CCICED

SPECIAL POLICY STUDY REPORT

Green Transition and Sustainable Social Governance

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** The co-leaders and members of this SPS serve in their personal capacities. The views and opinions expressed in this SPS report are those of the individual experts participating in the SPS Team and do not represent those of their organizations and CCICED.*

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Executive Summary

In 2018, Phase VI of the China Council for International Cooperation on Environment and Development (CCICED) established the Task Force on Innovation, Sustainable Production and Consumption, with Mr. Han Wenxiu, Executive Deputy Director of the General Office of the Central Financial and Economic Affairs Commission as the Chinese Co-Chair, and Mr. Macro Lambertini, CCICED Member and Director General of World Wide Fund for Nature (WWF), and Ms. Kathleen McLaughlin, CCICED Member and Chief Sustainability Officer and President of Walmart Foundation, as the International Co-Chairs. The overall objective of this Task Force is to support China's decision making on promoting green consumption, a green lifestyle, and green production, as well as improving the corresponding social governance system in the process of advancing ecological civilization.

In accordance with the overall research plan, a Special Policy Study (SPS) on Green Transition and Sustainable Social Governance was launched under the Task Force in 2018–2019. Mr. Ren Yong, Senior Research Fellow and Director-General of the Environmental Development Center of the Ministry of Ecology and Environment (MEE), served as the Chinese Co-Leader of the SPS; Mr. Fan Bi, Senior Research Fellow and Director-General of the Research Office of the State Council, worked as the Deputy Chinese Co-Leader; Ms. Åsa Romson, CCICED member and former Swedish Deputy Prime Minister and Minister for Climate and the Environment, acted as the International Co-Leader of the SPS; and Mr. Zhang Jianyu, Vice President of the Environmental Defense Fund (EDF) was the Deputy International Co-Leader. The research team consisted of Chinese experts and international experts from institutions including Environmental Development Center of MEE, Policy Research Center for Environment and Economy of MEE, Development Research Center of the State Council, State Information Center, Chinese Academy of International Trade and Economic Cooperation, IVL Swedish Environmental Research, Royal Dutch Association of Engineers, Institute of Global Environmental Strategies (IGES), Technische Universität München (TUM), and Asia Pacific Regional Office of UN Environment. The SPS primarily discussed the mechanisms for green consumption (lifestyle) to promote a green transition and made a quantitative analysis of the status and trends of consumption and its impacts on resources and the environment in China. It then reviewed green consumption (lifestyle) policies and practice in China, summarized the international experience of green consumption (lifestyle), and put forward strategic recommendations on promoting green consumption (lifestyle) in China.

In June 2019, the SPS reported its research findings and policy recommendations at the CCICED Annual General Meeting. As the SPS noted, current consumption patterns in China have resulted in prominent problems for resources and the eco-environment and have become a critical bottleneck restricting the development of the Ecological Civilization. It is necessary and important to recognize green consumption as a new driving force for high-quality development. Therefore, the SPS recommends that China seize the opportunity to incorporate

green consumption into the 14th Five-Year Plan (FYP) and key policy agendas of all sectors, making it a vital task for promoting high-quality development, Ecological Civilization, and green development. To do so, it requires top design and systematic planning that can consolidate scattered practices and fragmented policies, turn strong political will into a systematic strategic plan, specific and effective policy measures, and society-wide social practices to comprehensively push forward the green transition and upgrade consumption in China.

These research conclusions and policy recommendations have received wide attention and high regards from the CCICED members. During the Annual General Meeting, on June 5, 2019, Mr. Han Wenxiu met with the international co-leaders of the SPS and articulated his opinions on the significance of the topic, as well as the potential directions and focuses of the next step of research. The SPS and its follow-up research have also gained close attention and strong support from Mr. Li Ganjie, then CCICED Executive Vice Chairperson and Minister of MEE, Mr. Zhao Yingmin, CCICED Secretary General and Vice Minister of MEE, Mr. Guo Jing, CCICED Deputy Secretary General and Director General of the International Cooperation Department of the MEE, as well as the CCICED Chinese and International Chief Advisors, the CCICED Secretariat, the Swedish Ministry of the Environment, and the Embassy of Sweden in China.

Taking into account the opinions and requirements presented by Mr. Han Wenxiu and the results of the SPS's 2019 research, the SPS initiated a second phase in 2020 to explore three directions. The first is to combine the formation of green production and consumption patterns with the promotion of high-quality development. The second step will further refine and concretize the outputs from the first phase, convert them into feasible measures, and expand the research scope to cover green production, with the aim to support the research and development of China's 14th FYP. The third step is to continue to make good use of the CCICED platform and draw sufficient reference from best practices of developed countries. The specific research framework includes five steps:

(1) Evaluate and analyze the interrelationship between green consumption, green transition, and high-quality development. On the basis of phase 1 results, use such quantitative analysis tools as computable general equilibrium (CGE) to thoroughly analyze the contribution and role of green consumption in fuelling a green economic transition and high-quality development, and then identify consumption areas or factors that contribute the most.

(2) Build an indicator system for green consumption that consists of the indicator system and evaluation methods for measuring the progress and effects of green consumption as the basis and reference for China's efforts in pushing forward statistics, information disclosure, and the task and goal setting that are associated with green consumption.

(3) Develop case studies on green consumption and production in different industries, including green building, green automobile production and consumption, green power market reform, green logistics, digital low-carbon lifestyle platform, etc., highlighting green finance,

sustainable food chain, and ecological design.

(4) Study international experience related to green consumption.

(5) Develop an overall roadmap for boosting green consumption in China during the 14th FYP period.

On October 25, 2019, the SPS team convened an international workshop on green consumption and the inception meeting for the second phase research in Suzhou, Jiangsu province of China. Mr. Ren Yong and Mr. Fan Bi continued as Chinese Co-Leader and Deputy Chinese Co-Leader, respectively. In addition, Mr. Zhang Yong, Bureau Director of the General Office of the Central Financial and Economic Affairs Commission, was invited to serve as the SPS Chinese Co-Leader. Ms. Åsa Romson and Mr. Zhang Jianyu remained as the International Co-Leader and Deputy International Co-Leader, respectively. The SPS adjusted both the composition of its core expert team and supporting expert team (the list of experts who participate in the SPS research). On January 17–18, 2020, the SPS team held a plenary meeting in Beijing. After 6 months of efforts, the SPS team completed the second phase of research in May 2020, with this report as the output.

Conclusions and Policy Recommendations

After two years of research, the SPS team has put forward "8 general + 8 specific" policy recommendations and outlined the key research findings that underpin these recommendations.

I. Fully considering the plans to advance high-quality development, Ecological Civilization, and post-COVID-19 pandemic green recovery, the Chinese government should give green consumption and lifestyle a prominent strategic position on its agenda and comprehensively promote relevant practices through the implementation of the 14th FYP. There are at least six reasons to support this recommendation.

First, acknowledging the scale of the country's consumption, China plans to comprehensively transform consumption through quality upgrading. This will be a window of opportunity for fostering a new green consumption and lifestyle model. Lessons from other industrialized countries suggest that should this window be missed, it will be difficult to reverse a situation where a pattern of mass consumption and mass waste disposal forms.

Second, quantitative assessments have found that, since 2012, the decline in the resource and environmental performance of the consumption sector in China has partially offset improvements made in the resource and environmental performance of the production sector, thereby slowing down the speed of the country's green economic transition. With expanding consumption, growing pressure on natural resources and the environment can be expected to intensify. Precaution is needed to counter this tendency.

Third, in recent years, final consumption has maintained its place as the top driving force fuelling China's economic growth. As CGE models show, green consumption can be expected to have long-term positive effects on economic growth and employment. Achieving green consumption in the clothing, food, residential, and mobility sectors would act as a new driving force, providing momentum for speedy growth in related industries. Greening of food manufacturing, a transition to electric automobiles, and the greening of wholesale and retail practices will have the most significant pulling effects on green development in corresponding industries. This conclusion suggests crucial elements for a green recovery from the COVID-19 pandemic.

Fourth, a good social foundation is ready for China to fully boost the formation of green consumption. As shown by the *Survey Report on the Status of the General Public's Green Consumption in China* (2019), the concept of green consumption is becoming increasingly popular in the public's understanding of daily consumption. Around 83.34% of respondents expressed support for green consumerism, and 46.75% of these were "highly supportive." According to the *Report on Green Consumption Trends and Developments 2019*, the year-on-year increase in the sales volume of green consumption related products on JD.com was 18% higher than the overall sales increase of all products on the platform in 2019. In the face of the COVID-19 pandemic, an unprecedentedly large share of the public is reflecting in

a profound way on the human-nature relationship; this will further enhance people's willingness to consume in a greener way.

Fifth, consumption is an activity all citizens and groups engage in. Green consumption is a concrete action that can be taken by everyone in order to contribute toward building an Ecological Civilization. Promoting the formation of green consumption and lifestyles is doubtless an effective approach towards a governance system to be built, governed, and shared by all.

Sixth, internationally the European Union (EU) and countries such as Germany and Sweden have incorporated sustainable consumption into their overall development strategies as a new engine for economic growth and improvement of people's well-being.

Therefore, China should seize the window of opportunity to upgrade and transform consumption patterns, incorporating concrete green consumption and lifestyle actions and green development practices into the development of 14th FYP and thereby translating the central government's strong political will to accelerate the formation of Ecological Civilization over the next five years.

II. Establish goals and indicators for China to promote green consumption during the 14th FYP

At present, China has not yet established an explicit system of medium- and long-term goals and definite monitoring and evaluation indicators that are specific to green consumption. Taking into account existing progress in the development of green consumption policies and practices, as well as the requirements for achieving high-quality development and the building of an Ecological Civilization, it is recommended that the overall goals for China to accelerate green consumption during the 14th FYP period should adhere to the philosophy of Ecological Civilization, substantially improve the level of green consumption, and speed up the formation of green production patterns to foster a novel internal impetus for eco-environmental quality improvement and high-quality development. More specific targets may include a significant increase in the awareness of green consumption throughout society, a substantial increase in the supply of green consumer products, the preliminary formation of a green and low-carbon consumption pattern and lifestyle, and a fundamental green consumption policy system that makes use of both incentives and constraints.

Drawing on the UN 2030 Sustainable Development Goals on Consumption, and with reference to the experiences and learnings in such countries as Germany and Sweden, China should establish a green consumption indicator system, making use of both qualitative and quantitative methods, in order to monitor and evaluate the overall status and level of green consumption. Such an indicator system can also be used to follow up corresponding target values during the 14th FYP period. Green consumption indicators can be divided into an overall index and domain-specific indicators. The overall index could be composed of indicators for changes in per capita CO_2 emissions from daily life, daily domestic water consumption per capita, the output value of major green products, the government's green

procurement ratio, etc. Domain-specific indicators could be established for clothing, food, residential, mobility, household appliances, and tourism sectors to reflect their resource demands and environmental performance, making use of the best available data.

III. Promoting green consumption in the clothing, food, residential, mobility, household items and services, and tourism sectors during China's 14th Five-Year Period.

The clothing, food, residential, mobility (including communications), and daily utility products (household items and services) sectors account for 76% of individual consumption in China. As shown by the analysis from the CGE model built by the SPS team, this structure will not change significantly in the next 15 years. The above-mentioned five areas are the ones with the largest resource and environmental impacts among all domains of individuals' consumption. For every one unit of green product consumed, the economic output coefficient is 2.5 for the food sector, 3.0 for the residential sector, 3.8 for household items and services, and 2.7 for mobility and communication. These figures show the strong positive contributions these areas can have for the economy and environmental performance. Germany, Sweden and like-minded countries have identified food, housing, and mobility (including tourism) as key areas for sustainable consumption, based on their respective Greenhouse Gas emission contributions.

To this end, China should designate clothing, food, housing, mobility, household appliances, and tourism as key areas for promoting green consumption during the 14th FYP period and beyond. The main tasks will be to give priority to increasing the effective supply of green products and services in related fields while boosting the practice of "reduce, reuse and recycle." Steps to do this are to:

(I) Promote a green diet. Initiate anti-food waste actions covering the entire food chain from storage to transportation, retail to the dining table; implement comprehensive plans for green take-out for the catering industry; unify and strengthen green and organic food certification systems and standards; and expand the supply of green food.

(II) Promote green buildings. Steer cities and localities with adequate capacities towards fully applying green building standards for new buildings and expand the scope where green building is mandated. Push forward the application of green building standards in the renovation of old communities. Implement an action plan for the production and use of green building materials; promote the comprehensive design, construction and operation of green buildings; strengthen environmental labelling, especially energy-efficiency labelling and certification for green household appliances; and enhance the effective supply of energy-efficient green household products.

(III) Promote green mobility. Encourage the use of low-carbon or net-zero transport modes such as walking, cycling, and public transportation; strengthen efforts to promote new energy-efficient automobiles; encourage the use of new and clean energy vehicles in expanding and upgrading fleets for public transportation, sanitation, taxis, commuting, urban express mail services, and urban logistics; reinforce the promotion and use of new energy

vehicles in such areas as national Ecological Civilization pilot zones and key areas for air pollution prevention and control.

(IV) Promote green household appliances. Encourage consumers to choose green products such as energy-efficient household appliances, high-efficiency lighting products, water-saving utensils, and green building materials. Encourage businesses to provide reusable, durable, and maintainable products and enable consumers to choose such products. Support the development of a sharing economy. Encourage the effective recycling of personal resources not being used; improve the recycling system of social renewable resources; boost greening, reducing, and recycling practices in express packaging; strictly implement the government's priority procurement and mandatory procurement system for energy-saving and environmentally friendly products; and expand the scope and scale of green government procurement.

(V) Promote green clothing. Carry out "zero-discard" activities and "clothes reborn" activities for old and used clothes. Boycott fur and leather products made of rare animals to conserve biodiversity. Support and facilitate textile and apparel companies so they can build green supply chains. Improve the recycling and reuse of waste and old textiles in earth structures, building materials, automobiles, and home decoration sectors. Enhance the efforts in environmental labelling and certification of textiles and apparel. Substantially increase the effective supply of green textiles and apparel.

(VI) Promote green tourism. Develop and publish green tourism and consumption conventions and guidelines. Encourage tourist hotels, restaurants, and management agencies in scenic areas to introduce incentive measures for green tourism. Formulate and/or revise appraisal rules and standards for green services, including *inter alia* green markets, green hotels, green restaurants, and green tourism. Star-rated hotels and chain hotels should gradually reduce the free provision of disposable toiletries and supplies and pilot demand-oriented provision. Publish green tourism information on relevant tourism promotion websites and platforms and encourage consumers to bring their own toiletries. Endeavour to integrate biodiversity conservation into tourism-related standards and certification programs.

IV. Build a green consumption policy system with equal emphasis on both the supply side and demand sides, balanced use of incentives and constraints, and the principle that the system should be built, governed, and shared by governments, businesses, and consumers.

Consumption is an economic behaviour involving both supply and demand. The design of green consumption policy should respect economic principles. Consumption is a social behaviour that involves each and every member of society. Consumption is also a cultural behaviour, influenced by factors such as values and customs. The design of consumption policies needs to incorporate the clearly defined responsibilities and obligations of each actor and take into account incentive mechanisms, supervision and management, publicity and education, and so on.

The government should establish institutional arrangements for promoting green consumption by formulating legislation and standards. Encourage or mobilize consumers' willingness and behaviour to practice green consumption through industrial policies, fiscal and taxation policies, and price policies. Lead the constant increase in product and service quality by formulating and implementing standard systems of technology, products, quality, etc., and in particular, the "top runner" standards system. Guarantee the openness, fairness, and justice of the market, and regulate market operations via inspection, monitoring, and management.

Enterprises should facilitate the reduction of product prices through technological innovation to expand the supply of green products; practice eco-environmental responsibilities and corporate social responsibility (CSR); carry out such measures as product and service life-cycle assessment (LCA); green supply chain management, clean production, innovative business and consumer models and circular economy to reduce the negative environmental impacts in the life cycle of consumer products; emphasize a material reduction in the production of energy-saving, environmentally friendly, and low-carbon products; develop smart logistics and reduce the logistics costs of green consumer goods by system optimization and management of green consumer products (quantity and quality), brands, storage, transportation routes, and transport modes, so as to meet the needs coming from consumption upgrading.

In a context where sound incentives and constraints are in place, and with an enabling social atmosphere and favourable market environment, consumers will either consciously or unconsciously fulfill their responsibilities and obligations to protect the ecological environment, practice green consumer behaviour, and form a green lifestyle.

V. Establish green consumption promotion systems, mechanisms, and technical support institutions with clearly defined rights and responsibilities, and give full play to the unique role of women, youth, and social organizations in promoting green lifestyles.

The Chinese government should further define the role of government agencies, such as integrated economic management authorities, industrial/sectoral management authorities, and administrative authorities for eco-environmental protection, in advancing green consumption. It should also develop a corresponding list of green consumption responsibilities for government departments and agencies and establish a cross-sectoral collaboration mechanism to create synergies. At the same time, China should set up a technical support organization that is dedicated to promoting green consumption and in charge of specific operations, including green consumption research, information disclosure, monitoring and evaluation, communication and education, capacity building, etc. Meanwhile, the role of social organizations such as the China Consumer Association in promoting green consumption should be highlighted and given full play.

China should give full play to the unique role of women and youth in promoting a green lifestyle. According to relevant surveys, 80% of household consumption decisions are made by women, and female consumers have become the pioneers and main force in green consumption. Young people are strongly positive toward ecological environment protection

and green consumption, and thus are indispensable to furthering green lifestyle practices.

Gender-focused and youth-driven practices are quite common in countries like Germany and Sweden.

VI. Build on public reflection as a result of COVID-19 to launch a nationwide green consumption and new lifestyle campaign.

The government should leverage the positive roles that stars and social celebrities can have in demonstrating a green lifestyle to help green consumption become socially fashionable. Integrate the concept of green consumption into related education and training programs for various institutions at various levels, including families, schools, governments, and businesses. Strengthen awareness-raising efforts and incorporate green consumption initiatives into thematic publicity and education events, such as the National Energy-Saving Week, Science Promotion Week, National Low-Carbon Day, and Environment Day. Establish a green consumption incentive and penalty system for the general public; strengthen green consumption information disclosure and public participation; advocate simple, moderate, green and low-carbon production and lifestyles; oppose extravagant consumption, excessive consumption (waste), and irrational consumption; and raise awareness throughout society.

VII. Strengthen infrastructure and capacity building for green consumption.

Build a green consumption statistics database and carry out monitoring, data collection, and statistical and evaluation reporting on green consumption. Establish a national unified green consumption information platform to publish information on green products and services, improve transparency in green product production and consumption, and encourage stakeholders to recognize the credibility of green product and service certification/evaluation results. Strengthen capacity building and training on green consumption in government, social organizations, enterprises, and the general public; build multistakeholder partnership networks; and push forward the participation of multiple stakeholders.

VIII. Further develop a national green consumption action plan.

According to the experience of Germany, Sweden and other countries, in addition to the use of 14th FYP as an overarching instrument to lead related tasks, it is necessary to further develop a corresponding national action plan specific to green consumption. This should be a medium- and long-term action program to promote the formation of green consumption and lifestyle in a more comprehensive, in-depth, and systematic manner.

IX. Specific policy recommendations on green production and consumption that deserve close attention.

(I) Establish sound green building standards, and incorporate energy-saving and environmental protection requirements into the ongoing renovation of old communities in China to guarantee green renovation. The renovation of old communities should be integrated into the creation of smart cities and waste-free cities. New buildings must

thoroughly follow green building standards.

Statistics show that housing and residential expenditures account for 23.5% of residents' consumption in China, and building energy consumption makes up over one third of the total societal energy consumption. China's existing buildings have nearly 60 billion square metres of floor area, more than 95% of which belongs to high-energy-consumption buildings, with per unit energy consumption 2–3 times higher than that in developed countries with the same climate conditions. The recovery rate of construction waste in China hardly reaches 5%, far below the level of 90% in developed countries. In addition, some predictions indicate that the growth rate of the cumulative residential area of old communities in China will accelerate significantly in the next decade. An SPS CGE model analysis shows that a moderate increase in green construction investments for the green renovation of old communities and new green buildings will have positive effects on economic growth, employment, and resource use and environmental conditions in the short term. Related research also reveals that green buildings can save about 30% in energy demand compared to conventional buildings.

Therefore, the Chinese government should attach great importance to the development of green buildings and seize the particular opportunity brought by the ongoing large-scale renovation of old communities to fully push forward green renovation. The goal of green innovation can be achieved by establishing and improving governance mechanisms for the renovation of old communities, improving the green standard system and supervision system, and employing such means as smart technologies to greatly improve the quality of the green renovation.

(II) Comprehensively study and formulate a policy system on green production and consumption for the automobile industry.

The automobile industry has become the pillar industry of China's economy. Since 2009, the volume of car sales in China ranked top in the world for 10 consecutive years. At present, the number of employees in automobile-related industries has exceeded one sixth of the total employed population in China. However, the resource and environmental problems caused by the use of automobiles are becoming increasingly prominent. In 2017, the transportation sector in China accounted for 46% and 66% of the total national consumption of gasoline and diesel, respectively. In 2018, automobile-emitted NO_X amounted to 43.6% of the total NO_X emissions in the country; yet the contribution of the automobile sector to China's total NO_X emission reductions was less than 20%. Therefore, the automobile industry is an important area to promote green consumption and production.

From the perspective of fuel efficiency and pollution emission standards, the Chinese government has made significant progress in boosting the green transformation of the automotive industry in the areas of automobile consumption and production, transportation, and energy policies. In the field of new energy vehicles in particular, remarkable achievements have been made. According to the analysis from the SPS team, China's policies for the new energy vehicle industry are generally effective. Of all measures, purchase subsidies have made the highest contribution to the development of the new energy vehicle

industry, with a ratio close to 50%; the purchase subsidy policies also have had the most significant effects on promoting technology progress, cost reduction, and market growth.

However, a green consumption and production policy system for China's auto industry has not yet taken shape. A number of issues have seriously hindered green consumption and production practices in the auto industry, such as the imbalance in tax collection, loose links with energy conservation and emission reductions, an overemphasis on subsidies for purchase, and so on. Corresponding reform should be directed to the establishment and improvement of a sound policy system covering the entire automotive industry chain to support green consumption and production. Specific actions should focus on the production process, the development and application of non-HFC (Hydrofluorocarbons) alternatives, and encouraging alternative technologies. In the procurement process, tax reform should be promoted to enhance the effect taxes can play in leading energy conservation and emission reductions, reducing the cost of purchasing green car products, and encouraging green consumption. With regard to actual use, efforts are needed to make green car products easier to use and reduce corresponding costs. In terms of vehicle scrappage and recycling, it is important to advance the improvement of battery recycling policies and standards, improve policies related to the remanufacturing industry, and enable the integrated development of the remanufacturing and insurance industries so as to facilitate the development of the remanufacturing industry.

In terms of tax reform, the following steps could be considered. From 2021 to 2025, gradually phase out the current purchase tax exemption policy for new energy vehicles. From 2026 onward, implement a preferential tax policy based on fuel consumption, and set up a dynamic policy adjustment mechanism to respond to changes in fuel consumption regulations. From 2031 to 2035, raise the threshold for preferential policies and introduce a punitive tax system.

(III) Strengthen the reform of the green power consumption market.

By the end of 2019, the installed capacity of renewable energy-based power generation in China reached 794 million kWh, making up 39.5% of total installed power; renewable energy power generation amounted to 2.04 trillion kWh, accounting for 27.9% of the total power generation. It is anticipated that, by the end of the 14th FYP period (2021–2025), renewable energy-based power generation will approach 40% of China's total power generation.

Therefore, it is of great significance to create a green power consumption market and unlock the demand for green power from enterprises and other users. The following specific measures can be taken. First, promote the use of power purchase agreements (PPA) and virtual power purchase agreements (VPPA) to further articulate the specific rules and regulations for various power sources, including renewable energy, to be engaged in market-based transactions. Second, cut down improper administrative interventions from local governments, liberalize power generation plans and use plans, and respect users' choices. Third, facilitate market-oriented transactions between power users and clean energy-based power generation companies such as hydropower, wind power, and solar power. Fourth, improve the policy and market environment for various users to jointly develop and use distributed renewable energy-generated power. Fifth, gradually expand the pilot of direct trade of renewable energy-based power. Sixth, recognize the environmental attributes of

renewable energy certificates to enhance enterprises' confidence in the trading market. Seventh, establish a communication platform that includes various stakeholders to strengthen communication and cooperation.

(IV) Formulate a national action plan for the development of a green logistics industry.

As of the end of 2018, China's express delivery volume had reached 50.71 billion pieces, more than the developed countries and economies of the United States, Japan, and Europe combined. In 2018, the express delivery industry consumed 50 billion pieces of express waybills, 24.5 billion plastic bags, and 5.7 billion envelopes, 14.3 billion packaging boxes, 5.3 billion woven bags, and 43 billion metres of tape, resulting in a cost of nearly 1.4 billion yuan for waste disposal, including landfill and incineration. At the same time, transportation in China's logistics industry is still dominated by conventional fuel vehicles. Nearly 20 million vehicles are running for the logistics industry, consuming large amounts of gasoline and diesel while emitting pollutants.

Over the last few years, China has seen a number of good practices develop in green logistics, with promising experiences gained. However, in general, the lack of systematic policy support has been a chief factor restricting the development of a green logistics sector. Weaknesses include: corresponding legislation is lagging behind; management responsibilities are scattered in many government departments; responsibilities of relevant market players are unclear; existing legislative efforts focus more on macro-level guidance rather than concrete instruments; relevant standards, evaluation systems, and practical guidelines are missing; and inputs and the influence of pilot projects are not sufficiently strong. Therefore, policies to promote the development of a green logistics industry in China should be directed to the formulation of a special action plan at the national level as a package solution to the above policy issues, to comprehensively push forward the green development of the sector and systematically address the resource and environmental problems brought about by the booming growth of the sector.

(V) Fully employ digital technologies to support green and low-carbon lifestyles.

In recent years, there have been lots of projects (platforms) to pilot and boost digital low-carbon lifestyles. Schemes (and apps), including Ant Forest, Carbon Generalized System of Preferences (CGSP), the Zero Carbon Group app, and the Bean Sprouts App, have achieved positive results in innovating tools and mechanisms to lead a low-carbon life. Among them, the enterprise-led Ant Forest and the government-led CGSP are characteristic.

Based on these kinds of experiences, and with the support of the government, China is capable of building a digital platform for a green and low-carbon lifestyle with national influence and unified applicable standards to support individual consumers and groups to follow green and low-carbon behaviour. Such a unified platform would tackle a series of difficulties faced by the existing independent, decentralized, spontaneously organized, small platforms. For example, due to the lack of special policy support, platforms solely operated by enterprises are often unsustainable. Considerations of privacy and data security prevent

current platforms from obtaining large volumes of information on effective emission reductions. Due to discrepancies in accounting standards for green and low-carbon activities and a lack of unified supervision, carbon emission reductions arising from users' low-carbon activities may be double-counted. A unified national digital platform can also provide technical support for large-scale green consumption actions by governments and groups, such as the carbon neutrality plan for conferences and events.

(VI) Speed up the development of standards for green products and services, strengthen the certification and recognition efforts, and enhance the effective supply of green products and services.

Green products and services are the basis of green consumption. A priority should be placed on accelerating the development of standards for green products and services, including environmental labelling, energy conservation, water conservation, and green buildings, and reinforcing third-party, independent certification and recognition efforts. Green products and service standards and corresponding certification and recognition not only link the consumer to the producer but also leverage green consumption and green production. Thus, they deserve to be highlighted and given close attention.

(VII) Public institutions such as government and state-owned enterprises should take the lead in green procurement and carbon neutrality actions to play a stronger demonstrating role.

Revise the Government Procurement Law to include major actors such as government departments, public institutions, and state-owned enterprises at all levels in the scope for green procurement. Expand the range of products and services for green procurement, and pilot the implementation of a mandatory green procurement system. Establish incentive policies to encourage other social organizations and businesses to practise green procurement. Pilot the establishment of carbon neutrality schemes for large-scale events (including conferences and sports competitions) by governments, public institutions, and state-owned enterprises at all levels, and encourage other social actors to take carbon neutrality actions. Support various carbon neutrality actions through the national digital low-carbon platform and establishment of a carbon neutrality fund.

(VIII) Issue green consumption vouchers/coupons to stimulate and lead green consumption.

In recent days, to spur consumption in the face of the COVID-19 pandemic, local governments in Nanjing, Hefei, Hangzhou, Zhengzhou, and other cities in China have issued a variety of vouchers/coupons for food and beverages, supermarkets, rural tourism, and car subsidies, yielding positive results. For instance, as of April 9, 2020, the written-off vouchers in Hangzhou have amounted to 220 million yuan, resulting in consumer spending of 2.37 billion yuan, with a multiplier effect of 10.7 times. Recently, similar approaches have been used in the United States.

Based on these practices, it is necessary for China to study the feasibility of issuing green

consumption vouchers/coupons, not only as a stimulus for green recovery in the face of the COVID-19 pandemic but also as a normal practice that includes various forms of vouchers. The vouchers can be given by governments, product manufactures and sellers, and even groups that are interested. The scope of preferential treatment will be limited to the consumption of green products and services to attract consumers with green targets so as to leverage green consumption. Groups that are willing to push forward green consumption should be encouraged to carry out pilot projects.

1. Green Consumption, Transition and High-Quality Development

As the scale of consumption in China is continuing to expand rapidly, its structure is shifting from being subsistence-based to being like that of a well-off country. Its contribution to economic growth is soaring, and it is becoming an important engine for economic development. As shown by the China Council for International Cooperation on Environment and Development (CCICED) (2019) study[1], a green transition in the consumption sector will lead to and enforce the greening of production, facilitate green production and green lifestyles, mobilize the general public to actively practice green concepts, and improve the governance system for a green social transition. It will play a decisive role in the overall green transition and realization of high-quality development in China.

1.1 Status and Trends of Green Consumption in China

1.1.1 Overall Status of Consumption in China

In recent years, consumption in China has steadily and rapidly grown. In 2019, the total retail sales of consumer goods amounted to 41.2 trillion yuan, nearly doubling the volume of 2012, which was 21 trillion yuan. The corresponding growth rate reached 8.05%, which was twice as much as the 2018 level of 4.02% and 2% higher than the 2019 GDP growth rate. According to data released by the National Bureau of Statistics of China, the contribution of final consumption expenditure to GDP growth accounted for 57.8% for the whole year, 26.6 percentage points higher than the contribution of total capital formation. At the same time, consumption has moved to a new stage in which the spending power of residents is rising rapidly, the trend toward upgraded consumption has become more explicit, the demand for mid- and high-end goods and services has risen, and the consumption of services has expanded. In 2019, per capita consumer spending on services for the whole country accounted for 45.9% of per capita consumption expenditure, an increase of 1.7 percentage points over the previous year; the Engel coefficient was 28.2%, showing a drop of 0.2 percentage points. In 2019, the per capita consumption expenditure of the country exceeded 20,000 yuan for the first time, reaching 21,559 yuan, with a real increase of 5.5%. Consumption expenditures by rural households grew faster than by urban households. The nominal growth rate and real growth rate of rural household consumption expenditures were 2.4% and 1.9%, respectively, higher than those for urban households. The level of urbanization has further increased, with the urbanization rate of the permanent population surpassing 60% for the first time as of the end of 2019, creating a huge space for investment growth and consumption expansion.

[1] CCICED Special Policy Study on Green Transition and Sustainable Social Governance, June 2019. http://en.cciced.net/POLICY/rr/prr/2019/201908/P020190830114076694525.pdf

1.1.2 Progress in Green Consumption Policies in China

In recent years, China has put forward hundreds of concepts, guidelines, and specific policies related to the promotion of green lifestyles for citizens. It has witnessed promising achievements in greening household consumption in areas such as clothing, food, residences, and mobility. However, in general, an effective policy framework has not yet taken shape due to a lack of systematic planning and top-level design. Existing policy focuses more on resource and energy conservation rather than on ecology and environmental protection. Responsibilities for green consumption promotion are not clearly defined and are scattered across many government departments, with neither synergies created, nor an important place given to green consumption on key policy agendas. Without a systematic design and the integration of relevant policies, the environmental benefits and economic effects linked to green consumption might be greatly impeded. China now has strong political will, an increasingly mature social foundation, and a good practical basis for promoting the green transformation of consumption. The timing and conditions are right for incorporating green consumption into the national 14th FYP.

1.1.3 Trends and Features of Green Consumption in China

As noted by the *Survey Report on the Status of General Public's Green Consumption in China* (2019), the concept of green consumption is becoming increasingly popular in the public's understanding of daily consumption. Around 83.34% of the respondents expressed support for green consumption behaviour, and 46.75% were "highly supportive." In addition, there has been a constant increase in both businesses' willingness to procure, utilize, and sell environmentally friendly green products and consumers' willingness to buy safe, reliable, and green products. There is also much closer attention from the general public to green food and green home improvement. Consumers are not only willing to buy high-quality green products but also concerned about the impacts of production methods on the eco-environment.

According to the *Report on Green Consumption Trend and Development 2019* released by the JD Big Data Research Institute, the number of types and categories for "green consumption" commodities exceeds 100 million. The year-on-year increase in the total sales volume of green consumption related products on JD.com was 18% higher than the overall sales increase of all products on the platform in 2019. The top five categories with the largest sales volume included grain, oil and seasoning, facial care, children's clothes and shoes, furniture, and car trim. With regard to the share of commodities for "green consumption" in markets at all levels, the proportions of "green consumption" commodities were relatively higher in second-tier and third-tier markets, while the total green consumption volume ranked top in the first-tier market. Judging from the two-year change in the proportion of "green consumption" commodities in markets at all levels, the sales volume in new markets grew with the fastest speed.

In the context of occupation, gender and age, medical practitioners/public organization employees, females, and people above the age of 46 were the groups that were paying the

closest attention to "green consumption." The share of green consumption held by these groups was 7.4%, 11.5%, and 24.8% higher than the overall sales of all products on JD.com, respectively. According to the online survey results, 80% of the household consumption decisions were made by women. Women are important decision-makers for consumption, and female consumers have become the pioneers and main force of "green consumption" (Figure 1).

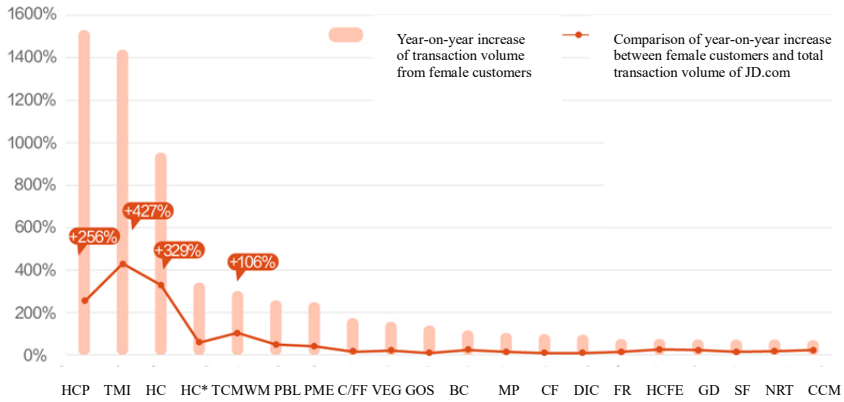

Figure 1. Top 20 categories by increase of transaction volume from female customers vs. sales volume of all products on JD.com

(Source: JD Big Data Research Institute, *Female Consumption Trends Report 2020*)[2]

1.2 Green Consumption Is the Key to Push Forward a Green Economic Transition

The green transition of the economy has been primarily driven by the transformation of two sectors—production and consumption. Built on the results of research conducted in 2019, the SPS team has improved the design of the existing green transition index and indicator system and conducted further empirical evaluation on the role and trends of green consumption in the green economic transition. The results are as follows:

1.2.1 There has been a shift towards a *green transition year by year; however, the growth trend has gradually flattened.*

From 2004 to 2008, green transition index values increased substantially on a yearly basis, clearly indicating a growth in the green transition change rate. From 2009 to 2015, however, the momentum behind the green transition slowed, and the speed of the green transition decreased. Since 2016, a slight decline has been detected in green transition index values, revealing a declining trend in green transition (Figure 2).

[2] Notes: HCP: Health care and protection (including mask); TMI: Toys and musical instruments; HC: Home care; HC*: House cleaning (including disinfectant); TCMWM: Traditional Chinese medicine and western medicine; PBL: Pork, beef, and lamb; PME: Poultry meat and eggs; C/FF: Chilled/Frozen food; VEG: Vegetable; GOS: Grain, oil and seasoning; BC: Body care; MP: Milk powder; CF: Complementary food; FR: Fruit; HCFE: Health care and fitness equipment; GD: Gaming device; SF: Seafood; NRT: Nutrients (including Vitamins); CCM: Chess, cards, and mahjong

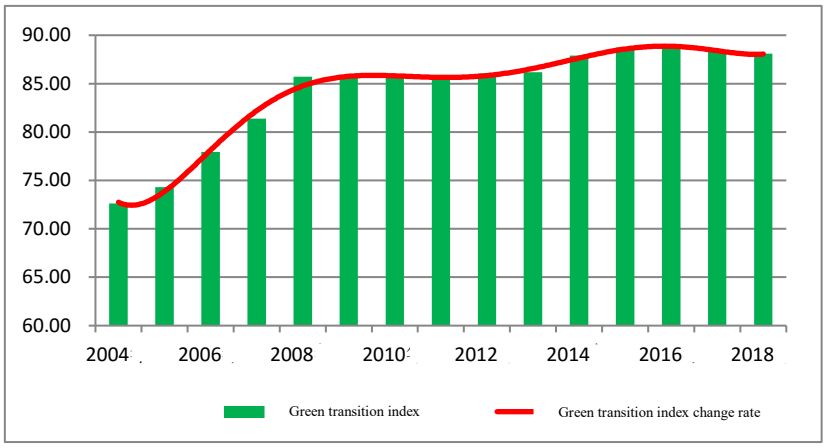

Figure 2. Trend of the green transition index change (2004–2018)

1.2.2 The green transition index related to lifestyles *has dropped,* suggesting that this is a *bottleneck* area restricting *overall progress* on a *green economic transition.*

The green transition index in the production sector has been on an upward trend since 2004. In contrast, the green transition index in relation to lifestyles has shown a sharp downward trend since 2008. The green transition index value from 2016 to 2018 was even lower than that of 2004. This has contributed to a slowdown in the overall green transition of the economy (Figure 3).

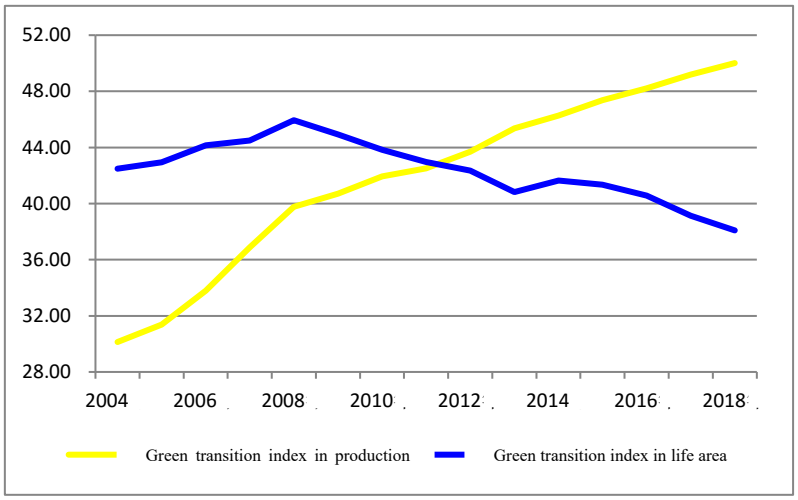

Figure 3. Green Transition index trends in production and lifestyle sectors (2004–2018)

The slowdown of the green transition in the lifestyle area can be primarily attributed to the steady growth in consumption of resources and energy, the increase of pollutant emissions from domestic sources, and the reinforced adverse impact of lifestyle on eco-environmental quality. From 2004 to 2018, with the improvement of living standards, there was an increase in household energy consumption. The per capita domestic energy consumption increased from 191 kgce in 2004 to 441 kgce in 2018. Both the emission of major domestic pollutants (including carbon dioxide and domestic wastewater) and domestic waste collection volume

have shown a clear year-on-year upward trend.

As revealed by the above results, the positive environmental effects and benefits created by the improvement of resource and environment efficiency in the production sector in China are not yet able to compensate and offset the negative environmental impacts brought about by the expansion of the country's consumption sector. The green transition process in domestic consumption is sluggish and deteriorating, resulting in delays to both the pace and depth of the overall green transition of development in China. From a resource and environmental performance perspective, there is huge room for advancing China's green transition in both the production and consumption sectors, especially related to lifestyles. Urgent measures are needed to green the lifestyles and the consumption behaviour of the public.

1.3 Advancing Green Consumption Is an Important Option to Push Forward High-Quality Development

1.3.1 Demand and Supply Are Closely Related Aspects of Economic Activity, and High-Quality Development on the Supply Side Depends on Optimization and Upgrading on the Demand Side.

The booming development of green consumption can create an ample market space for building a green economic system. In 2019, the Engel coefficient of China's household consumption dropped to 28.2%, with a decrease of 3 percentage points from the level of 31.2% in 2013. In the future, as the demographic structure changes and the urbanization rate increases, the joint effects of pro-consumption factors such as employment, income, and social security will lead to further decreases in the Engel coefficient. It is projected that the Engel coefficient will continue a decline to 20% by 2035, reaching the well-off line of 20% to 30% set by the United Nations (UN). In the meantime, the household consumption model in China will further shift from a material-oriented and subsistence model to a well-off, service-oriented model. An increase can be expected in the share of per capita consumer spending on services such as transportation and communication, education, culture and entertainment, as well as health care. Such important changes and trends in consumption scale, structure, and preferences in China will inevitably induce corresponding adjustments on the supply side for production and services provision. In this process, should the general public be positively guided towards green consumption, it will effectively boost the development of green product manufacturing, energy conversation, and environmental protection industries, and act as a new driving force for green growth. Green products and industries for energy conversation and environmental protection have long industrial chains, high levels of inter-connectivity, and a strong capacity for job creation; thus, they can also pull the development of other related industries as they themselves develop. Green consumption's direct growth and indirect pulling effects will exert positive effects that help drive economic growth.

1.3.2 Advancing Green Consumption Is An Important Direction for Fostering New Momentum and Achieving Stable Economic Growth.

Generally speaking, the production of green products involves longer industrial chains and higher-quality processes compared to traditional products. Gradually expanding the consumption of green products will have a stronger pulling effect on the economy. However, in the short term, there might be some adverse impacts that require attention and evaluation, such as relatively high product prices, which may take up larger proportions of total spending and affect the budget available for other goods and services. Therefore, the SPS team built a large-scale dynamic computable general equilibrium (CGE) model to analyze the multiple scenarios for replacing traditional consumption with green consumption. Under the simplified assumption that people's consumption preferences remain unchanged, the substitution of green consumption for traditional consumption will have limited negative impacts on the economy in the short term; but in the medium to long term, it will bring about a continuous increase in positive economic growth.

Figure 4 illustrates consumption trends for 2020–2025 under a baseline scenario and under a green consumption model. It is assumed that, starting from 2020, consumer products worth over 400 billion yuan (around 1% of total household consumption volume) will be replaced by green products in the areas of food, automobiles, buildings, household electric appliances, and household items. Should that happen, in the short term, the GDP will drop slightly by 0.06% (around 6.1 billion yuan) relative to the baseline scenario, indicating a short-term, small, and manageable negative impact. The cause for this decline lies in the relatively high price of green products, which leads to an increase in the composite average price for household consumption by 0.11% relative to the baseline scenario. This increase is significantly higher than the GDP deflator (only a 0.02% increase). Given the balanced relationship between GDP by output approach and GDP by expenditure approach in macroeconomics, the price difference will cause short-term growth of -0.12% in employment on the production side and a -0.06% drop in GDP.

However, in the medium to long term, as investments in the production of green products become profitable, there will be a gradual turn to positive GDP growth relative to the baseline scenario. It is projected that the GDP will increase by 0.05% relative to the baseline scenario in 2025 (equivalent to an increase of 73 billion yuan relative to the baseline scenario in 2025), with investment rising by 0.09% (equivalent to an increase of 49 billion yuan), household consumption by 0.01% (equivalent to an increase of 6 billion yuan), leveraged exports by 0.3% (equivalent to an increase of 59 billion yuan), and the corresponding employment by 0.02% (equivalent to an increase of 600,000 jobs).

Assuming a replacement of traditional products worth 2% of the total household consumption volume with green products, a similar trend is obtained, i.e., there is greater economic loss relative to the baseline scenario in the short term (-0.25%), but a larger positive economic growth gained in the medium to long term (0.14%).

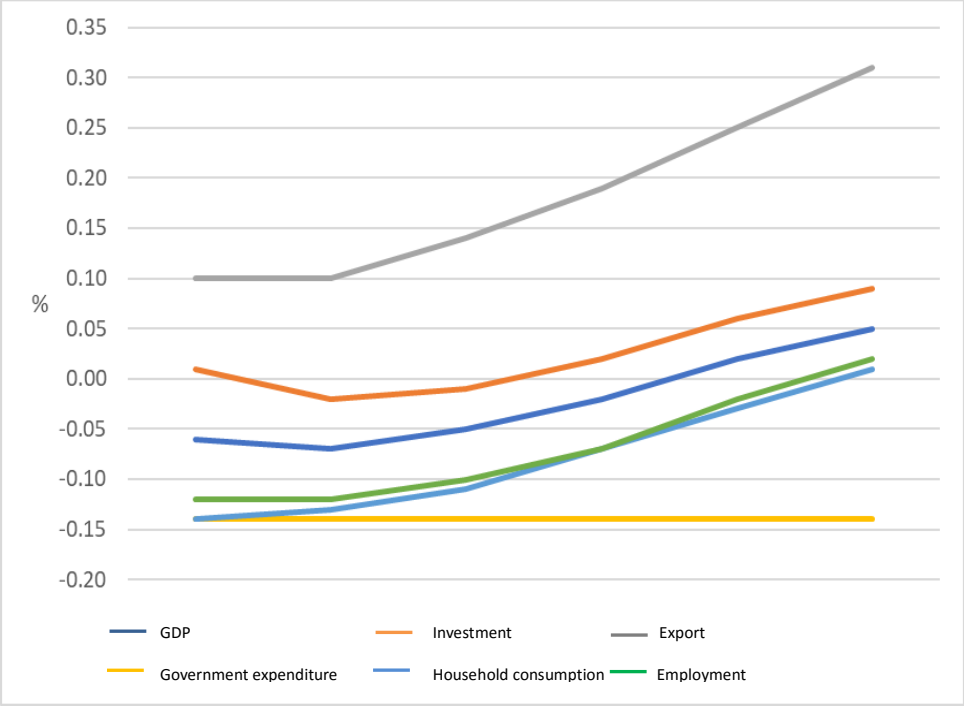

Figure 4. Macro impact of 1% of household consumption volume being replaced by green consumer goods

The above scenarios, moreover, do not take into account the fact that green products will provide consumers with better enjoyment, a sense of honour and gain, and bigger positive environmental effects than traditional products. For the middle and upper classes who are economically well off, an enhanced supply of green products will not drive out traditional consumer goods. They will instead stimulate more consumer desire and expand consumption scale. At present, the CGE model has not yet quantified such a scenario, but a qualitative judgment shows that, under this quite realistic assumption, the gains from such a scenario might significantly offset the short-term negative economic impacts projected by the previous scenarios, even resulting in positive macro-economic growth in the short term. In this case, there could simultaneously be positive growth in the medium to long term.

1.3.3 Replacing Traditional Consumption With Green Consumption Will Effectively Help Optimize and Upgrade the Industrial Structure, and the Manufacturing Industry of Green Products Will Achieve Sustainable and Rapid Growth.

According to the industry output results obtained by the above CGE model (Table 1), should green consumption substitution be implemented in 2020, the output value of green consumer goods will grow rapidly and constantly in both the short term (2020) and the medium to long term (2025), driving industry-wide overall growth (offsetting negative impacts) with new momentum for green growth. The food manufacturing industry will foster the strongest green growth momentum while electric vehicle manufacturing in automobile manufacturing and green wholesale and retail in service industries will have the largest increment. All of these industries should be treated as priority industries for promoting green consumption.

Table 1. Impact of substitution of green consumer goods on value-added of major sectors (0.1 billion yuan, current price of 2017)

Value-added of major sectors	2020	2025
Food	-1571	-1744
Green food	1600	1856
Building	-3	30
Green building	5	13
Household appliances	-9	4
Green household appliances	5	8
Automobile	-49	-54
Electric vehicle	61	75
Wholesale and retail	-217	-112
Green wholesale and retail	200	247

1.3.4 The Substitution of Green Consumption for traditional Consumption Also Has Obvious Resource and Environmental Effects.

As clean energy such as electricity and natural gas is more frequently used in the production and use of green consumer goods, the corresponding consumption of coal and oil will reduce, which will spur the green transition in the energy sector. According to energy consumption results from model estimations, under the baseline scenario (without consideration of the COVID-19 impact), China would consume 4.95 billion tonnes of standard coal equivalent in 2020, of which, 4.05 billion tonnes of coal, 630 million tonnes of oil, and 320 billion cubic metres of natural gas. Should products worth 1% of household consumption volume be replaced by green consumer goods, the total energy consumption would reduce by 0.05%, out of which coal demand will reduce by 0.07%, oil by 0.08%, natural gas by 0.06%, and non-fossil power generation would increase by 0.05%. It is estimated that the emissions of carbon dioxide would be reduced by 7 million tonnes, those of sulphur dioxide by 56,000 tonnes, and those of nitrogen oxides by 31,000 tonnes.

1.4 Changes in Consumption in China and the Corresponding Long-Term Impacts of the COVID-19 Pandemic

1.4.1 Consumption Volume Has Dropped Drastically due to COVID-19.

According to data released by the National Bureau of Statistics of China, China's total retail sales of consumer goods from January to March 2020 reached 7.858 trillion yuan, showing a year-on-year nominal decrease of 19.0%. Retail sales of consumer goods other than automobiles were 7.2254 trillion yuan, a decrease of 17.7% (Figure 5).

Retail sales of consumer goods in urban areas were 6.7855 trillion yuan, a year-on-year decrease of 19.1%, and in rural areas, 1.0725 trillion yuan, a decrease of 17.7%.

Retail sales of commodities amounted to 7.2553 trillion yuan, a year-on-year decrease of 15.8%; sales revenue from the catering industry was 602.6 billion yuan, a decrease of 44.3%.

Supermarket retail sales in units above a designated size (i.e., normally those with total annual sales greater than 5 million yuan) increased by 1.9% on a year-on-year basis, while those of department stores, specialty stores and exclusive stores decreased by 34.9%, 24.7%, and 28.7%, respectively.

Nationwide online retail sales amounted to 2.2169 trillion yuan, showing a year-on-year decrease of 0.8%, 2.2% less than the decrease rate in the January–February period. Online retail sales of physical commodities amounted to 1.8536 trillion yuan, with an increase of 5.9%, accounting for 23.6% of total retail sales of consumer goods. In terms of online retail sales of physical commodities, the sale of food and daily utensils increased by 32.7% and 10.0%, respectively, while the sale of clothing-related commodities fell by 15.1%.

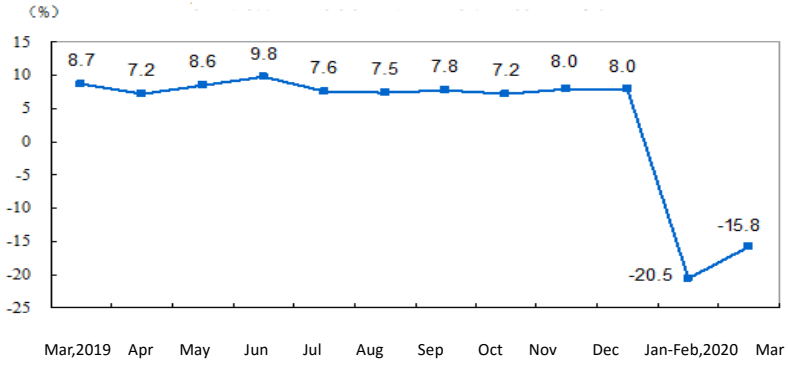

Figure 5. Year-on-year change in the rate of total retail sales of consumer goods by month

1.4.2 The Long-Term Stable Growth of Consumption Will Remain Unchanged.

The Covid-19 pandemic has had a significant short-term impact on consumer markets, resulting in a sharp decrease in retail commodity sales. Retailers and restaurant businesses experienced an accelerated transition to and growth of online sales. Self-service retail formats such as supermarkets have seen a slight increase in sales; sales of community retail stores have declined but less than the overall level; the retail sales of food commodities (such as grain and oil) grew rapidly; and the sales of protective equipment increased significantly.

However, as China's consumer market is large in scale, filled with potential, and resilient, the promising trend of long-term steady growth has not changed. Affected by short-term external factors, consumer demand has been suppressed temporarily, yet residents' willingness and capacity to consume still exists. The short-term fluctuations will not alter the promising long-term development trend. The long-term stable growth of the consumer market and the momentum for its accelerated transformation and upgrading have remained unchanged. Once the pandemic's influence resides, and with the gradual release of restrictive consumption and the continuous optimization of the market supply structure, China's consumer market will maintain stable growth.

The COVID-19 pandemic has resulted in huge, profound, and far-reaching economic and social impacts on China and the world, sounding an alarm bell warning people of the impacts of their lifestyles and consumption patterns. First, it has shown that it is important to establish ecological values and build a lifestyle of harmony between man and nature. A disharmonious relationship between man and nature may cause immeasurable and tremendous damage to human society. It is necessary to build and foster an ecological value wherein man respects nature and nature's laws and acts to protect it. Second, it has shown the importance of promoting green lifestyles and green consumption. It is crucial to end our harmful lifestyles and replace them with simple and moderate lifestyles that strive for quality of life improvements through reducing resource consumption and pollutant discharges to the maximum extent possible. It is crucial to strongly oppose overconsumption, advocate green and moderate consumption, and prohibit illegal hunting, trading, and abusive use of wildlife. Third, we must accelerate the pace of the green transition in the consumption sector. This means employing administrative, economic, legal, and policy instruments to both the supply and the demand sides to enhance the effective supply of green products, foster green consumer markets, advance the greening of lifestyles and consumption patterns, and reduce the resource and environmental impacts of lifestyle-based consumption.

2. Green Consumption Case Studies

2.1 Green Building: Green renovation of residential buildings

2.1.1 Status and Problems

According to data released by the National Bureau of Statistics of China in 2018, residence-related expenditure accounted for 23.5% of household consumption in China, second only to food (28.4%), and building energy consumption made up over one third of total energy consumption of the whole society. Advancing the greening of residential buildings has become an important component of promoting the green consumer market. China's existing buildings have nearly 60 billion square meters of floor area, more than 95% of which belong to high-energy-consumption buildings, with per unit energy consumption 2–3 times higher than that in developed countries with the same climate conditions. The recovery rate of construction waste in China is barely 5%, far below the level of 90% in developed countries. The huge consumption and waste of energy and resources directly and adversely affect the high-quality development of the national economy and energy.

In 2019, the National Development and Reform Commission and the Ministry of Housing and Urban-Rural Development jointly conducted a survey. According to the survey results, there were 170,000 old residential communities across the nation, with a total residential area of more than 4 billion square metres, which were home to over 100 million people. It is projected that the actual growth rate of real estate investment in the next decade may fall back to zero at the end of the 14th FYP period and gradually go into a negative growth rate while the growth rate of residential areas in aging communities will speed up significantly. In recent years, China has carried out a number of old community renovation projects in many areas at various levels. The following problems and weaknesses have been observed in the process. First, more focus has been placed on individual renovation projects with limited attention to the overall design. Simple construction projects are highlighted, yet people's most needed services and functions are missing. Follow-up scientific management is not being used. Second, renovations are mostly arranged by the government. There are no adequate channels for private capital and the general public to participate in the process. Private enterprises have insufficient motivation to participate. Third, national-level attention and support is not sufficient, since supporting policy measures such as financial subsidies and tax incentives are relatively small, making it difficult to drive investment into the green building sector.

2.1.2 Multiple Benefits Brought by the Green Renovation of old Communities and Green Buildings

Renovation of old communities includes renewal and on-site reconstruction. In the process of pushing renovation efforts forward, it is essential to fully mobilize local government, residents, and enterprises and evoke their sense of initiative and ownership. The decisive role of the market in renovation and renewal projects should be brought into full play. Emphasis

needs to be placed on overall planning, long-term effects, and classified measures for different targets, details, and initiating pilots so as to fully release the triple dividend in people's welfare, the economy, and the environment that can be brought about by renovation and renewal efforts.

Green buildings are an important starting point for smart city development. A fundamental goal of building a smart city is to let citizens fully experience how resource-efficient, convenient, easy, and comfortable life can be in a smart city. Green buildings serve as an entry point where the new concept of the "intensive, intelligent, green, low-carbon" approach emphasized by an Ecological Civilization is integrated into urbanization. Green building is also the dominant future trend in the construction sector and symbolizes a typical feature of a smart city. Green building development should respond to the requirements of smart cities. The construction industry needs to follow relevant planning and construction standards and technical specifications, draw on the Internet of Things, and make coordinated use of the new generation of information technology to comprehensively meet the needs of energy conservation, emission reduction, and comfortable living. Green building will contribute greatly to the planning and development of people-oriented, highly-efficient, and sustainable smart cities.

Since the promulgation of the *Notice on Conducting National Smart City Pilot* by the Ministry of Housing and Urban-Rural Development in November 2012, nearly 600 smart city pilots have been established nationwide, and more than 500 cities have clearly proposed relevant plans for building smart cities. Such specifications as the *Smart City – Top-level Design Guide* (GB/T 36333-2018) and the *Technical Outline for Smart City Spatio-temporal Big Data and Cloud Platform Construction (2019 Edition)* have been released one after another to promote the construction of smart cities.

At present, the development of a green building industry in China is in a "naive stage." Due to relatively high construction costs, green building-related products are not competitive in the market, and it is difficult to form a scale effect. The SPS team probed into the issue from the two perspectives of the green renovation of old communities and new green buildings and quantitatively analyzed the economic benefits, social welfare benefits, and environmental benefits of green building development in the short term with the help of a CGE model. A comprehensive review of results from the CGE model analysis and exciting research in the field reached the following findings:

(1) Economic benefits: Should a moderate increase in green building investment take place, there will be a significant positive effect on economic growth in the short term. The four leading economic indicators of GDP, investment, export, and government consumption exhibit an upward trend in the short term, with the rate of change increasing year by year.

(2) Social welfare benefits: The moderate shift of investment from traditional buildings to green buildings will have a positive effect on promoting the healthy development of the real estate industry, expanding employment opportunities, and protecting people's livelihoods. But

at the same time, it is also necessary to guard against the negative effects caused by the expansion of investment expectations or excessive investment.

(3) Environmental benefits: The statistical results show that more than 50% of the raw materials obtained by mankind from nature are used to build various types of buildings and their ancillary equipment. The construction and use of these buildings have consumed about 50% of global energy. The share of building- and construction-related pollution such as air pollution, light pollution, and electromagnetic pollution, account for 34% of the total environmental pollution. Construction waste makes up to 40% of the total waste generated by human activities. On the one hand, green buildings can save energy consumption by using green building materials; on the other hand, energy will be saved when people are using green buildings. As revealed by related studies, green buildings can save about 30% of energy compared with conventional buildings. In addition, green buildings also have remarkable performance in water and land savings. In conclusion, the resources, energy, and environmental benefits of green buildings are considerable.

2.1.3 Preliminary Conclusions and Recommendations Pertinent to the Green Renovation of Residential Buildings in China

2.1.3.1 It Is Necessary to Attach Great Importance to Green Building Development

Against the background of economic recovery after the COVID-19 pandemic, high-quality development, and the building of an Ecological Civilization, it is a necessary choice for China to accelerate research on new development models of energy conservation and emission reduction, break through the bottleneck of traditional industrial development, and seek new driving forces for economic development. Of the three major energy-consuming sectors (i.e., the construction, transportation, and secondary industries), the construction industry has the largest potential for energy conservation. Therefore, it is necessary to strongly support the promotion and application of green buildings and facilitate the healthy development of the green building industry so as to achieve the goal of high-quality economic and energy development and satisfy people's desire for a better life. The construction of new buildings should follow green building standards, while close attention needs to be directed to the green renovation of old buildings. Green renovation should be treated as the entry and focal point of the first round of efforts at change.

2.1.3.2 Establish and Improve Governance Mechanisms for Renovation and Renewal of old Communities

Define the rights and obligations of the government, enterprises, and residents, and clarify the roles and functions of various stakeholders in the process of renovation and renewal. Formulate management regulations for the definition and adjustment of ownership involved in renovation and renewal. Establish a handover system for construction institutions and management institutions and a corresponding judicial mediation mechanism. Develop top-level design and guidance for the planning and adjustment of the renovation and renewal

of old communities to maximize their quality. Establish a mechanism for mutual consultation, joint construction, and sharing. Encourage the communities to set up multistakeholder consultations and push forward planning, design, construction, and acceptance in an orderly manner. Establish innovative and supportive fiscal and taxation policies, and provide discounted interest loans to support in-situ reconstruction of old communities in the same area. Innovate investment and financing mechanisms, promote cooperation between the government and private capital, facilitate the use of fiscal funds in leveraging social funds, and encourage financial institutions to reinforce financial support. Implement an incentive and linkage mechanism for neighbouring households, and execute differentiated preferential policies so that the more households that complete the renovation and renewal rapidly, the more benefits each household receives.

2.1.3.3 Improve the Standard System and Supervision System for Green Renovation

Improve renovation and renewal standards and promote green renovation. Lift the restrictions on green space, sunshine and other indicators and compile a list of green renovations. Support energy-saving renovation to meet the standards of new buildings in a one-step process. Encourage the application/construction of structural performance testing and reinforcement, heating measurements, rainwater collection, elevator installation, external wall insulation, integrated renewable energy systems, greywater recycling, parking lots, etc. Vigorously promote the recycling and recovery of construction and demolition waste, formulate technical standards for the recycling and recovery of construction waste, and improve pollutant emission control standards and supervision systems. Give priority to supporting in-situ reconstruction, strengthen research to coordinate the overall planning of old community renovation and renewal, and release the potential of new communities. Old communities with little renovation value should be reconstructed in situ. Make full use of underground and aboveground space, facilitate lightweight upgrades of buildings, in order to maximize floor area (i.e., enhance the land-use efficiency). For those communities with sufficient capacity, sufficient space should be reserved for installing elevators. Optimize management and supervision processes and simplify approval, complaint, and supervision procedures.

2.1.3.4 Use Intelligent Technological Means to Greatly Improve the Quality of Green Renovation

Significantly improve the performance of buildings, emphasize safety and health performance and adaptive design for the elderly during the construction process, and create a more comfortable working and living environment through means of intelligent technology. Use intelligent technology-based construction modes to link information on people and things together in the construction process to achieve interconnectivity and information sharing. Integrate the application of information surveying and mapping, digital construction, standardized design, factory production, assembly, construction, integrated decoration, information management, and intelligent applications. Streamline various links in the value chain, including investment and financing, planning and design, production and transportation, construction, as well as operation and management. All of these measures will contribute to

and guarantee the attainment of energy and material savings, cleanliness, safety, high quality, and high efficiency as well as the overall large benefits of construction activities.

2.2 Green Consumption and Production in the Automobile Industry

2.2.1 Status and Problems

The automobile industry has become the strategic pillar industry of China's economy. For 10 consecutive years since 2009, the volume of car sales in China has ranked the top in the world, reaching nearly 30% of global car sales in recent years. As shown by statistics from the China Association of Automobile Manufacturers, the share of employees in automobile-related industries has surpassed 10% in urban employment for many years in a row, and the number of employees exceeds one sixth of the total employed population in China. Each additional employee in the automobile industry can leverage an increase of 10 employees in related sectors. According to statistics, in 2017, the consumption of gasoline and diesel in the transportation sector in China accounted for 46% and 66% of national total consumption, respectively. In 2018, automobile-emitted NOx amounted to 43.6% of total national NOx emissions, yet the contribution of the automobile sector to China's total NOx emissions reduction was less than 20%.

As shown by relevant research at home and abroad, if non-fossil energy is used for power generation and hydrogen production, the promotion of electric passenger vehicles can effectively mitigate climate change; future vehicle efficiency improvements are expected to reduce emissions from internal combustion engine vehicles (ICEVs) to ~450gCO_2e / mi (grams of carbon dioxide equivalents per mile), and those of hybrid electric vehicles (HEVs), fuel cell electric vehicles (FCEVs), and battery electric vehicles (BEVs) to 300–350gCO_2e/mi. In the entire life cycle, the environmental cost of HEVs and BEVs is lower than that of ICEVs, and the environmental cost of BEVs is only 36.04% of that of ICEVs. The total energy consumption of HEVs and BEVs, respectively, equals 59.92% and 52.20% of ICEVs' total energy consumption. Compared with ICEVs, BEVs and HEVs have lower energy consumption during the use phase. Vigorously developing new energy vehicles will generate outstanding energy-saving and emission-reducing effects, and thus should be an important means of achieving green consumption in the automobile industry.

China depends on a multi-faceted approach to promote the green transformation of the automobile industry from the perspectives of consumption, production, transportation, and energy policies. To promote green consumption related to automobiles, the Chinese government has successively introduced a range of policies, including purchase subsidies, tax incentives, accelerated construction of charging infrastructure, financial loan support, and promoting accessible transportation. The design of the tax system takes into consideration the role of taxes in guiding energy savings and emissions reductions. Such policy guidance is reflected in the setting of tax rates for passenger vehicle excise taxes and vehicle and vessel taxes, as well as the reform of the refined oil excise tax. Positive results have been obtained in the implementation of relevant policies. In terms of green production, China has taken active

actions to reduce hydrofluorocarbon (HFC) refrigerants. It attaches great importance to the development of the remanufacturing industry, with management regulations and policy measures developed for the recycling and use of used parts, market entry, production authorization, taxation, pilot and demonstration projects, quality management, marketing, and incentives. China has established framework legislation for the recycling and reuse of new energy vehicle batteries, making use of an extended producer responsibility system as a fundamental guiding principle.

However, there are also problems and weaknesses in these policies. In terms of policies addressing the consumption of new energy vehicles, the first problem is the unbalanced structure of the tax regime. The tax burden on a purchase is relatively high while that on utilization is low, which is not conducive to the economical use of vehicles. The second problem is that the current tax system is not directly linked to energy-efficiency indicators. The emission index does not directly reflect the energy efficiency of automotive products. Third, the new energy vehicle subsidy policy places more emphasis on purchase than on utilization. The construction of related infrastructure is lagging behind. Fourth, the new energy vehicle transportation policy is only implemented in a limited number of cities; policy coverage is not sufficiently wide. In the field of automobile production, there are also problems such as the lack of a policy system for HFC emission reductions from air conditioning refrigerants, limited development of a parts remanufacturing industry, and inadequate legislation and standards for battery recycling, all of which have seriously inhibited green consumption in the automobile industry.

2.2.2 Evaluation of New Energy Vehicles

China has already listed the new energy vehicle industry as one of its strategic emerging industries and established a comprehensive industrial policy system covering industry guidance, research and development (R&D) support, production supervision, purchase incentives, and use incentives. Driven by industrial policies, the new energy vehicle industry has achieved remarkable results, which are highly reflected in three dimensions, including the gradual growth in the market share of new energy passenger vehicles, the continuous enrichment of vehicle types, and the constant improvement of key technologies. However, the industrial issues caused by industrial policies are also outstanding. The coexistence of achievements and problems has triggered debates in the industrial and academic circles on the implementation effect of industrial policies for new energy vehicles. It is necessary to systematically evaluate this issue.

The SPS team sorted and deconstructed China’s policies on new energy vehicles issued from 2009 to 2017 by their roles and targeted sections and then divided them into four categories. The first category is policy instruments for the R&D section, including financial support at the national or local level to encourage new energy vehicle R & D. The second category is policy tools for production, including the creation of a separate set of qualifications for investing in new energy vehicle-related projects and the setting of new energy vehicle production ratios as a requirement. The third category includes policy measures dedicated to

purchasing, mainly made up of direct incentive policies such as the direct fiscal incentives and tax preferences on product purchases, as well as indirect incentive policies, such as restrictions on the purchase of ICEVs in private areas. The fourth category is policy tools targeting product use, consisting of various fiscal and tax incentive policies that reduce the costs of vehicle use as well as non-financial and tax policies, such as non-restrictions to road access and preferential parking.

The SPS team employed an improved analytic hierarchy process (AHP) model to analyze the contribution of industrial policies. As shown by the results, China's policies promoting the new energy vehicle industry are generally effective. Of the measures, purchase subsidies have made the highest comprehensive contribution to the development of the new energy vehicle industry, with a ratio close to 50%. They also have had the most significant effects on promoting technology progress, cost reduction, and market growth. The contributions of the preferential tax policy, product access regulations for enterprises, national R&D plans, and transportation support policies decreased in descending order. In addition, from the perspective of individual indicators, preferential tax policies and transportation support policies have made a larger contribution to technological progress, R&D support and preferential tax policies to cost reduction, and transportation support policies and preferential tax policies to market growth. At the same time, the evaluation has unveiled flaws in the existing policy system. First, the comprehensive contribution of the purchase subsidy policies is excessively large, resulting in a high degree of dependence on subsidies by industries, enterprises, and consumers. This could result in drastic drops in the market should the subsidies be phased out. Second, support from national R&D plans needs to be strengthened to further enhance their contribution to technological progress.

2.1.3 Conclusions and Recommendations

First, establish and improve a sound policy system covering the entire automobile industry chain to support green consumption and production. In the automobile production process, the development and use of non-HFCS alternatives and alternative technologies should be encouraged. For automobile purchases, tax reform should be promoted to enhance the effect of taxes in leading energy conservation and emission reduction, reduce the cost of purchasing green car products, and encourage green consumption. With regard to the actual use of vehicles, efforts are needed to make green car products easier to use and reduce corresponding costs. In terms of vehicle scrappage and recycling, it is important to push forward the improvement of power battery recycling policies and standards, improve policies related to the remanufacturing industry, and enable the integrated development of the remanufacturing and insurance industries so as to facilitate the better development of the remanufacturing industry.

Second, in order to guide the green consumption of automobile products, it is necessary to give further play to the role of fiscal and taxation policies in leading the trend to energy conservation and emission reductions. With reference to international experiences, and in consideration of China's industrial development and tax system status, priority should be

given to implementing a green tax system based on passenger vehicle fuel consumption indicators. For passenger vehicles that meet the fuel consumption targets in advance, a certain range of tax preferences should be given in the purchase tax and consumption tax according to the degree that they outperform targets. For passenger vehicles that fail to meet targets and standards, the tax should be increased according to the degree of underperformance in meeting targets.

Third, specific plans are needed for implementing a green tax scheme for automobiles in 2021–2035, based on the current tax system and preferential tax policies. From 2021 to 2025, gradually phase out the current purchase tax exemption policy for new energy vehicles, and initiate preliminary research. From 2026 onward, implement tax preferential policies based on fuel consumption, and set up a dynamic policy adjustment mechanism to respond to changes in fuel consumption regulations. From 2031 to 2035, raise the threshold for preferential policies and introduce a punitive tax system. Two policy scenarios, one based on the introduction of a strong policy (greater tax preferences) and one employing a weak policy (smaller tax preferences and greater punitive tax), have been proposed, and their respective policy effects are analyzed. The calculation results show that the implementation of a green tax system can effectively adjust the structure of the automobile market and increase the market share of energy savings and new energy vehicles while having a significant positive effect on energy conservation and emissions reductions (Table 2).

Table 2. Policy effectives under different scenarios

	Share of energy-saving vehicles and new energy vehicles (NEVs)			**Fuel conservation (10,000 tonnes)**			**Pollutant emission reduction (10,000 tonnes)**		
Scenarios	**2025**	**2030**	**2035**	**2025**	**2030**	**2035**	**2025**	**2030**	**2035**
Strong policy	20%	52%	62%	440	690	824	3.1	9.1	12.8
Weak policy	16%	42%	56%	402	582	766	2.1	5.4	10.6
No policy	12%	34%	47%	375	576	730	1.4	4.2	8.6

Fourth, in order to encourage green production in the automotive industry, automotive air-conditioning refrigerants with low global warming potential (GWP) values such as 2,3,3,3-tetrafluoropropene (HFO-R1234yf) can be selected to replace existing HFC refrigerants so as to slow down global warming. Further steps include improving the legislative system for auto parts remanufacturing, promoting the integrated development of the remanufacturing industry and the insurance industry, and cultivating and expanding diversified marketing and promotion approaches for remanufactured parts. Also important will be facilitating the deployment of industry standards and promoting sustainable development through power battery recycling, and further improving regulations and systems for an integrated and efficient resource utilization industry.

2.3 Green Power Market and Reform

2.3.1 Status of Green Power Development in China

Green power generally refers to the power generated by renewable energy-based power generation projects. By the end of 2019, the installed capacity of renewable energy-based power generation in China reached 794 million kWh, showing a year-on-year increase of 9%. The installed capacity accounted for 39.5% of the entire installed capacity, showing a year-on-year rise of 1.1%. The level of renewable energy utilization in China is also rising. In 2019, renewable energy power generation amounted to 2.04 trillion kWh, a year-on-year increase of approximately 176.1 billion kWh. The power generated from renewable energy sources made up 27.9% of the total power generation, exhibiting a year-on-year increase of 1.2 percentage points. It is anticipated that during the 14th FYP period (2021–2025), newly installed wind power capacity will reach 120 to 200 kWh, and the installed capacity of photovoltaics (PV) will be around 200 to 300 kWh. Estimations also show that, by the end of the 14th FYP period, the share of renewable energy-based power generation will exceed one third of China's total power generation and approach 40%.

Distributed power generation has developed rapidly in China in recent years, with distributed PV power generation for enterprises and households dominating, and distributed wind energy development for use in industrial parks and rural collectives expanding. By the end of 2019, the cumulative grid-connected capacity of distributed PV power generation in China reached 62.63 million kW, accounting for 31% of the total installed capacity of photovoltaic power generation. With the drop in cost in wind and PV power generation, the innovation in and maturation of distributed generation business models, and the successive introduction of supporting policies in various regions, China's market for distributed generation from renewable energy will continue to expand.

In 2019, the actual consumption of power from all renewable energy sources, including hydropower, was 2.0141 trillion kWh, accounting for 27.9% of the total electricity consumption in China, a year-on-year increase of 1.4%. The national consumption of electricity from non-hydro renewable sources amounted to 738.8 billion kWh in 2019, accounting for 10.2% of the total electricity consumption, a year-on-year increase of 1%.

2.3.2 Progress and Challenges Related to the Reform

There are three major ways enterprises consume green power in China at present. The first is when enterprises invest in renewable energy-based power generation projects on their own or through a third-party developer. The second is when enterprise consumers purchase green power directly from power generation companies. The third is when power users purchase green power certificates.

With the resumption of the power sector reform, the access conditions for power users wanting to participate in market-oriented transactions have been gradually relaxed. The

changes in the power pricing mechanism, with the liberalization of trading methods and varieties, have created conditions for power users to participate in market-based transactions. However, China's green power market is still in an initial stage of development; the promotion of green electricity consumption needs to be a critical component of substantive power market reform. The power market reform related to green power consumption mainly involves two levels: one is the reform of policies and institutional arrangements for renewable energy power generation (including an on-grid price formation mechanism, a guaranteed purchase system, a green certificate system, and a market-based trading mechanism); the other is the overall reform of the power market, with particular focus on user-side reform to allow power market access to facilitate the participation of various power users, and reform of the transaction mechanism. To date, the following reforms have been achieved: first, the green power policy has gradually shifted from the practice of "purchase with guaranteed price and volume" to market-oriented practices; second, the reform of the power market has shifted from system design to implementation; and third, green power trading has shifted from inter-grid trading to full-scope trading.

The establishment of China's green power market is still in process. Limited procurement channels and unclear trading mechanisms are currently the biggest obstacles for companies to achieve their renewable energy consumption targets. At present, the most mature path for enterprise users is investment in distributed PV power generation projects, either by enterprises themselves or through third-party developers, yet the scale of such practices is limited. The most expensive path is purchasing green power certificates for renewable energy; however, the price for green certificates is falling. The path that has been attracting the most attention is the use of power purchasing agreements (PPAs) for the procurement of renewable energy power, a system for dealing with high market entry barriers and not clearly defined trading rules. The use of virtual power purchasing agreements (VPPA) is still limited and is dependent on the establishment of a power spot market in China.

2.3.3 Thinking and Recommendations for Reform

In order to boost the development of green power markets, further improve the market base, and unlock the demand for green power in various industries, the following recommendations are made.

First, accelerate the establishment of a green power market system. Promote the use of PPAs and VPPAs to further define specific rules and regulations for various power sources, including renewable energy, to be engaged in market-based transactions. Effectively mobilize all market participants and spur their sense of ownership.

Second, cut down improper administrative interventions from local governments, liberalize power generation plans, use plans and users' choice. Liberalize power development plans and respect users' choices within provinces and remove interprovincial barriers and restrictions on market players' participating in cross-provincial and cross-regional and inter-market transactions.

Third, further liberalize and protect power users' choices. Facilitate the market-oriented transactions between power users and clean energy-based power generation companies, such as hydropower, wind power, and solar power. Lift restrictions on inner-provincial and inter-provincial power purchases by power grid companies, power users, and power sales companies, and give priority to cross-provincial transactions of renewable energy in the transmission network.

Fourth, improve the policy and market environment for various users to jointly develop and use distributed renewable energy-generated power. Government and power grid companies should continue to deepen reforms, streamlining administration, decentralizing governance, strengthening regulation, and optimizing services. Cultivate innovative business models to introduce new business entities, such as virtual power plants and integrators, and approve their participation in distributed and wholesale power markets.

Fifth, gradually expand direct trading of renewable energy-based power pilots. Provide capacity-building support for power generation enterprises. Encourage power generation enterprises to carry out mid- and long-term power transactions with such users in close proximity as industrial enterprises and data centres that have a relatively large electric load and continuous stable use of electricity. Reduce the transmission and distribution prices for direct transactions in close proximity, and reduce the corresponding policy cross-subsidies.

Sixth, recognize the environmental attributes of renewable energy certificates to enhance enterprises' confidence in the trading market. Expand the scope of certificates to cover all kinds of renewable energy power generation projects. Expand the supply of affordable green certificates through grid parity projects, which will help decouple the price of certificates from the intensity of subsidies. Support the purchase of unbundled renewable energy certificates.

Seventh, establish a communication platform that includes various stakeholders to strengthen communication and cooperation. Build a case-sharing platform that will facilitate the exchange and learning of the best practices of green power purchasing in China, and collect information on the renewable energy procurement needs of various enterprises. Promote exchanges and cooperation among governments, power generation and consumption enterprises, industry associations, research institutions, and international organizations.

2.4 Green Logistics

2.4.1 Current State and Problem

By the end of 2018, the total number of express deliveries in China had reached 50.71 billion, which surpassed the total volume of developed countries and economies, including the United States, Japan, and Europe. In 2018 alone, 50 billion waybills, 24.5 billion plastic bags, 5.7 billion envelopes, 14.3 billion packaging boxes, 5.3 billion woven bags, and 43 billion metres of tape were consumed in the express logistics industry. Management of express delivery

waste, including landfill and incineration, cost 1.4 billion yuan. In megacities, the increase of express delivery packages accounted for 93% of the total increase in domestic garbage, reaching 85% to 90% in some large cities. In addition, logistics transportation in China mainly depended on vehicles using traditional fuels. With almost 20 million vehicles for logistics consuming gasoline and diesel, a large amount of pollutants were emitted, imposing immense burdens and pressures on resources and the environment.

The Chinese government attaches high importance to the development of green logistics. In 2009, the State Council released the Plan for Adjusting and Vitalizing Logistics, proposing to encourage and support energy conservation and emissions cuts in the logistics industry and to develop green logistics. Afterward, China released relevant policy documents to advocate for the development of green logistics at the national, ministerial, and local levels in areas of transportation, storage, packaging, flow processing, and recycling, among other logistics links.

Their analyses into relevant policies on green logistics led the research team to identify several problems in current policies: (1) Legislation on green logistics lags behind. Although existing laws on environmental protection and resources regulate green logistics, there is no systematic special planning for green logistics. The duties, rights, and responsibilities of relevant entities are not clearly defined, and effective restraint mechanisms have not been established. (2) Green logistics have been incorporated into national strategies, but policies are relatively general and lack clear and definite targets as well as comprehensive supporting mechanisms. (3) Practices and measures related to green logistics focused more on green packaging and recycling of waste and old products, with weak practical support from the national level. (4) Decentralization of the green logistics authority led to insufficient follow-up of green logistics policy assessments and a lack of dynamic follow-up evaluations. (5) Green logistics pilot programs are important instruments for promoting the green transition of logistics. There have been positive outcomes achieved with the pilot program on recyclable bags, and pilot projects on green purchasing are actively promoted. However, it is important to proactively track and evaluate the effects of pilot programs, promoting and up- and out-scaling the successes.

2.4.2 China's Practices on Green Logistics

Currently, e-commerce and logistics companies are actively promoting cloud-based warehouse management, smart sorting and route planning, packaging algorithms, electronic waybills, environmentally friendly bags, green packaging boxes (such as use of recycled paper and printing using environmentally certified printing ink), sharing delivery boxes, logistics vehicles fuelled by new energies, solar energy logistics parks, and technologies free of oil and ink, etc., to meet the goal of realizing green logistics and cutting carbon emissions. A summary of the efforts of 10 companies[3] involved in green storage, green transportation

[3] The 10 companies are: JD Logistics, SF Express, Suning, Meituan, Cainiao, STO Express, ZTO Express, YTO Express, Best Express [formerly known as Huitong], and Yunda Express).

and delivery, green packaging, green flow processing, recycling of waste and old products, and green information provision identified the following characteristics.

First, priority measures for the green logistics industry are gradually shifting from reducing consumable items and packing materials to green packaging, storage, transportation, recycling, and green information processing. Especially after 2016, there have been rapid developments in this direction. Multiple measures have been adopted to facilitate green logistics, with storage, transportation and delivery, package and information processing becoming the main focus. The recovery of waste and old products is attracting attention in the development of green logistics, while the field of green flow processing needs further development.

Second, the adoption of new technologies is an important factor in facilitating green logistics, as well as an indispensable measure for e-commerce and logistics companies to realize a green transition. It plays a key role in promoting green storage, green transportation, green packaging, and green recycling.

Third, some measures are difficult to implement. For instance, green storage (i.e., storage facilities characterized by low environmental impacts, low storage damage and loss, as well as saving transportation costs) requires a lot of financial support. In addition, new energy vehicles and unmanned aerial vehicles (UAVs) face a series of issues like cost and traffic conflicts. The high cost of green packaging makes it difficult to be widely adopted. The foundation of green recycling infrastructure is weak, heavily relying on consumers and deliverymen, with the overall recovery rate of packaging being less than 20%. The delivery end still composes a weak link in package recycling.

Fourth, green logistics need scientific methods of assessment. However, guidelines for assessing green logistics have not been established. An inventory of green logistics technologies to be promoted needs to be formulated to provide a reference for all logistics companies and vendors. The management of the green logistics supply chain is underdeveloped. Currently, green logistics measures are mainly targeted at logistics companies, while those for vendors, suppliers, and consumers are relatively weak, with insufficient participation from consumers.

Case 1. Green packaging
Green packaging activities in China's main e-commerce and logistics companies include: 1) Ecological design of packaging: in 2013, SF Express formed a research team on packaging; then, in 2016, it established the Packaging Laboratory of SF Technology. In 2016, JD and Tung Kong Inc. jointly initiated JD Packaging Laboratory. In 2019, Suning.com established Green Packaging Laboratory. These actions all aimed to promote green packaging. Related efforts include environmentally friendly design, such as disposable plastic bags promoted by Cainiao of Alibaba Group and bio-based packaging bags promoted by Best Express. These designs reduce raw materials, for example, by reducing the weight of packaging boxes (JD) and reducing the thickness of tape (SF). Designs can also extend the usage of packaging, such as Feng BOX from

SF, Qingliu Box from JD, and the sharing of delivery boxes by Suning. Environmental design of packages reduces the consumption of materials, lowers costs, and decreases waste.

2) Greening the use of packaging: Cainiao built the first "Green Warehouse" in the world for all sorts of products, delivering products to consumers in recycled boxes. The whole process requires no secondary packaging, that is, it uses zero tape, zero packing, and zero new paper boxes. On Alibaba platforms, consumers can purchase commodities with green packages and receive "green energy" scores on Ant Forest, which encourages retailers to use green packaging. The "Qingliu Initiative" by JD promoted simplified printing of transportation package boxes and the adoption of packaging for direct delivery and circulating boxes. Meituan initiated the first alliance of recovering food delivery boxes in the catering industry to recycle take-out boxes.

3) There are mainly two types of reuse for recovered packages. The first type is targeted at internal recovery within logistics companies without the involvement of consumers. The second type is recovery targeted at consumers, conducted through three modes: door-to-door recovery by deliverymen, establishing recovery stations, and setting up recovery boxes. By June 2019, JD recovered more than 5.4 million paper boxes. The proportion of old paper boxes directly recovered and reused in the delivery service by retail stores of Alibaba LST reached 30%.

Case 2. Green transportation and delivery

According to the R*eport on the State and Trend of New Energy Vehicles Development in Express Delivery in China* (2018), as of June 2018, 12,988 new energy vehicles had been put into operation for express deliveries in the 31 provinces (or districts, municipalities) of China, a 4-fold increase compared to 2016. Of these, 82% are micro-small cars, and 84% are rentable. In terms of city distribution of new energy vehicles, the most new energy vehicles are in Shenzhen, followed by Tianjin, Beijing, and Shanghai. Currently, JD has replaced all of its logistics vehicles with electric vehicles in Beijing and planned to replace all delivery vehicles in JD with new energy vehicles in five years. In terms of city delivery, delivery by UAVs and robots is emerging, mainly targeted at the hub to consumer transportation route to solve the last-mile delivery challenge. SF Express, Cainiao, JD, Suning, ZTO, and YTO and other logistics companies have adopted UAV delivery. SF, Cainiao, JD, Suning, STO, ZTO, YTO, Best Express, and Yunda Express have established cloud platforms that are responsible for delivery schedules and management.

2.4.3 Conclusion and Suggestions

First, establish special planning for promoting green logistics at the national level, and guide and supervise e-commerce companies to develop green logistics. Clarify the main responsible entities for green storage, green packaging, green transportation and delivery, as well as reverse logistics recovery systems; set up targets and goals for mid- to long-term assessments; specify the responsibilities of all parties, including the government, industry and consumers; and promote green development of e-commerce logistics.

Second, establish a mechanism for evaluating green logistics technologies to assess new measures to promote green logistics and facilitate the implementation of excellent green logistics measures. Issue and periodically update a green logistics technology inventory for the reference of and adoption by logistic companies in order to facilitate the successful implementation of new green logistics measures.

Third, encourage the development of green packaging in the industry, promoting a green transition in logistics packaging. Incorporate the green packaging industry in the *Guideline Inventory of Green Industries*, and facilitate the development of packaging reuse and biologically disposable packaging. In addition, it is important to evaluate green packaging, apply green purchasing requirements to logistics packaging, promote standard packaging, establish unified reverse recovery systems for logistics packaging, break barriers between companies and facilitate the reuse of logistics packaging.

Fourth, deepen pilot work on green logistics and improve the exemplary role of pilot projects. While drawing on the experiences related to logistics transportation gained during the fight against Covid-19, expand the scope of green pilot projects, combine green logistics and urban governance, address the challenge of broken chains witnessed in single logistics companies so as to assure the flow of supplies and smooth transportation channels, and connect upstream and downstream elements of the logistics supply chain to realize efficient collection, distribution, storage, transportation and delivery of all kinds of production and living materials.

Fifth, improve the environmental awareness of consumers to promote package recovery at the consumer end. Promulgate measures that could motivate consumers to recover logistics packaging and promote or innovate favourable mechanisms to encourage consumers to undertake environmentally responsible behaviours when choosing a package or recovering packages, such as the green energy system of Ant Forest, deposit for package, or the financial rewards for recovering packages to facilitate the recycling of logistics packaging.

2.5 Digital Platforms for a Low-Carbon Lifestyle

2.5.1 The Current State of and Challenges Facing Low-Carbon Lifestyle Programs and Platforms

In recent years, many kinds of low-carbon lifestyle programs and platforms have been experimented with, including Ant Forest, Tanpuhui, the Zero Carbon Group app, and the Lvdoya app. These have proven to be effective, innovative mechanisms for guiding transitions towards a low-carbon lifestyle. The Ant Forest digital platform built by business and the Tanpuhui platform (literally meaning “low carbon benefits all”) built by the government are representative cases.

There are still many difficulties and challenges inhibiting the comprehensive use of these kinds of digital platforms, which aim to guide the public to live a low-carbon life nationwide.

First, simply depending on companies to operate these platforms is unsustainable, as they require special policy support. Yet currently, the policy base underpinning a transition towards a low-carbon life is relatively weak. The guiding role of government needs to be further enhanced. In an effort to protect the privacy of individual data and the security of data providers related to emission reductions, low-carbon lifestyle platforms are not able to acquire sizable and effective data on emission reductions. The motivation for companies to participate in carbon reductions is insufficient, and it is difficult to attract business companies to cooperate in the promotion of digital platforms. Second, there is no unified standard for assessment or centralized supervision of such platforms. As a result, different platforms might calculate and double-count emission reductions. The methodology or algorithm used by different platforms in measuring individuals' voluntary behaviours in reducing carbon emissions can be quite different, leading to huge gaps in the assessment results of reduced carbon emissions. This could lead to the situation that users might question the seriousness, scientific evidence, or effectiveness of emission reduction data. Without unified supervision and monitoring at the national level, the carbon reduction numbers from users could be double-counted by authorized platforms.

Case 3. Low-carbon Military World Games

Wuhan Municipal Government initiated a Low-carbon Military World Games Program at the 7th Military World Games in 2019. This program quantified and summarized citizens' emission cuts through their green and low-carbon behaviour and their contribution to a carbon-neutral Military World Games. This Low-carbon Military World Games program was connected to the platforms of Wuhan City Pass, Hello Global and Bank of Communications, among others. After collecting users' low-carbon behaviour data and measuring it in carbon emission cut equivalencies, the program issued carbon credits.

This Low-carbon Military World Games' program was officially launched on June 18, 2019. After four months of operation, it had created favourable social and emission reduction benefits. First, the program issued users with electronic Carbon Offset Certificates of Honor for the Military World Games, which enhanced their sense of honour as low-carbon citizens. Carbon credits could be redeemed for Military Games gifts, which motivated citizens to practice low-carbon lifestyles. Companies and vendors were attracted to the platform, as it could help them establish green branding. In addition, the program ran for 122 days, with a total of 1,747,089 visits. It certified 75,700 users, reducing carbon emissions by a total of 92.61 metric tonnes. There were 100,739 instances of low-carbon green consumption behaviour, with carbon dioxide emission cuts equivalent to 22.08 metric tonnes. It is estimated that the emission of carbon dioxide for athletes taking shuttle buses between the Games Village and venues was about 80 to 100 metric tCO_2e. Carbon offsetting was thus successfully promoted.

2.5.2 Corresponding Recommendations

In order to fully benefit from digital platforms aimed at furthering green consumption among the public and guiding people to practice low-carbon lifestyles, the following

recommendations are proposed, drawing on experiences from the operation mode of the Low-carbon Military World Games program.

First, establish a national digital platform for a low-carbon lifestyle. Based on the operation mode of the Low-carbon Military World Games Program, gradually attract organizers of large sports games and international and domestic meetings to use the platform. Construct an ecosystem for carbon neutralization and build a digital platform for a low-carbon lifestyle that is nationally influential and makes use of a comprehensive application standard.

Second, have the government play an exemplary role and set up a normalized carbon offset mechanism. Further refine the implementation plan for the *Guidelines of Realizing Carbon Neutral Large Events (trial)*, give full play to the exemplary role of government, and require hosts to use the low-carbon lifestyle digital platform to achieve carbon neutrality when activities (sports games, meetings, etc.) organized by the government would emit over 1 tonne of carbon.

Third, issue an *Annual White Book of Enterprises Supporting Carbon Neutrality*, and include emission reductions into the social credit system. Include participation in carbon offset efforts as one of the indicators for the annual assessment of the performance of state-owned enterprises and multinational enterprises, and provide examples of leading enterprises actively participating in carbon reduction and performing climate responsibilities. Meanwhile, the government could formulate favourable policies for companies or individuals that make contributions to realizing carbon neutrality at large events, sports games, or meetings.

Fourth, set up a special carbon-neutrality fund to provide financial safeguards for realizing carbon neutrality at large events (e.g., sports, conferences). Ecological and environmental authorities should establish the special carbon-neutrality fund. Hosts of large events should contribute a specific portion of advertisement benefits to this special fund in order to guarantee the daily management and operation of the fund. Investments from private and public welfare capital should also be encouraged.

Fifth, initiating green consumption coupons will help develop new consumption growth areas. The government should promote a green consumption coupon program system, formulate relevant policies for green consumption coupons, and make green coupons available to individual consumers making use of a digital platform to stimulate the consumption of green products.

2.6 Other Cases Promoting Green Consumption

Case 4. Green financing aid for green consumption
There are two main steps to be taken so that green financing can support green consumption. First, increase the accessibility of financial resources for green consumption to help consumers that favour green consumption receive financial support, and give full play to the leveraging role of finance in consumption. Second, use green financial instruments to reduce green consumption

costs to make green consumption products more price competitive, promote the flow of social resources into green consumption industry chains, facilitate companies to produce green products, and realize the green and sustainable development of the economy. China has formulated a multi-level system of service providers that finance consumption and has gradually formed a system of consumption financing mainly composed of commercial banks, consumption financing companies, and financial platforms for Internet-based consumption. According to the *Report of the Development of Consumption Financing in China*, in the five years from 2014 to 2018, the financial credit volume for consumption on the Internet expanded from 20 billion yuan to 7.8 trillion, representing a 400-fold increase.

Specific measures include the green buildings mortgage services provided by Industrial Bank and Maanshan Rural Commercial Bank, loan businesses for green car consumption provided by China CITIC Bank, the green energy-efficiency loan business of Maanshan Rural Commercial Bank, and the green credit cards issued by China Construction Bank, Industrial Bank, China Everbright Bank, Agricultural Bank of China, Ping An Bank, etc.

Case 5. Sustainable food supply chain and consumption system

In 2017, the *Report on China Sustainable Consumption* jointly released by the United Nations Environment Programme and the China Chain-Store & Franchise Association (CCFA) showed that over 70% of consumers in the urban areas in China are aware of sustainable consumption to some degree. Almost half expressed a willingness to pay more for sustainable products up to a rate of less than 10%. However, the lack of sustainable consumption brands is restraining the further development of sustainable consumption. In 2018, the World Wildlife Fund (WWF) released Seafood Consumption Guidelines for sustainable aquatic products. Through assessing the sustainability of seafood products, the guidelines provide references and a feasible instrument for green consumption choices.

It is estimated that about 54% of food waste in the world takes place upstream in the value chain, during the production and post-harvest treatment and storage of food. The remaining 46% takes place downstream during the processing, circulation, and consumption of food. WWF promoted industry initiatives and pilot work in the restaurants and cold-chain logistics industries. In 2018, WWF started pilot work at 5-star hotels in Changxing County and promoted tools and training videos for reducing food waste in kitchens. In 2019, WWF and the Cold-chain Logistics Committee of China Federation of Logistics and Purchasing (CFLP) jointly launched the Initiative of Sustainable Aquatic Products Cold-chain of China, advocating for cold-chain companies to reduce resource waste and cut greenhouse gas (GHG) emissions during transportation, and working to jointly contribute to mitigating global warming.

WWF is committed to promoting sustainable food production, processing, and circulation systems globally. It advocates for the concept and practice of sustainable food consumption to improve efficiency and productivity, reduce waste and change consumption patterns, and ensure that human beings receive adequate food and nutrition while fully maintaining and protecting our

natural resources. WWF carried out work under the following three goals:

1) By 2030, realize sustainable management of 50% of agriculture and aquaculture with no land cultivated for food at the expense of natural habitats;

2) Reduce global food waste per capita by half and reduce post-harvest food loss;

3) Have 50% of food consumption meet the dietary guidelines of the United Nations Health Organization and Food and Agriculture Organization of the United Nations in target countries.

Seven European countries signed the Amsterdam Declaration in 2015, committing to support the measures of the private sector in resisting deforestation in the supply chain. In Europe, 74% of palm oil imported for food production needs to meet the certified sustainable standards established by the Sustainable Palm Oil Roundtable Initiative (RSPO).

China has also initiated a series of industry actions for realizing a sustainable supply chain. In 2017, WWF, China Meat Association, and 64 companies jointly released the Chinese Sustainable Meat Declaration, aiming to create a sustainable meat industry and enterprise supply chain. The eight commitments of the Declaration covered zero deforestation and improving efficiency, among other aspects. In 2018, WWF, China Chamber of Commerce of I/E of Foodstuffs, Native Produce and Animal By-products (CFNA) and RSPO jointly launched the China Sustainable Palm Oil Initiative to promote sustainable palm oil and have it become a mainstream commodity in the Chinese market.

Case 6. Walmart Project Gigaton

Walmart launched Project Gigaton in the United States in 2017, a major initiative to engage suppliers, non-governmental organizations, and other stakeholders in climate action. Project Gigaton aims to avoid one billion tonnes (a gigaton) of GHGs from the global value chain by 2030 by engaging suppliers in target-setting and initiatives in six areas: energy use, sustainable agriculture, waste, deforestation, packaging, and product use. The Project Gigaton platform includes a variety of tools, including calculators for setting and reporting goals, best practices workshops, and links to additional resources and initiatives to make progress.

To date, Project Gigaton is one of the largest private sector consortia for climate action. Since its launch, more than 2,300 Walmart suppliers from 50 countries have signed up to participate and reported cumulative avoided emissions have reached more than 230 million tonnes (MMT) of GHG emissions (calculated in accordance with Walmart's Project Gigaton Methodology).

Walmart launched Project Gigaton in China in 2018, setting a sub-target of 50 MMT by 2030. To date, suppliers have reported over 5 MMT toward this target. Among these suppliers is China's Technical Consumer Products Inc., which supplies lightbulbs to Walmart stores in China and globally. Taking its Project Gigaton commitment even further through product innovation, Technical Consumer Products introduced new energy-efficient bulbs at its Shanghai plant that are

currently available around the world and in more than 400 Walmart stores in China. The redesigned light bulbs consume 36% less energy than their predecessors. The amount of energy that could be saved from 2018 sales alone is enough electricity to power 2,768,000 Chinese households for a year.

Moreover, in 2016, Walmart launched a Mill Sustainability Program to support suppliers and their mill partners in improving their manufacturing practices to help reduce environmental impact. Since then, participation has increased to more than 65% of apparel and soft home sales in U.S. Walmart stores in 2020 being sourced from suppliers working with mills that have completed the Sustainable Apparel Coalition's Higg Index Facility Environmental Module (FEM).

The Higg FEM Index is an industry-accepted tool that uses a cross-functional approach, allowing facilities to work internally to track their environmental impact, set goals, and improve their overall environmental performance. Of the 334 mills that completed last year's Higg FEM and shared their results with Walmart, over 54% of the facilities were in China. The total GHG emissions directly related to Higg reporting mills was more than 4.7 MMT CO_2e, where over 1.9 MMT CO_2e of those emissions were produced in China.

3. International Experiences with Sustainable Consumption Policy

3.1 Sustainable Consumption: Different concepts, different implications

Green consumption, sustainable consumption, and sustainable lifestyles are three closely related terms often used interchangeably in discourse on demand-side sustainability. However, they have different conceptual approaches and emphases; each concept is tied to particular policy objectives, implementation strategies, and implications.[4]

- *Green consumption* is closely tied to the greening of products and services in the marketplace and facilitating consumer access to them; it seeks to improve the quality of economic growth.
- *Sustainable consumption* is a broader concept that goes beyond the marketplace, although it is still very highly aligned with materialism and product/service consumption. The application of sustainable consumption highlights the need for eco-efficiency (getting more from less) while also being attentive to the increased utility of consumption.
- A yet broader concept is *sustainable lifestyles*, which extends beyond material consumption and markets to reflect the more intangible aspects of everyday life, such as the values and social norms that shape our daily practices. Applying the sustainable lifestyles concept necessitates not only accounting for the environmental impacts of everyday living, it also acknowledges the fulfillment of needs through non-market options and includes practical instruments to support well-being and equity for all. An even more comprehensive term, in keeping with a sufficiency approach, is *sustainable living*.

Which term is selected depends on the level of ambition and how expansive a policy approach should be. This paper employs the concept of sustainable consumption, although elements of sustainable lifestyles and green consumption are included as well. While acknowledging that domestic, public, and private sector consumption are integral to sustainable consumption, this paper focuses on government policy to promote sustainable consumption, and specifically domestic consumption—by individuals, households, and community groups. It does this through a comparison of sustainable consumption perspectives, policies and programs, and experiences in the European Union (EU), Germany, Japan, and Sweden. It does not analyze government and public consumption (e.g., green procurement), nor does it analyze the numerous initiatives by businesses (e.g., sustainability reporting[5] or greening of value chains[6]) and civil society organizations (e.g., sustainability campaigns).

3.2 A Comparison of Government Approaches to Sustainable Consumption Policy

[4] "Avoiding Consumer Scapegoatism: Towards a Political Economy of Sustainable Living": *https://helda.helsinki.fi/bitstream/handle/10138/303978/Avoiding.pdf*

[5] http://docs.wbcsd.org/2018/02/CDSB_Case_Study_China.pdf.

[6] http://www.cciced.net/cciceden/POLICY/rr/prr/2016/201612/P020161214521503400553.pdf).

Governments have an important role to play in setting the framing conditions around how production and consumption are practiced. They can establish visions and guidelines for a sustainable society, and promote change among households and organizations through various incentive structures and regulatory measures. Key approaches governments have used include treating sustainable consumption policy as i) a part of an overall development strategy; ii) a standalone strategy or action plan; iii) a part of a sectoral policy, issue strategy, or program; or iv) a part of the mandate of a public agency or organization. Several country governments combine more than one of the above approaches. Examples are discussed below.

Sustainable consumption integrated into an overall (sustainable) development strategy. In this case, the government identifies priorities for sustainable consumption and, instead of preparing a separate strategy, integrates those priorities in a broader strategy that guides government planning and operations. Examples include when sustainable consumption is built into national vision documents, national (sustainable) development strategies, national green growth or green economy strategies, and national Sustainable Development Goal (SDG) implementation plans. The *EU Circular Economy Strategy*[7] and the attendant Action Plan[8] are high-level examples of how sustainable consumption can be reflected in a sustainable development strategy. Japan's *Basic Act for Establishing a Sound Material-Cycle Society* underpins its sustainable consumption and broader sustainability initiatives. An important strategy choice in Sweden is to integrate sustainable consumption into its overall framework for reaching the environmental objectives[9]—a system to guide the overall efforts to safeguard the environment. Efforts towards resource-efficient material cycles and more sustainable consumption have been identified as essential ingredients for obtaining environmental objectives. Germany's National Sustainable Development Strategy has aligned with Agenda 2030 in order to support the implementation of the 17 SDGs.

Incorporating sustainable consumption into the national development framework has the advantage that consumer behaviour is not addressed in isolation from the broader development trajectory. Since lifestyles and consumption touch on a variety of soft (e.g., education, health) and hard (e.g., industry, infrastructure) issues, a coherent and concerted approach is needed, as is often the case with overall national strategies. The risk, however, is losing focus, especially if there is competition for resources and political attention among priority issues, leading to sustainable consumption being subordinated to more short-term politically charged issues. This would postpone the need to address rising consumerism or inequality and could entrench unsustainable consumption problems, making it even more difficult to address if, and when, it eventually receives attention. There can also be missed opportunities to address unsustainable practices from a demand-side approach, including solutions that reduce harmful consumption altogether.

[7] Behavioural Study on Consumers' Engagement in the Circular Economy: https://ec.europa.eu/info/sites/info/files/ec_circular_economy_executive_summary_0.pdf

[8] Information on EU Circular Economy Action Plan: https://ec.europa.eu/environment/circular-economy/

[9] http://www.swedishepa.se/Environmental-objectives-and-cooperation/Swedens-environmental-objectives/The-environmental-objectives-system/

Sweden's Sustainable Consumption Strategy (Strategi för hållbar konsumtion) and Germany's National Programme for Sustainable Consumption (Nationales Programm für Nachhaltigen Konsum) are two unique examples of ***dedicated national strategies for sustainable consumption***. The two countries also co-lead two of the six programs under the United Nations' 10-Year Framework of Programmes on Sustainable Consumption and Production. Sweden co-leads with Japan on Sustainable Lifestyles and Education, and Germany co-leads with Indonesia and Consumers International on Consumer Information. This paper will go into more detail about these national strategies.

The most widely adopted approach is to integrate ***sustainable consumption as part of a sectoral policy, issue strategy, or program.*** Sustainable consumption is tied to sectoral policies, including for energy, water, transportation, health, and housing and infrastructure. An example is the Swedish National strategy and Action Plan on sustainable food[10] Sometimes sustainable consumption is embedded in programs established in response to societal issues driven by citizens or in which citizens are affected. Examples include national programs or strategies for poverty reduction and national programs on social health and obesity.

Although not officially government policy, the Science Council of Japan has proposed a Roadmap to Healthy Low-Carbon Lifestyles, Cities and Buildings. It is aimed at ensuring a high quality of life for citizens as Japan faces a super-aged society of elderly citizens. It targets infrastructure in cities and buildings, making sure they are suitable for the demographic and also deliver a low-carbon footprint and high environmental performance. The recommended policies are divided into four parts: increasing motivation for new, healthy, low-carbon lifestyles and behavioural changes; designing healthy low-carbon cities and traffic systems for a mature society; accelerating low-carbon housing and buildings, health measures, and energy generation; and applying Japan's low-carbon cities, buildings, and traffic systems strategically across Asia[11].

Such sectoral or issue-based programs run the risk of being time-bound and can disappear when governments change. Thus, while effective during the operational term of a priority government program, approaches should be institutionalized to achieve long-term stability.

Sustainable consumption through public agencies/institutions or civil society organizations. The rise of consumer organizations, especially in Europe and North America, has paralleled the rise in public concern about the market's willingness to prioritize consumer interests over profits. Organizations such as Test Achats in France, Which Uk! in the United Kingdom, Consumentenbond in the Netherlands, Stiftung Warentest in Germany, the Swedish Consumers' Association in Sweden, and Consumer Co-operatives in Japan are examples of transitional consumer organizations that, in conducting products tests and ensuring producer responsibility, are shifting concerns from product price, quality, and respect for consumer

[10]https://www.government.se/information-material/2017/04/a-national-food-strategy-for-sweden--more-jobs-and-sustainable-growth-throughout-the-country.-short-version-of-government-bill-201617104/
[11] https://www.japanfs.org/en/news/archives/news_id035986.html

rights to broadened mandates that include responsible/sustainable consumption.

3.3 Supranational Level: The EU policy approach to sustainable consumption

The EU internal market is built on common law for all products and its trade within the EU. The EU is actively moving to direct member states' economies to limit resource use and waste, develop new industries, promote green jobs, redesign urban structures, and change societal behaviour by promoting and enabling sustainable consumption. The importance of promoting a sustainable consumption policy gradually took root in the EU, moving from an early focus on recycling and waste minimization to increased attention on sustainable product design and information availability for consumers about the energy use and environmental impacts of products. The EU's renewed Sustainable Development Strategy[12] (2006) provided an important impetus that led to the development of a range of initiatives and instruments. These include the Ecodesign Directive[13] (2009), which set ecodesign requirements for energy-consuming products, the Ecolabelling Directive, and the Energy Labelling Framework Regulation, which aimed to ensure consumers are provided with information on the energy and environmental performance of products. Substantial improvements were incentivized through these regulations, but numerous gaps remained. Product legislation tended to address only specific aspects of a product's life cycle, and many of the environmental impacts of products were not addressed.

With heightening concern in the EU about global warming, pollution, inefficient material use, natural resource depletion, and import dependency for energy and natural resources, in 2008, the European Commission drew up the Sustainable Consumption and Production and Sustainable Industrial Policy (SCP/SIP) Action Plan.[14] The SCP/SIP Action Plan sought to develop a more comprehensive approach, expanding the coverage of the Ecodesign Directive to cover all energy-related products, setting environmental benchmarks for products, and conducting periodic reviews; establishing a harmonized base for public procurement by EU institutions and Member State authorities; and, importantly, promoting smarter consumption. A range of actions were launched to encourage retailers and manufacturers to green their supply chains and to raise consumer awareness and involvement.

The newest and most important policy development is the European Green Deal, which addresses the areas of clean energy, sustainable industry, building renovation, sustainable mobility, food production and consumption, and biodiversity protection. It aims for climate neutrality and zero pollution by 2050. It also aims to ensure European global leadership in this realm and to provide a model for other countries, including China, to consider. In March 2020, a new Circular Economy Action Plan[15] was adopted as one of the main components of the European Green Deal. Going significantly beyond the 2015 Circular Economy Package, it

[12] https://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2010917%202006%20INIT
[13] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2009:285:FULL&from=EN
[14] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52008DC0397&from=EN
[15]https://eur-lex.europa.eu/resource.html?uri=cellar:9903b325-6388-11ea-b735-01aa75ed71a1.0017.02/DOC_1&format=PDF

aims to make sustainable products the norm in the EU, empower consumers and public buyers to consume sustainably, and achieve a system where no waste is produced. It focuses on the value chains in areas where circularity potential is high: electronics, batteries and vehicles, packaging, plastics, textiles, construction and buildings, food, water and nutrients. It further aims to make circularity implementable for people, regions, and cities. Product durability, reusability, and recyclability, energy and resource efficiency, and recycled material content are to be enhanced. Single-use is to be restricted and premature obsolescence of products countered while product-as-a-service is to be incentivized. Various measures to empower consumers are central to the plan, including enhanced information about product lifespan and the availability of repair services, and the establishment of minimum requirements for sustainability labels and information tools. A "right to repair" is being considered, as are requirements for companies to substantiate their environmental claims using Product and Organisation Environmental Footprint methods. The Monitoring Framework for the Circular Economy is to be updated. Furthermore, a Circular Economy Stakeholder Platform offers the public an opportunity to share their ideas about good practices, publications, events, and networks related to sustainable consumption, production, waste management, and innovation.[16]

3.4 National Government Strategies on Sustainable Consumption

The following sections provide background details on three case study countries— Germany, Sweden and Japan—highlighting the unique characteristics of each country's approach and presenting options that may be of interest to China as it designs its own sustainable consumption policies.

Consumer protection, consumer rights, consumer safety, and consumer information have long been important for industrialized countries.[17] More recently, the sustainability of consumer behaviour has become a critical area of concern. In industrialized countries, upwards of 50% of environmental impacts (including GHG emissions, resource use, pollution, noise, and loss of biodiversity) can be linked to available domestic consumption options and practices. However, political measures introduced to address the impact of consumption have typically done so with a focus on industrial sectors, without taking into account the conditions and drivers of demand-side behaviour.

3.4.1 Germany

In February 2016, just shortly after the SDGs were agreed upon, Germany became the first nation to adopt a standalone National Programme on Sustainable Consumption.[18] The strategy was developed in the Federal Ministry for the Environment and negotiated within the

[16] https://circulareconomy.europa.eu/platform/.
[17] See, for example, the German Consumer Information Act.
[18] National Program for Sustainable Consumption: https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Produkte_und_Umwelt/nat_programm_konsum_bf.pdf

framework of a formal inter-ministerial working group on sustainable consumption. The composition of this inter-ministerial working group—led by the Federal Ministries for the Environment, Nature Conservation and Nuclear Safety; Justice and Consumer Protection; and Agriculture and Nutrition—reflects the cross-sectional approach and transversal nature of sustainable consumption.

Germany's strategy outlines five foundational principles: making sustainable consumption feasible (by increasing the ability of consumers to make decisions and take action); taking sustainable consumption out of the niche and into the mainstream (e.g., by creating protected spaces and promoting new initiatives, with incentives for the use of particular technologies or for enabling sustainable behaviour); ensuring all sections of the population are included (by tailoring the approaches to specific target groups); looking at products and services from a life-cycle perspective; and shifting the focus from products to systems and from consumers to users.

Despite the recognition of the impact of harmful consumption, efforts to develop a strategy in Germany entailed debates on how to avoid consumer scapegoatism[19]—a situation where the burden is shifted to consumers without a critical analysis of their capacities or drivers of their behaviours. The strategy therefore sought to understand aspects of the supply side that shape consumer behaviour. Supply-side instruments like the Ecodesign Directive, producer responsibility schemes, and warranty regulations are explicitly part of the government approach because they heavily influence consumption patterns and can help reduce impacts through, for example, lower-energy consumption or the greater durability of products.

3.4.2 Sweden

Sweden's *Strategy for Sustainable Consumption* aims to make it easier for citizens and consumers to act sustainably. This is a government strategy to promote sustainable household consumption and was introduced in order to address the increasing environmental impact following Swedish consumption. Implementation of the strategy is led by the Ministry of Finance and is carried out mainly by the environment and industry ministries.[20]

The strategy was adopted in the fall of 2016. It addresses what the State, together with municipalities, the business sector, academia, and civil society, can do in order to make it easier for citizens to shift to more sustainable consumer behaviours and lifestyles. The strategy has seven strategic focus areas: increasing knowledge and deepening cooperation; encouraging sustainable ways of consuming; streamlining resource use; improving information on companies' sustainability efforts; phasing out harmful chemicals; improving security for all consumers; and putting a special sectoral focus on food, transport, and housing. The Ministry of Finance is responsible for the implementation. The Forum on Eco-smart

[19] Consumer Scapegoatism and Limits to Green Consumerism: https://doi.org/10.1016/j.jclepro.2013.05.022
[20] Swedish national Strategy for Sustainable Consumption: https://www.government.se/4a9932/globalassets/government/dokument/finansdepartementet/pdf/publikationer-infomtrl-rapporter/en-strategy-for-sustainable-consumption--tillganglighetsanpassadx.pdf

Consumption, a national dialogue and a digital platform, is one of the implementation mechanisms supporting knowledge building and communication about sustainable consumption. The Swedish Consumer Agency has been assigned by the government to operate the forum, supported by an inter-agency reference group consisting of the Swedish Environment Protection Agency (EPA), the Swedish Chemical Inspectorate, the Swedish Energy Agency and the Swedish Food Agency. An advisory board with representatives from industry, academia, etc. has also been appointed to guide the implementation.

The strategy is currently being implemented. Some examples of government policy initiatives are new education materials to facilitate knowledge building on consumption's environmental impacts; economic incentives to increase repair and maintenance of selected product groups; stricter requirements on consumer information in the business and financial sector; debt counselling services to support families and individuals to get their financial situation in order; measures to stop companies from engaging in unlawful marketing practices; annual national workshops on sustainable living; and the introduction of well-being indicators.

3.4.3 Japan

While Japan does not have a dedicated sustainable consumption strategy, it has a broad sustainability policy framework and programs dedicated to consumption and lifestyles. The Japanese approach is highly influenced by its history of development and waste management. In the 1950s, Japan's economy changed significantly in both size and structure. The scale grew drastically, restructuring was driven by heavy and chemical industries, and the concentration of the population in cities intensified. Both municipal and industrial waste rapidly increased. Inadequate waste disposal and illegal dumping became rampant. Developing a waste management policy, improving sanitation, and prevention of environmental pollution became important. These developments fed into the government's sustainability strategy, with its dedication to building a "sound material cycle society." Given the topical issue of the coronavirus pandemic and that suggested solutions are linked to sanitation, Japan's history of linking waste management systems to sanitation and public health provide indications of how sustainable lifestyles can also be addressed through public health policy and infrastructure.

In a more recent iteration, Japan established The Basic Act on Establishing a Sound Material-Cycle Society. The act establishes basic principles centred on cyclical utilization of resources and disposal of waste, including clear priorities and hierarchical measures for the 3Rs (reduce, reuse, recycle). The act requires the government to develop and renew a Fundamental Plan for Establishing a Sound Material-Cycle Society every five years. With this plan, Japan is building on cultural traditions embedded in programs and projects, such as sustainable packaging and recycling through its 3R campaign, promoting household waste separation and energy efficiency at home. Given how integral consumption is to lifestyles, culture, and tradition provide important levers. The Japanese language has a word that embraces the concept of sustainability: *mottainai*. *Mottainai* is used to indicate the wastefulness associated with discarding something that still has value. The idea was picked

up in a comic strip by the same name in an effort to help educate the manga-loving population.

One example of the above is the nationwide "Cool Choice" program, launched in 2005 in order to encourage people to choose decarbonized products, services, and lifestyles, such as through the use of public transportation and energy-efficient appliances. The government also launched a "Cool Biz" campaign, encouraging sustainable and temperature-appropriate clothing in the work environment. In a country known for its formal working environment, in the summer, people are encouraged to wear light, casual clothing, meaning no neckties for men and no suit jackets. By dressing more "coolly," in addition to feeling more comfortable at work, this campaign reduces the need to set very low temperatures for air conditioners in offices. Results show strong savings: approximately 6.95 million people and 100,000 companies have adopted "Cool Choice" practices. While the decline by 10% in the carbon dioxide emissions from the household sector between 2013 and 2017 cannot be tied exclusively to this program— energy-saving initiatives after the Fukushima nuclear disaster also contributed—the "Cool Biz" campaign has certainly played a significant role.

3.5 Determining Priority Areas: European, Swedish, and German experiences

In over 50 years, consumption policy has evolved from addressing the consequences of end-of-pipe issues (such as waste and local contamination) to taking on a broader systemic lens (such as shaping social norms and values that inform the economic system within which production and consumption activities occur).[21] In the late 1960s and 1970s, industrial manufacturing caused serious environmental problems due to air and water pollution and from poor waste management. Government policies were mainly reactive, with a heavy focus on public health and the emergence of consumer protection legislation. By the 1980s, the more preventive approach of cleaner production was adopted, and, in the 1990s, this approach was re-emphasized in eco-efficiency and product-oriented approaches. Demand-side policies emphasized increased efficiency in material and energy use, supported by ecolabels and better household waste management—known as the 3R approach. Towards the turn of the century, government policy began to acknowledge the negative impacts of harmful overconsumption and the role of social inequities in driving unsustainable patterns. Contemporary European policies tend to be a mix of eco-efficiency and inclusive characteristics of social welfare, as encapsulated in the "leave-no-one-behind" motto of the SDGs.

Priority sectors and themes for sustainable consumption policy in Europe have been heavily driven by research. The Seventh Framework Programme for Research and Technological Development (FP7)[22] was the EU's main instrument for funding research in Europe and ran from 2007 to 2013. It was designed to respond to employment, competitiveness, and quality of life in Europe. The successor program, Horizon 2020,[23] supported research and innovation

[21] https://www.oneplanetnetwork.org/sites/default/files/2._scp_in_asia.pdf
[22] EU Seventh Framework Programme for Research and Technological Development (FP7): https://wayback.archive-it.org/12090/20191127213419/https:/ec.europa.eu/research/fp7/index_en.cfm
[23] EU Horizon 2020: https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020

with nearly €80 billion of funding for the period from 2014 to 2020. Under these schemes, several research projects were funded which focused on consumption, lifestyles, and policy analysis, in order to support EU- and national-level government strategies and approaches—for example, baseline and needs assessments; assessment of risks and uncertainties; life-cycle assessment; material flow analysis; cost–benefit analysis; environmental and social impact assessments, etc. The scale of funding and the rigour of research undertaken has established a clearer understanding of areas where consumption and lifestyles have the highest impact on the environment, and, therefore, should constitute priority areas for policy. These include food systems, mobility, housing, consumer goods, leisure and tourism, and cross-cutting areas such as energy, water, and waste. Although emphases might differ from one country to the next, these major areas often remain as top areas of focus and have come to shape priorities for sustainable consumption policy.

Despite the scientific clarity, addressing consumption also needs buy-in from citizens. As such, the policy-framing phase is crucial; the governments of Sweden and Germany have relied heavily on public consultations and deliberative processes, inviting non-governmental organizations, businesses, and local communities into carefully designed public citizen consultation processes. Analyses of these processes show that, once the public understands the critical nature of the issue, proposed policies are widely accepted. In fact, most post-consultation commentary suggests that citizens who acquire an awareness of the impact of sustainable consumption tend to propose more ambitious actions than governments eventually reflect in policy.

In Sweden, consumption-based GHG emissions have been an important (leading) criterion used to assess the impact of consumption. The main reasons are that climate impact is of high priority, and that methodology and data are accessible. Major efforts have been made to develop consumption-based indicators and to collect data on GHG emissions along product life cycles. Household consumption represents a dominant part of the total consumption-based GHG emissions, with three areas standing out: food, transportation, and housing. These three areas are therefore of high priority for sustainable consumption policy.

According to the most recent annual assessment, total GHG emissions from Swedish consumption in 2017 were 90 million tonnes of GHG-equivalents—about 9 tonnes per capita. Of this total, 58% arose outside of Swedish borders (see Figure). Emissions abroad are generated from, among others, air flights, the import of palm oil, electronics, and textiles. Swedish household consumption accounts for 60% of the total GHG emissions, while emissions from the public sector account for 11%. For household consumption, shares of emissions from food, transportation, and housing are, respectively, 15%, 20%, and 10%, while the remaining 29% is attributed to investments.

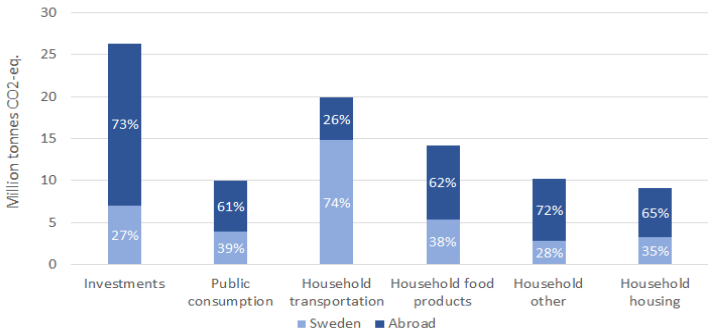

Figure 6. Swedish consumption-based emissions per consumption category within Sweden and outside Swedish borders (2017). *Source:* Sweden Statistics (SCB)

For Germany, the National Programme for Sustainable Consumption places its emphasis on six key areas of private consumption: mobility, food, home, workplace and office, clothing, and leisure and tourism. Mobility accounts for 26% of GHG-related emissions, with food at 13% and housing at 36%.

3.6 Policy Instruments

Common to most EU Member States, EU legislative frameworks and policy instruments that are highly relevant for sustainable consumption and production are transposed to the national level. Beyond the EU common SCP policy agenda, there are additional national governmental initiatives in place to facilitate the shift to sustainable consumption. Examples of national government policy instruments and measures in place addressing key Swedish Environmental Quality Objectives at the macro (sector) and micro (product supply and demand) levels include a carbon tax and subsidies; flight tax; bonus-malus system on new cars; electric car subsidy; subsidies on solar panels, investment support programs ("Climate step" and "Industrial stride," waste prevention in a circular economy): 12 – 25% reduced value-added tax on repair of bikes, shoes, leather goods, clothing and household linen; tax reduction for repair and maintenance of white goods (large electrical goods such as fridges and washing machines); and a financial support program called Sustainable Use of Plastics.

The Swedish government is also supporting stakeholder collaborations. Some current examples are national and regional workshops on sustainable consumption and lifestyles, a multistakeholder dialogue on the textile chain, and a national forum on eco-smart consumption (described in more detail in Section 3.4.2). Examples of instruments mentioned here have been reported in accordance with Agenda 2030 indicator 12.1.1 (Number of countries with SCP national action plans or SCP mainstreamed as a priority or a target into national policies).[24]

Sweden has implemented a large number (over 100) of environmental consumer policy instruments designed to directly influence consumer behaviour (demand-side) in an

[24] More detailed information on the implementation of 10YFP (target 12.1) is accessible through the One Planet Network platform: https://www.oneplanetnetwork.org/

environmentally sustainable direction. Among these instruments, 32 have been evaluated.[25] They include a mixture of administrative, economic, and informative instruments (economic is dominating) addressing housing, travel, and food. A majority address carbon dioxide emissions and other air pollutants, and a few are cross-objective (e.g., labelling schemes).

The German National Policy for Sustainable Consumption includes more than 170 measures, which are either "hard" instruments, directly addressing one of the six priority policy areas discussed above or "soft" cross-cutting instruments.

3.7 Governance and Institutional Arrangements

3.7.1 Institutional Arrangements

Both Sweden and Germany have made the implementation of the sustainable consumption strategy a multi-agency, inter-ministerial responsibility. In Sweden, since 2014, 18 strategically relevant national and regional agencies have been cooperating at the highest management level (Director General) in the Environmental Objective Council.[26] Annual and in-depth assessments of environmental progress are made. Based on these, the council aims to contribute to solving conflicts between environmental and other goals in society and will present proposals to the government. Each year (2016–2019), the council has presented around 20–30 measures to be undertaken in collaboration by relevant national agencies in order to speed up the work towards meeting environmental objectives. So far, approximately 30% of the collaborative measures have been targeting the area "economy, growth and consumption." In February 2020, the council presented its fifth list of inter-agency collaborative measures. Several tasks will be undertaken in the period 2020–22 in order to strengthen Swedish environmental policy towards the objectives. Policy instruments for sustainable consumption is one out of seven priority areas for 2020–22.[27]

In 2016, when the Swedish sustainable consumption strategy was adopted, the government allocated 43 million Swedish kronor annually until 2020, and thereafter 9 million kronor per year to strengthen the Swedish Consumer Agency's work in environmentally sustainable consumption. The Consumer Agency was assigned by the government to establish a new National Forum on Eco-smart Consumption.[28] The vision is to make the sustainable choice the standard choice by sharing ideas, knowledge, and solutions (see Section 3.4.2 上方).

For the implementation of the German National Program for Sustainable Consumption, a National Competence Centre on Sustainable Consumption has been established at the Federal Environment Agency (UBA). It also involves other agencies, such as Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the Federal Agency for Agriculture and

[25] http://www.naturvardsverket.se/Global-meny/Sok/?query=styrmedel+f%c3%b6r+h%c3%a5llbar+konsumtion
[26] Miljömålsrådet, http://www.sverigesmiljomal.se/miljomalsradet (Environmental Objective Council)
[27] http://www.sverigesmiljomal.se/contentassets/f2f66cba53f745398381eb7346a215a6/miljomalsradets-atgardslista-2020.pdf
[28] https://www.forummiljosmart.se/

Nutrition. The centre organizes the implementation process of the program and ensures the involvement of relevant stakeholders in a National Network on Sustainable Consumption. It develops a reliable knowledge base on sustainable consumption and provides information to the public, organizing workshops and conferences.

An inter-ministerial working group was established to support the implementation of the program, bringing together representatives from all government departments concerned with sustainable consumption. It is headed by three federal ministries: the Federal Ministry for the Environment, Nature Protection, and Nuclear Safety (BMU); the Federal Ministry of Justice and Consumer Protection (BMJV); and the Federal Ministry of Agriculture and Nutrition (BMEL).

The program will create a public platform designed both to expand ideas about instruments and approaches that have already proved successful and to instigate new ones. This will ensure a continued assessment of the diversity of approaches available in the field of sustainable consumption and also encourage as many actors as possible to participate. A change in consumption patterns towards greater sustainability can only be achieved with the participation of all parts of society and a range of policy approaches undertaken in an integrated fashion.

3.7.2 Monitoring

The regular monitoring of the implementation of the German National Program for Sustainable Consumption is aligned with the required assessments of progress related to the SDGs. In line with international indicators intended to measure SDG 12 on sustainable consumption and production patterns, consumption-related indicators and targets were developed for the German National Sustainable Development Strategy. These indicators monitor the market share of sustainable products in 19 product groups, including food, paper, textiles, cars, and electric appliances. A target of a 34% market share by 2030 has been set for these product groups; GHG emissions per capita tied to consumption are to continuously decline; the share of Blue Angel-labelled paper in public procurement at the federal level is to reach 95% by 2020; and GHG emissions from public vehicles per km are also targeted for continuous decline.

For Sweden, since 2008, the country has been articulating the relationship between national-level consumption and impacts on climate by analyzing emissions along whole product life cycles. To improve its methods, the Swedish EPA recently funded the PRINCE project, which sought to develop state-of-the-art indicators for the environmental impacts of Swedish consumption.[29] The project was led by Sweden Statistics, with participants from academia.[30] Based on the research results, two new consumption-based indicators were

[29] New data build on new methodology developed within the PRINCE project: https://www.prince-project.se/publications/environmental-impacts-from-swedish-consumption-new-indicators-for-follow-up-prince-final-report/

[30] https://www.youtube.com/playlist?list=PLgGFtRVUTORQspUzwN7xGX1pKkMz4okum

introduced in the environmental quality objective monitoring system: consumption-based GHG emissions per consumption category and consumption-based emissions in Sweden and abroad.[31] Last year, the Swedish EPA proposed a set of consumption-based indicators to monitor the GHG emission trends from selected consumer categories (passenger travel, flights, food, housing construction and housing, textiles) to the government.[32]

GHG emissions from Swedish households have decreased by 14% from 2008 to 2017, despite the (25%) increase in consumption volume. About two thirds of this decrease is estimated to be from the effect of increased eco-efficiency in imported goods as well as nationally produced goods. One third of the decrease is estimated to be related to a shift in Swedish consumption patterns. Consumption-based emissions, however, are still far above sustainable levels.[33] The government is probably going to explore the introduction of national consumption-based emission goals in 2020.

The Consumer Agency in Sweden developed a method in 2009/2010 to examine consumers' experiences related to different goods and service markets, such as those for dairy products and meat. The agency has used the results from its research to identify markets that are problematic for consumers. The results of this research have been published annually in the *Consumer Report*, which was released in six editions between 2013 and 2018.[34]

Sweden also monitors efforts in sustainable consumption from a gender perspective. Since 2015, the Swedish Consumer Agency has, on behalf of the government, mapped out what opportunities are available to consumers to act in environmentally sustainable ways. To understand this, consumer experiences are obtained by means of self-administered questionnaires. These are then supplemented with calculations from Statistics Sweden, showing the climate impact of consumption in general as well as in various markets. Similar calculations are made for GHG and other atmospheric emissions. The survey is designed in a way that provides disaggregated data for men and women and in different age groups. Results of the 2018 survey[35] show that women see greater opportunities to make more environmentally sustainable choices. The consumer category that finds it most difficult to make environmentally sustainable choices are middle-aged men between 3 –64 years, whilst women aged 65–75 find it the easiest to make more sustainable choices. Those with little or no interest in environmental issues see fewer opportunities to make more sustainable choices. There is a significant difference between women's and men's attitudes towards environmental issues. As much as 25% more women than men consider it important to consider how their consumption impacts the environment. Women have a better understanding of environmental choices and more often use ecolabels and other information to help them decide.

[31] http://sverigesmiljomal.se/miljomalen/generationsmalet/

[32] http://www.naturvardsverket.se/Miljoarbete-i-samhallet/Miljoarbete-i-Sverige/Regeringsuppdrag/Redovisade-2019/Matmetoder-for-konsumtionens-klimatpaverkan/

[33] Annual evaluation of the Environmental Quality Objectives 2019 (report in progress)

[34] https://www.konsumentverket.se/om-konsumentverket/vart-arbete/forskning-och-rapporter/konsumentrapporten/

[35] https://www.konsumentverket.se/globalassets/publikationer/var-verksamhet/konsumenterna-och-miljon-2018-17-konsumentverket.pdf

3.7.3 Gender Perspectives

Gender parity in commissions is an increasingly important topic in Germany. The German Council for Sustainable Development, an advisory body to the German government, has a predominance of female members in 2020 (9 women, 5 men). Sustainable consumption and resource management fall within its mandate. Gender is not explicitly addressed in the National Programme on Sustainable Consumption but is an implicit part. To become explicit, there are currently research projects to identify gender aspects of sustainable consumption, meant to enhance people's participation in the program.[36,37]

Gender equality is central to the Swedish government's priorities in decision-making. Women and men must have the same power to shape society and their own lives. The government's most important tool for achieving this, as a strategy to reach the goals declared for the Swedish gender equality policy dating back to 1994, is gender mainstreaming. According to the strategy, gender equality work must be integrated into the regular operations and not merely be dealt with as a separate, parallel track. The Swedish government has commissioned the Swedish Gender Equality Agency to support 58 government agencies, among others, the Consumer Agency, with the work of integrating a gender perspective in all their operations. The government ordinance, which governs the work of the Consumer Agency, instructs that the agency should integrate issues of sustainable development and work to achieve the Swedish environmental objectives, and the agency should also integrate a gender perspective.

For its work on gender integration, the Consumer Agency has set itself an objective to acquire knowledge showing different possibilities for women and men as consumers, and for the agency's activities to be based on this knowledge. The agency has, for example, organized workshops on "Women, Men, And Environment – Why Gender Perspective Is Relevant for Sustainable Consumption." In 2017, the agency assigned researchers to compile a report providing an overview of consumer behaviour and gender aspects. The report began with the question: "How do conditions differ for men and women as consumers to make active choices in the marketplace and in everyday consumer life?"[38] The report systematically identifies the latest research in relation to several market contexts or focus areas identified through discussions between the Consumer Agency and the Swedish Environmental Protection Agency. The report shows, for instance, that, in decisions concerning financial services, men and women exhibit different behaviours. Women tend to focus on minimizing potential losses from investments, whereas men express a conviction to maximize profit, socially and financially.

3.8 Conclusions and Recommendations

[36] Dagmar Vinz, Gender and Sustainable Development: A German Environmental Perspective, *European Journal of Women's Studies*, 1 May 2019, https://doi.org/10.1177/1350506808101764.
[37] OECD (2008) "Promoting Sustainable Consumption: Good Practices in OECD Countries"; OECD (2018) "Policy Coherence for Sustainable Development and Gender Equality Fostering an Integrated Policy Agenda"
[38]https://www.konsumentverket.se/globalassets/publikationer/var-verksamhet/konsumentbeteende-och-genus-en-forskningsoversikt-konsumentverket.pdf

The increased role of consumption in determining the long-term availability of economic resources, in defining public attitudes of citizens, and in creating impacts on the environment requires that sustainable consumption commands priority attention in any future-proof national sustainability strategy. This is especially the case for China, given the combination of the size and the rate of growth of its economy. It is also an opportunity for the country to show global leadership, given that most strategies to address sustainable consumption are still evolving, and to achieve the ultimate objective of delivering on well-being for all while limiting ecological impacts within sustainable limits. Recommendations based on international experiences are made with the hope that they can inform and be adapted to the development of a China strategy.

1) **Embed the concept of sustainable consumption into the 14th FYP**. Attention to the importance of sustainable consumption can be accompanied by major goals to reduce the ecological and societal impacts of excess consumption. As well as clear direction for demand-side action, the plan should include actions geared at changing provisioning systems that determine consumer choice, as well as the physical architecture and socioeconomic systems that lock in everyday living.

2) **Develop a dedicated Chinese sustainable consumption strategy and related action plan** to further China's long-term ambitions to develop as an ecological civilization, achieve a well-off society, and address climate change and resource depletion concerns. The Swedish and German sustainable consumption strategies, as well as the recent European Green Deal, provide useful examples. The action plan should develop specific policy instruments to address different areas of consumption, mixing educational campaigns, information systems, incentive structures, and regulatory approaches. The plan can follow a life-cycle approach and address key areas where Chinese consumption has the highest impact on the environment.

3) **Construct an integrated indicator system that can comprehensively reflect the status and level of sustainable consumption by private consumers**. This will support the monitoring of sustainable consumption objectives in the Sustainable Consumption Plan. Consider including the proposed indicators within China's existing national system of statistics categories for green households or consumer goods and services.

4) **Develop explicit well-being indicators to be used in monitoring and reporting on how economic development is responding to the needs of all.** Monitoring of consumption should not be limited to only environmental concerns but also reflect people's growing demand for a better quality of life and a new effort by the government to drive high-quality development. Such a set of indicators could complement China's Green GDP efforts. As an example, the Swedish government introduced 15 national well0being indicators.[39] Since 2017, these indicators have been reported in the government's proposed annual spring budget.

5) **Develop clear definitions and technical criteria for ecolabels and minimum**

[39] https://www.government.se/articles/2017/08/new-measures-of-wellbeing/

sustainability standards, including low- or net-zero levels for key sectors, including housing, mobility, consumer goods, and food, especially in relation to resource use (including materials, energy, water, land) and waste (and pollution). One lesson from Germany is that there is a need for a coherent approach: instruments should be implemented in a coherent manner, acting institutions should use the same definitions and targets, and related information should be clear and accessible. The certification and standards should affect the design and manufacture of consumer products and also use and post-use phases. There are also opportunities to adopt solutions that catalyze sustainable consumption across sectors. For example, initiatives that enable sharing, reuse and repair can support goods, housing, and mobility sectors.

6) **Set up a well-resourced and empowered coordinating agency to ensure the implementation and monitoring of sustainable consumption policy.** A successful coordinating agency should be delegated sufficient and capable staff, have financial and other resources, be given the authority to ensure implementation by related stakeholders, and have representation from not only the ministry responsible for the environment but also other government ministries (including economy, finance, housing, transport, etc.).

7) **Create a dedicated funding stream to sustain the operations of the sustainable consumption coordinating agency**. To fund the agency, sustainable consumption programs, and implementation of the strategy, revenue could be generated from instruments such as a carbon tax (e.g., in Japan) or differentiated vehicle taxes (e.g., in Germany). As well as providing revenue, experience from Sweden shows that a congestion tax, green car premiums, and differentiated vehicle taxes have the highest effects on consumer choices among evaluated instruments designed to directly influence consumer behaviour.

8) **Create an Ombudsman for Sustainable Consumption, Youth and Future Lifestyles**. In 2007, the Hungarian Parliament created a special Ombudsman for Future Generations, whose responsibilities include intervening where state policies would lead to overconsumption and thus endanger prospects for the society of tomorrow.[40] Other countries, such as the United Kingdom, have argued for similar foresight.[41] Such an Ombudsman would need to work together with a coordinating agency responsible for realizing the Chinese national sustainable consumption strategy as well as the elements nested within the FYP.

9) **Establish a China Panel for Wellbeing Society and Future Sustainable Living** and task it with examining trends, anticipating future directions, and continuously advising the government and ombudsman on what actions are needed to ensure long-term sustainable ways of living for Chinese society. This would go beyond directly addressing resources and consumption and look at critical aspects of everyday living that affect the choices and patterns of people. For example, it could make concrete recommendations for **programs on a future-proof digital society that examines how information**

[40] http://environmentalrightsdatabase.org/hungarys-ombudsman-for-future-generations/
[41] http://www.if.org.uk/2011/08/16/a-parliamentry-ombudsman-for-future-generations/

communication technology, digitalization, and digital tools could be harnessed to reduce consumption impact (e.g., digitalization and traceability in food systems and production value chains; contracted labour practices such as telecommuting and work-life balance; and opportunities for servicing instead of product ownership systems). It could also enhance the rights of consumers through the strengthening of consumer organizations. This is one area where China could leapfrog over the more traditional sustainable consumption policy approaches of industrialized countries and introduce innovative instruments.

10) **Launch several highly communicative national programs that showcase the benefits of sustainable consumption to the public** while also helping to make a transition to a sustainable society. Research shows that some of the most effective programs are linked to key turning points and events in life, such as marriage, birth, or graduation from school. These are milestones in peoples' lives where they tend to re-examine lifestyles and practices and redefine aspirations as they switch from one stage to the next. Programs targeting these key turning points could be combined with **nationwide awareness-raising campaigns on the impacts of unsustainable consumption, opportunities for transitioning, and benefits of sustainable living**.

4. Overall Roadmap for Boosting Green Consumption in China During The 14th FYP

The 14th FYP period is a critical stage for China as it moves to high-quality growth and furthers achievement of the ambitious goal of building a beautiful China. Consumption is a major engine for economic growth and an important driving force for high-quality development. As shown by both domestic practice and international experience, vigorous promotion of green consumption has a highly significant positive effect on transforming the mode of development, changing lifestyles, and improving ecological and environmental quality. For a long time, the policy focus for China's green economic transition has been placed on green production on the supply side. In recent years, emphasis has gradually shifted to the green transition in the consumption sector. The European Union, Germany, Sweden, Japan and other pioneer economies have all attached great importance to green consumption and formulated corresponding national strategies and action plans on sustainable consumption and green consumption. Considering the goals and requirements of future high-quality development, in the 14th FYP period, China should take existing progress and practice as the foundation, fully learn from international experience, and enhance emphasis on green consumption on the demand side. It is recommended to establish a systematic national green consumption strategy and action plan, including goals and indicators, priority areas, key tasks, and policy measures, and push a green transition and the upgrading of consumption on the demand side to push forward the green transition in the production sector on the supply side, so as to advance the overall green transition of the economy and society as well as high-quality development.

4.1 Set goals and indicators for green consumption

In recent years, the Chinese government has formulated a number of sectoral policies on green consumption, such as the "Notice on Guiding Opinions on Promoting Green Consumption" and "Opinions on Accelerating the Establishment of Legal and Policy Framework for Green Production and Consumption" by the National Development and Reform Commission (NDRC) and other line departments, articulating the basic directions and key priority areas for China to push forward green consumption. However, in general, there has been no targeted and systematic establishment of strategic goals and specific monitoring and evaluation indicators that are clearly defined. It is necessary to deliberate and establish long-term strategic goals and specific target indicators for promoting green consumption as a national top-level design.

4.1.1 Identify strategic goals for promoting green consumption

With regard to international experience, the European Union (EU), Germany, Sweden, and Japan have developed long-term strategic goals for sustainable consumption or green

consumption. The European Green Deal sets the goal of climate neutrality by 2050 for major sectors with consumption included. Germany emphasizes the necessity of mainstreaming sustainable consumption. Sweden is committed to facilitating the easy shift to more sustainable consumption behaviors and lifestyles for its citizens. Japan is dedicated to building a Sound Material-Cycle Society by pushing forward resource utilization and proper waste disposal.

Taking into account the existing progress of green consumption policies and practice, and the requirements proposed by future green economic transition and high-quality development, the following long-term strategic goals for China to accelerate green consumption are recommended: adhere to the philosophy of Ecological Civilization, substantially improve the level of green consumption, and speed up the formation of green production patterns to foster novel internal impetus for eco-environmental quality improvement and high-quality development. Specific targets may include the following aspects:

(1) A significant rise in the awareness of green consumption in the whole of society: Society-wide visibility and awareness raising efforts and education actions on green consumption are carried out in depth. Green consumption has become an integral part of various environment-related thematic campaigns and awareness raising activities, and is gradually incorporated into the products pertinent to education, culture, art, and information media. Consumption concepts and patterns featured as simple, moderate, green and low carbon are widely disseminated and spontaneously practiced. The good social tendencies and practices of green, low-carbon, and conservative consumption are internalized by the entire society.

(2) A substantial increase in the supply of green consumer products and services: Enterprises' contributions to and capacities for green product design, research and development, and manufacturing continue to grow. Substantial increases in both the types and market shares of various green products and services such as labeled energy-saving and environmentally-friendly products, environmentally labeled products, and certified green and organic products are realized. The circulation channels and sales networks for green products are increasingly improving, with a number of exemplary green product markets and sales platforms in shopping malls and supermarkets having formed. The penetration rate of green consumption on major e-commerce platforms has risen significantly, and the provision of infrastructure that underpins green consumption has noticeably been enhanced.

(3) The preliminary formation of green and low-carbon consumption patterns: Such irrational practices as extravagant consumption, excessive consumption, and food waste are largely corrected. Green consumption is fully implemented in all areas of household consumption, including clothing, food, homes, mobility, and daily appliances. Green transport modes like walking, cycling and public transportation are further developed and practiced. The ability of public institutions to lead and promote green consumption is further strengthened. The scope of green products for government procurement and the

corresponding procurement scale continue to expand. A social atmosphere for the recycling and reuse of idle resources is basically formed. The recycling rate of domestic waste is remarkably increased, and the amount of domestic waste generated is drastically reduced.

(4) Establishment and improvement of a green consumption policy system with both incentives and constraints: Further improvements are witnessed in the standard system and green labeling and certification system for green products and services. Laws and regulations pertinent to green consumption are gradually perfected to form basically an economic policy framework for green consumption that can encourage and discourage consumer behaviors.

4.1.2 Establish specific indicators for monitoring and assessing green consumption

In 2016, the NDRC and three other line ministries issued the "Green Development Index System" to put forward evaluation indicators for gauging the greenness of life-related areas. Major indicators include: per capita energy consumption reduction rate for public institutions, green product market share (high-efficiency and energy-saving product market share), the growth in the number of new energy vehicles, green mobility (public transport passenger volume per 10,000 urban population), the proportion of green buildings in new buildings in urban areas, the green space rate in urban built-up areas, the penetration rate of tap water in rural areas, and the penetration rate of sanitary toilets in rural areas. These indicators do not thoroughly cover all areas of consumption, and thus have limited capacity to truly and scientifically measure and reflect the progress and status of green consumption at the national or regional levels.

There are also practices of sustainable consumption at the international level. The UN Sustainable Development Goal 12 is designed to ensure sustainable consumption and production patterns, including the following targets: by 2030, halve per capita global food waste and substantially reduce waste generation. The German sustainable consumption indicators mainly include: per capita carbon dioxide emissions, per capita carbon dioxide emission related to food consumption, and food waste generation; the potential of residential heating for carbon dioxide emission reduction; per capita paper consumption and the proportion of recycled paper in office paper; carbon dioxide emissions from the transportation sector, and especially the area of aviation. Swedish sustainable consumption indicators mainly include: carbon emissions of food consumption, food labels; energy labels for residential building materials, renewable electricity, and improvement of public transportation infrastructure. The indicators related to green consumption in the European Green Deal mainly cover the following aspects: greenhouse gases emission reduction targets, improved energy efficiency, energy consumption of buildings, greenhouse gases emissions from transportation, zero- and low-emission vehicle ownership, and public recharging and refueling stations.

Building on domestic progress and with reference to international experience, China's green consumption index and indicator system should be expected to reflect the overall status and level of green consumption, and at the same time implement and advance green

consumption-related work. The indicator system should include both result-oriented indicators and process-oriented indicators.

Therefore, the indicator system needs to cover the entire chain and process of green consumption, including: green product supply, green consumption processes and patterns, and the endpoint of consumption (Figure 4-1). Green product supply affects the production process and subsequent resource and environmental impacts caused by consumption, mainly through the product supply structure, including the proportion of green products. Green consumption refers to the process whereby a consumer consumes a green product, such as in the areas of clothing, food, housing, household appliances, and mobility. Consumption patterns relate to the intensity of resource and environment consumption. The endpoint of green consumption is mainly reflected in the domestic waste generated by consumption and corresponding waste disposal, which represents the impact of the consumption endpoint on resources and the environment.

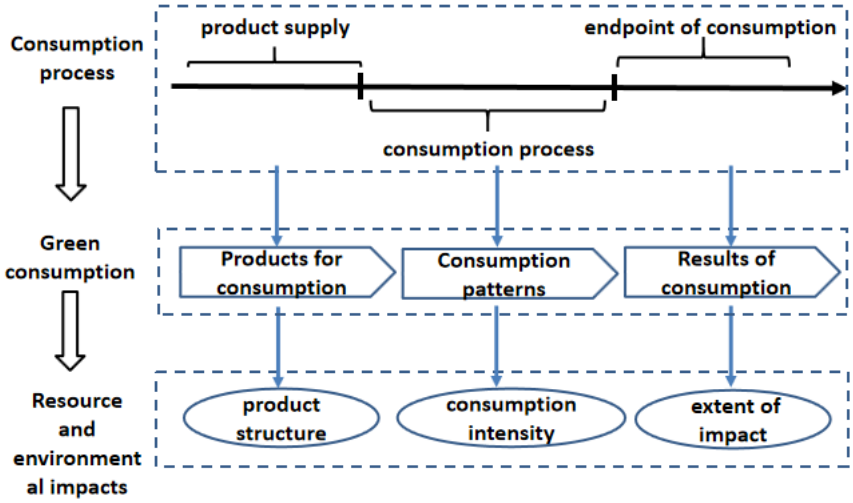

Figure 4-1 Green Consumption Process

Based on the above processes, as well as principles of scientificity, comprehensiveness, policy relevance, data availability; with an eye to the future; and taking into consideration the overall strategic goals and key areas for furthering green consumption, the SPS team selected 13 specific indicators. These include an overall index and domain-specific indicators. Combined they establish a framework for China's green consumption indicator system (Table 4-1). Further efforts can be made to improve the selection and establishment of indicators on the basis of this indicator system framework. At the same time, on the basis of this current framework, it is essential to set the corresponding target values for certain periods of time in the future, such as the 14th FYP period. The setting of targets should follow the principle that the green consumption promotion "can only get better, not worse" and ensure that positive indictor trends continue and the negative indicator trends continue to decline.

Table 4-1 Framework of Green Consumption Index and Indicator System in China

I. Overall Index	**Current Value**
1. Growth rate of per capita domestic energy consumption (%)	6
2. Growth rate of per capita domestic CO_2 emission (%)	6
3. Per capita daily domestic water consumption (l/person)	179.7
4. Output value of major green products (100 million yuan)	——
5. Proportion of green government procurement (%)	Around 90
II. Domain specific indicators	**Current Value**
6. Clothing: Recycling rate of waste and old textiles (%)	Around 30
7. Food: Rate of food waste (%)	12
8. Housing: Proportion of green buildings in new buildings in urban areas (%)	50
9. Housing: Energy consumption per unit of building area of public institutions (%)	Cumulative decline of 10% in five years
10. Household appliances: Recycling rate of urban-rural domestic waste (%)	Around 15
11. Mobility: Proportion of urban green mobility (%)	Around 70
12. Mobility: Share of new-energy vehicle in total sales volume of automobile of the year (%)	
13. Tourism: Proportion of green hotel and restaurant (%)	
Explanatory Notes: (1) The values for the growth rate of per capita domestic energy consumption and growth rate of per capita domestic CO_2 emission indicate the annual average growth rates from 2016 to 2018; (2) The values for per capita daily domestic water consumption, proportion of green government procurement, recycling rate of waste and old textiles, rate of food waste, and recycling rate of urban-rural domestic waste use 2018 data; (3) The values for the proportion of green buildings in new buildings in urban areas, energy consumption per unit of building area of public institutions, and proportion of urban green mobility are the projected values for 2020; (4) The indicator for urban green mobility refers to the proportion of green mobility in the central urban area of large and medium cities; (5) The output value of major green products includes certified energy-saving and water-saving products, green labeling products, green and organic food, etc.; (6) The proportion of green government procurement refers to the share of green products among products of the same category purchased by the government; and (7) This indicator system uses nationwide statistics, and does not distinguish between urban and rural areas.	

4.2 Key areas and major tasks for pushing forward green consumption

The concept of green consumption widely recognized internationally includes the following aspects: First, it is important to mobilize consumers to choose green products, meaning they are not polluting and are beneficial to public health when consumed. Second, emphasis should be placed on the disposal of waste generated during the consumption process. Third, efforts are needed in guiding consumers to transform their consumption philosophy and switch to the practice of sustainable consumption which advocates the respect to nature and the pursuit of health, and a balanced emphasis on environmental protection, resource and energy conservation in the process of pursuing a life of comfort. The China Consumers Association outlined three dimensions to define green consumption in 2001. The first one is the content of

consumption (i.e. consumers choose green products that are non-polluting and beneficial to public health). The second refers to the consumption process (i.e. emphasis on minimizing environmental pollution and close attention to waste disposal). The third dimension is about the idea, understanding, or philosophy of consumption (i.e. a balanced emphasis on environmental protection and resource and energy conservation in the process of pursuing a life of comfort, so as to achieve sustainable consumption). These basic understandings provide essential rules to follow in determining key areas and main tasks for realizing green consumption.

4.2.1 International experience and national practice in the key areas for green consumption

From an international perspective, the focus areas for sustainable consumption or green consumption in economies such as the EU, Germany, and Sweden include food, housing, mobility, daily necessities, and public procurement. The EU's focus is put on sectors of food, mobility, housing, consumer goods, leisure and tourism, as well as cross-sectoral areas such as energy, water resources, and waste. Although the national priorities of EU countries may differ, these main areas often are at the top of the policy agenda and ultimately form the top priorities of sustainable consumption policies. In Sweden, greenhouse gas emissions from consumption have always been an important criterion for evaluating the impact of consumption. Strong efforts in Sweden have been invested in the establishment of consumption indicators and collection of greenhouse gas emission data covering products' life cycles. In terms of household consumption, the areas that contribute the most greenhouse gases to total emissions and thus are of particular importance are food, transport and housing. In Sweden, emissions from private consumption account for 60% of total emissions, while those from public consumption make up 11%. In private consumption, contributions of food, transport, and housing are 15%, 20%, and 10%, respectively. The remaining 29% of total emissions is attributed to investment. Thus, food, transport and housing are the priority fields for sustainable consumption policies. Germany focuses on the six major consumption fields of mobility, food, home, workplace and office, clothing, as well as leisure and tourism. Transport accounts for 26% of total greenhouse gas emissions, food contributes 13%, and consumption at home makes up 36%.

From the perspective of relevant domestic policies in China, as set out in the "Guiding Opinions on Promoting Green Consumption" and the "Opinions on Accelerating the Establishment of Legal and Policy Framework for Green Production and Consumption" issued by NDRC and nine other departments, the key areas for green consumption are essentially comprised of fields such as old clothes recycling, green home, green mobility, green office, green procurement, and green product supply. The NDRC's "Overall Plan for Creating a Green Life Actions" proposes to launch coordinated actions in seven key areas, including energy-saving public institutions, green family, green school, green community, green mobility, green shopping mall, and green building.

From the perspective of China's concrete practices, pilots and efforts are conducted in a

number of key areas. For example, in the building and construction field, there are actions to promote the application of green building standards to new buildings and green renovation of existing old communities. In the field of automobile and transportation, vigorous development and application of new energy vehicles has occurred. In the power sector, renewable energy and green power consumption has been promoted. In terms of new business forms, people are piloting the establishment of digital platforms for low-carbon lifestyles. In the sector of logistics, practices include green packaging, green transportation and distribution, and green recycling. In the field of food, efforts are focusing on the establishment of a sustainable food supply chain and consumption system. In financial sector, there are continuous innovations and provisions of financial products for green consumption. All of these practices provide a policy and practical foundation for identifying future key areas for green consumption in China.

4.2.2 Identification of key areas for green consumption

Based on international experience and China's domestic foundation, the SPS team explored three different dimensions to analyze and identify the key areas that China's green consumption should focus on, including expenditures and growth of various consumption sectors, resource and environmental impacts of various consumption sectors, and the pulling effect on economic growth of various consumption sectors.

4.2.2.1 Expenditure and growth of various consumption sectors

As found in China's statistical system and practice, household consumption basically falls into eight categories, including food, tobacco, and liquor; clothing; residence; articles for daily use and services; transport and communications; education, culture and recreation; health care; and other articles and services. In 2018, food expenditure in China fell to 28.4%; and spending in residences made up 23.5%. Expenditure on transport and communications increased rapidly before 2010, gradually stabilizing thereafter, and reached 13.5% in 2018. 2018 expenditures on articles for household use and services accounted for 6.2%. The respective share of health care, clothing, articles for daily use and services, as well as other articles and services remained stable in the range of 6% to 8%.

As shown by the estimation results from scenario models, household consumption in China will speed up its shift from a subsistence-based model to a well-off one, and the consumption structure will change dynamically. The proportion of expenditure on food and clothing will show a downward trend; both the share of housing expenditure and that of transport and communications will decline slightly; and the proportion of spending in fields of health care, household appliances and items, education, culture and recreation, and others will continue to rise. The forecasted expenditure in eight categories of consumption in the future is displayed in the following tables. In general, in the next 15 years, there will be no substantive changes in the structure of household consumption; and food, residences, and mobility will continue to dominate household consumption in China (Tables 4-2 and 4-3).

Table 4-2 Expenditure in eight categories of consumption

(Unit: 1,000 million yuan)

Category	2015	2020	2025	2035
Food	79072	109175	146615	269298
Clothing	21151	27309	33336	67325
Residences	58760	87734	129462	269298
Household appliances and items	16244	34824	68615	134649
Transport and communications	35999	61143	102275	161579
Education, culture and recreation	29627	48229	77677	188509
Health care	17946	30738	51785	134649
Other	7181	17716	37544	121184

Table 4-3 Share of expenditure in eight categories of consumption

	2015	2020	2025	2035
Food	30%	26%	23%	20%
Clothing	8%	7%	5%	5%
Residences	22%	21%	20%	20%
Household appliances and items	6%	8%	11%	10%
Transport and communications	14%	15%	16%	12%
Education, culture and recreation	11%	12%	12%	14%
Health care	7%	7%	8%	10%
Other	3%	4%	6%	9%

4.2.2.2 Resource and environmental impacts of various consumption sectors

Two types of energy and environmental effects of consumption can be identified. There are the direct energy and environmental impacts caused by the energy consumption and environmental pollutants emitted by industrial activities. This direct impact is limited to energy consumption and environmental pollutants directly generated by industries. In addition, there are the estimated total energy consumption and environmental impacts caused by consumption as derived from input-output models. This component of consumption's impacts include not only the energy consumption and environmental pollutants emitted directly by household consumption, but also the energy consumption and environmental pollutants emitted during the production of various products to be consumed. The complete impacts are estimated as described below:

In 2015, the total energy consumption per unit of expenditure in categories of food, tobacco and liquor; clothing; residences; articles for daily use and services; transport and communications; education, culture and recreation; health care; and other articles and services was 122.44 kg/10,000 yuan, 170.99 kg/10,000 yuan, 125.19 kg/10,000 yuan, 166.80 kg/10,000 yuan, 220.61 kg/10,000 yuan, 138.73 kg/10,000 yuan, 201.27 kg/10,000 yuan, and 147.71 kg/10,000 yuan, respectively; per unit expenditures for energy consumption were

highest in the categories of transport, communications and health care (Figure 4-2).

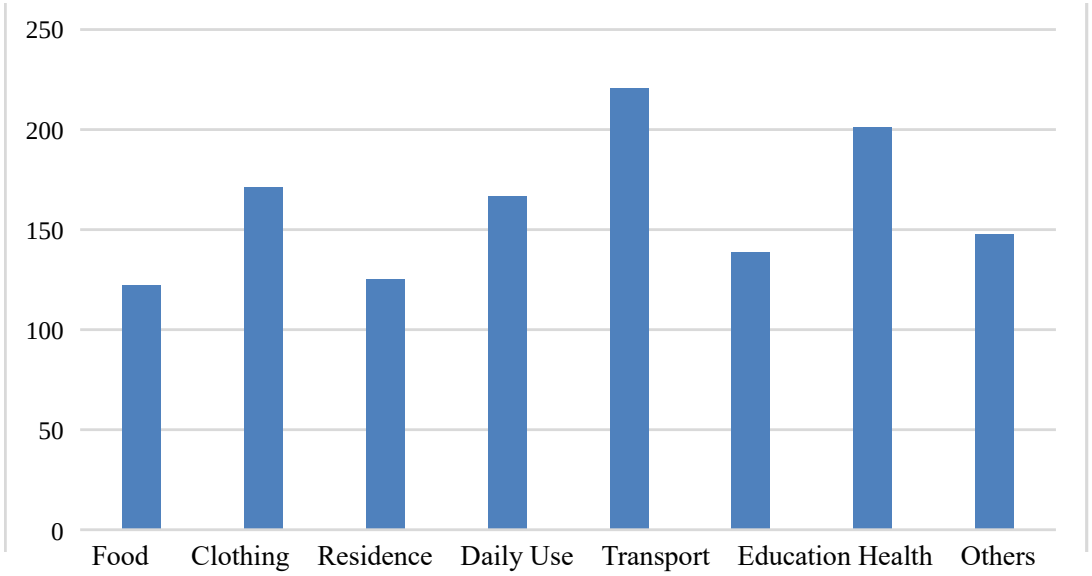

Figure 4-2 Total energy consumption per unit of expenditure in 8 categories of consumption

The pollutants emitted per unit of expenditure in the eight major categories of consumption in 2015 are shown in Table 4-4. As revealed by the table, the category food, tobacco and liquor had the largest chemical oxygen demand (COD) per unit of expenditure; the category of transport and communications had the lowest COD per unit of expenditure; and there was little difference in COD among the remaining categories. Similarly, the category food, tobacco and liquor had the largest level of ammonia nitrogen emissions; while the category transport and communications had the lowest level of ammonia nitrogen emissions. Sulfur dioxide and nitrogen oxide emissions per unit of expenditure for residences were the largest, with little difference in the emission amounts of the remaining categories, which is primarily attributed to the residential consumption of coal.

Table 4-4 Pollutant emissions per unit of expenditure in eight categories of consumption (kg/10,000 yuan)

	COD	Ammonia nitrogen	SO_2	NO_X
Food, tobacco and liquor	3.15	0.37	0.50	0.26
Clothing	1.24	0.14	0.67	0.36
Residence	1.11	0.10	2.66	2.32
Articles for daily use and services	1.01	0.10	0.79	0.48
Transport and communications	0.59	0.06	0.79	0.58
Education, culture and recreation	1.22	0.11	0.73	0.38
Health care	1.11	0.11	0.87	0.48
Other articles and services	1.31	0.13	0.72	0.40

4.2.2.3 Pulling effect on economic growth of various consumption sectors

Based on the 2017 input-output table covering 149 sectors, the SPS team analyzed the economic pull effect of green consumption in key areas. As a first step, based on survey results, the SPS team separated green products and services by industries: agricultural products, processed foods, selected household appliances, household goods, automobile manufacturing, construction and decoration, wholesale and retail trade in the input-output table; it then used this categorization in measuring the economic pull effect of green consumption in these various fields. The production cost structure of green products/services in various categories is different from that of traditional products/services. Of the eight categories of consumption, the products and services included in the table are the categories of food, residence, articles for daily use and services, as well as transport and communications.

The calculation results show that one unit of green consumer goods in the field of food, tobacco and liquor has an economic pulling coefficient of 2.5; one unit of green building in the residence category has an economic pulling coefficient of 3; the pulling coefficient for household items and services is 3.8, ranking top; and electric vehicles in the field of transport and communications enjoy a pulling coefficient of 2.7. Built on the proportion of various types of consumption in total household consumption, and the economic pulling effect of green consumption in different fields, preliminary estimates show that under the current household consumption structure, green consumption in categories of food and residence have the strongest comprehensive pulling effect on the economy, followed by the field of transport and communications, and with the category of articles for daily use and services ranking third (Table 4-5).

Table 4-5 Economy-pulling effect of green consumption growth in 8 categories consumption

	Food, tobacco &liquor	Clothing	Residence	Articles for daily use & services	Transport &communications	Education, culture & recreation	Health care	Others
Ratio in total household consumption	28%	6%	23%	6%	13%	11%	8%	2%
Economic pulling coefficient for per unit of green consumption	2.5	-	3.0	3.8	2.7	-	-	-
Comprehensive pulling effect	0.7	-	0.7	0.2	0.4	-	-	-

4.2.3 Main tasks for advancing green consumption

According to the above calculation and analytical results, China's green consumption during the 14th FYP period should focus on key areas such as food, residence, mobility, household appliances, clothing, and tourism, Main tasks should be identified to facilitate transformation of consumption in a green, low-carbon and conservation-oriented direction, and speed up the

formation of green consumption, with the purpose of effectively boosting ecological environment quality and high-quality development.

4.2.3.1 Food: Promote green diet

The EU aims at a Farm to Fork Strategy to reduce pollution caused by eutrophication. Germany calls for a green diet and lifestyle to reduce food waste and encourage the use of low-packaging or zero-packaging products. Sweden is concerned about carbon emissions and labeling for food consumption. The main tasks for China to promote green diet may include the following aspects. First, resolutely fight against food waste; initiate anti-food waste actions covering the entire chain of storage, transportation, retail, and dining-table; and advocate scientific and enlightened food consumption practices. Second, push canteens and dining service providers for government agencies, state-owned enterprises, and public institutions to reduce the wasting of food and generation of food waste; encourage consumers to order based on needs and take leftover food home; and encourage catering enterprises to set reasonable charging standards for food waste in buffet-style meals. Third, fully implement green take-out plans for the catering industry; and support catering enterprises, food retail enterprises, and food takeout industries to use simplified packaging and recyclable packaging to reduce excessive packaging and the use of plastic boxes. Fourth, unify and strengthen green and organic food certification systems and standards; and expand the effective supply of green food.

4.2.3.2 Residence: Promote green buildings

The EU supports renovation of public and private buildings to improve the energy efficiency of household heating systems. Germany supports consumers in purchasing energy-efficient household appliances, home supplies, water, electricity, and heating services, etc., and endeavors to improve energy labeling schemes. Sweden promotes the energy labeling schemes for housing materials and the use of renewable electricity. China can take the following major steps to promote green building. First, guide capable cities and localities to fully apply green building standards to their new buildings; expand the scope for mandatory use of green building; and promote the full application of green building standards in public construction projects that are sponsored by government funds. Second, push forward the application of green building standards in the renovation of old communities. Third, implement the action plan for production and application of green building materials; and promote the use of green building materials and environmentally-friendly decoration materials such as energy-saving doors and windows, and products from recycled construction waste. Fourth, promote the design, construction and operation of green buildings in a comprehensive way, including high-quality planning and construction of green municipal infrastructure systems, such as water, electricity, and gas utilities, and waste disposal; carry out the construction and renovation of energy-efficient residences; and promote methods and technologies for green rural housing construction. Fifth, strengthen environmental labeling, especially energy efficiency labeling and certification for green household appliances; and enhance the effective supply of energy-efficient green household products.

4.2.3.3 Mobility: Promote green mobility

The EU is accelerating the shift to sustainable and smart mobility by using connected multimodal mobility to improve transportation efficiency, and setting the price of transport to reflect its impact on the environment and health. Germany is using car labels to provide information about vehicle efficiency, and supporting efforts to make public transport more attractive, such as upgrading local public transport networks. Sweden continuously improves its public transport infrastructure. China should initiate the following efforts to promote green mobility. First, increase the proportion of public transportation systems in urban planning and construction, create smart cities, and improve the efficiency of public transportation systems. Encourage the use of low-carbon transport modes such as walking, cycling, and public transportation. Strengthen the construction of urban slow-moving systems such as bicycle lanes and pedestrian walkways to improve conditions for cycling and walking. Second, strengthen efforts in promoting new energy automobiles; accelerate the construction of electric vehicle charging infrastructure; and advocate modes of shared transport such as car sharing and car-pooling. Third, encourage the use of new and clean energy vehicles in expanding and upgrading fleets for public transportation, sanitation, taxis, commuting, urban express mail service, and urban logistics. Fourth, reinforce the promotion and use of new energy vehicles in such areas as national Ecological Civilization pilot zones and key areas for air pollution prevention and control.

4.2.3.4 Household items and service: promote green household appliances

The EU encourages consumers to choose reusable, durable and repairable products; while Japan boosts the recycling and reuse of household goods. China's major efforts in the area should consist of the following steps. First, encourage consumers to choose green products such as energy-efficient household appliances, high-efficiency lighting products, water-saving utensils, and green building materials. Promote the use of new energy vehicles. Call for the return of cloth bags and shopping baskets; promote the repeated use of environmentally friendly shopping bags; and reduce the use of disposable daily necessities. Second, encourage businesses to provide reusable, durable, and maintainable products and enable consumers to choose such products. Encourage textile, construction, electronics and other industries to carry out design of recyclable products that can reduce material use or promote reuse. Advocate the long-term use of furniture, electronics, and electrical appliances. Third, support the development of sharing economy and encourage the effective recycling of personal idle resources. Orderly develop on-line reservation for car-pooling, private vehicle rental, bed and breakfast rental, and exchange of old objects, etc. Fourth, improve the recycling system of social renewable resources. Encourage the provision of development, upgrade and maintenance services for information electronic device and products. Fifth, boost the greening, reducing and recycling practice in express packaging. Sixth, improve the efficiency in the use of office equipment, assets and supplies; strictly implement the government's priority procurement and mandatory procurement system for energy-saving and environmentally-friendly products; and expand the scope and scale of government green procurement; and improve the evaluation standards of energy and material-saving public institutions.

4.2.3.5 Clothing: Promote green clothing

Germany supports and facilitates resource-efficient development of the apparel and textile industry to reduce the potential risks and impacts of textiles on health and the environment. China should launch the following major tasks to promote green clothing. First, carry out "zero-discard" activities and "clothes reborn" activities for old and used clothes. Facilitate the development and improvement of waste and used textile recycling systems for communities; regulate the waste and used textile recycling, sorting, and hierarchical utilization mechanisms, so as to orderly promote the reuse of second-hand clothes. Second, boycott fur and leather products made of rare animals to conserve biodiversity. Support and facilitate textile and apparel companies to build green supply chains. Use renewable raw materials and reduce the potential health and environmental risks of new functional textiles. Third, improve the recycling and reuse of waste and old textiles in earth structures, building materials, automobiles, and home decoration sectors. Fourth, enhance the efforts in environmental labeling and certification of textiles and apparels. Substantially increase the effective supply of green textiles and apparels.

4.2.3.6 Tourism: Promote green tourism

Green tourism is on the rise worldwide. Main steps for China to take to promote green tourism could include: First, develop and release green tourism and consumption conventions and guidelines. Second, encourage tourist hotels, restaurants, and management agencies of scenic areas to introduce incentive measures for green tourism. Third, formulate and/or revise appraisal rules and standards for green services including *inter alia* green markets, green hotels, green restaurants, and green tourism. Fourth, star-rated hotels and chain hotels should gradually reduce the free provision of disposable toiletries and supplies and pilot demand-oriented provision. Fifth, publish such green tourism information on relevant tourism promotion websites and platforms and encourage consumers to bring their own toiletries. Six, endeavor to integrate biodiversity conservation into tourism-related standards and certification programs.

4.2.3.7 Employ Building a Green Life actions as a channel to push forward the implementation of tasks for advancing green consumption

Link green consumerism to the implementation of the "Overall Plan for Creating Green Life Actions" issued by NDRC. Effectively incorporate tasks for advancing green consumption into actions for developing energy-saving public institutions, green families, green schools, green communities, green mobility, green shopping malls, and green buildings. Expect social systems, such as the media, to truly and effectively facilitate information provision related to the formation of a simple, moderate, green and low-carbon, civilized and healthy life philosophy and lifestyle.

4.2.4 Overall policy framework for promoting green consumption

At present, there are a number of green consumption related policies in China, but they are quite fragmented and have not been integrated into a systematic and effective policy framework. Specific observations can be made: (1) There is a lack of systematic planning and top-level design. Most green consumption policies are conceptual, guiding and voluntary in nature, with incomplete categories, limited policy impacts and enforcement efficacy, and

insufficient operability. (2) In relation to green consumption policies, the most emphasis has been placed on resource and energy conservation; less attention has been given to eco-environmental protection. There are insufficient economic incentives in these policies, leading to limited regulatory effectiveness. (3) Government functions and responsibilities related to green consumption are scattered in different agencies. The role of environmental authorities needs to be strengthened. The fragmentation of policies and management is quite prominent. If no systematic design and integration of related policies occurs, the environmental and economic effects of green consumption will be greatly weakened. The expectation of future high-quality development and green economic transformation have put forward demands and higher requirements for the development of green consumption policies. It is necessary to constantly improve, strengthen and innovate policies in this area during the 14th FYP period to form a more holistic and integrated policy framework.

Consumption is an economic behavior that must respect economic laws. Consumption is a social behavior that involves each and every member of society. Consumption is also a cultural behavior, influenced by factors such as values and customs. The design of policies needs overall consideration of government interventions, the economic, social, and cultural attributes of consumption, as well as factors including incentive mechanisms, supervision and management, publicity and education, and so on. The overall policy framework to promote green consumption should consider the internal linkage and transmission mechanism between production and consumption, cover measures for both the supply and demand side, and mobilize multiple stakeholders such as government, enterprises, consumers, and social organizations to take joint actions (Figure 4-3).

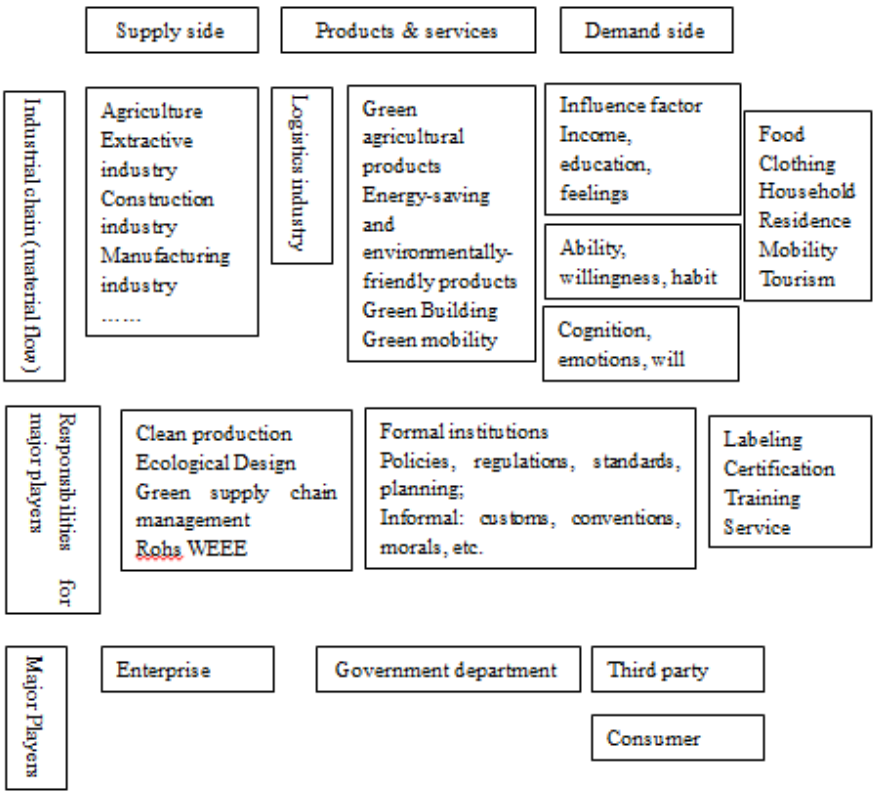

Figure 4-3 Schematic diagram of green production and consumption governance structure

4.2.4.1 Design of policy measures for the supply side

Green production provides green consumers with quality consumer goods and promotes healthy consumption patterns. Policy objectives on the supply side should enhance the diversity of supply of green products and services, so as to address the problem that there are no green options for consumers to choose from; ensure the quality of products and services; and guarantee the regulated operation of the market. On the supply side of products and services, both government (as policy maker, promoter, and supervisor) and enterprises (large enterprises, medium- and small-sized enterprises, individually owned enterprise, small and micro enterprises, and farmers in production, logistics, and services industries) can intervene in the market. The way these actors can influence the supply of green consumption in the market are discussed below.

Governmental interventions mainly include: formulation of regulations and standards to form relevant institutional arrangements to promote green consumption; use industrial policies, fiscal and taxation policies, price policies and other policy measures to encourage or mobilize consumers' willingness and support for green consumption; develop and implement standards for technologies, products, and quality, in particular the Leader/Top Runner standards system can spur the continuous improvement of products and services; ensure an open, fair and just market, and regulate market operations through inspection, supervision and management.

The responsibilities and functions of enterprises mainly include: contribute to the reduction in prices of green products through technological innovation in order to expand the scale of green consumption; assume eco-environmental protection responsibility and corporate social responsibility (CSR), and carry out product and service life cycle assessments (LCA), green supply chain management, and clean production to reduce the negative environmental impacts in the life cycle of consumer products; emphasize dematerialization in the production of energy-saving, environmentally friendly and low-carbon products; develop smart logistics, and reduce the logistics costs of green consumer goods through system optimization and management of green consumer products (quantity and quality), brands, storage, transportation routes, and transport modes, in this way contribution to the upgrading of consumption.

The policy measures for the supply side of green consumption can be summarized as found in the following diagram (Figure 4-4).

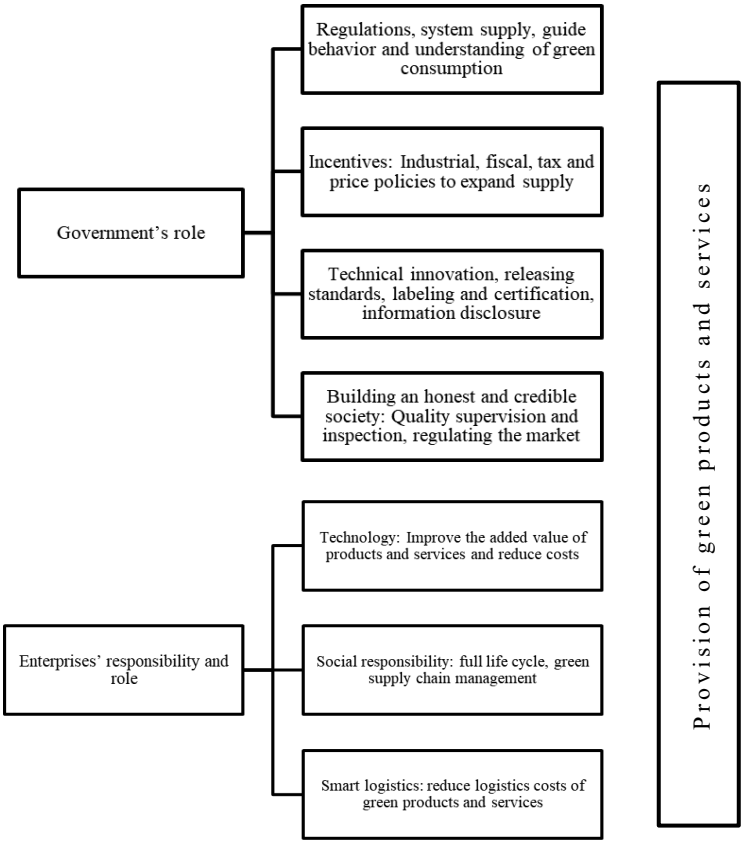

Figure 4-4 Framework of policy measures for the supply side of green consumption

4.2.4.2 Design of policy measures for the demand side

On the demand side of green consumption, governments and enterprises are the main consumers. They can promote the consumption of bulk green products through green procurement, and can thus serve as a model. Consumers can be a third party, a mass organization, a household, or an individual. The policy goals on the demand side of green consumption are to use green products and services to the maximum extent; reduce the waste of consumer products and improve utilization efficiency during the consumption process; at the endpoint of consumption, encourage consumers to participate in the construction and action of recycling systems for idle products and waste products, and reduce littering to relieve environmental pressures.

Measures on the demand side of green consumption should be centered on consumers; follow the problem-oriented principle, highlight key points, pursue systematic coordination, take into consideration applicability and feasibility, and follow a step-by-step approach; target efficient resource utilization, environmental quality improvements, and climate friendliness; establish and improve relevant laws, standards and policies to promote resource use reduction, clean production, resource recycling, and end-of-life governance; and form a green consumption pattern in the whole of society. Such measures can be summarized as seen in the following diagram (Figure 4-5).

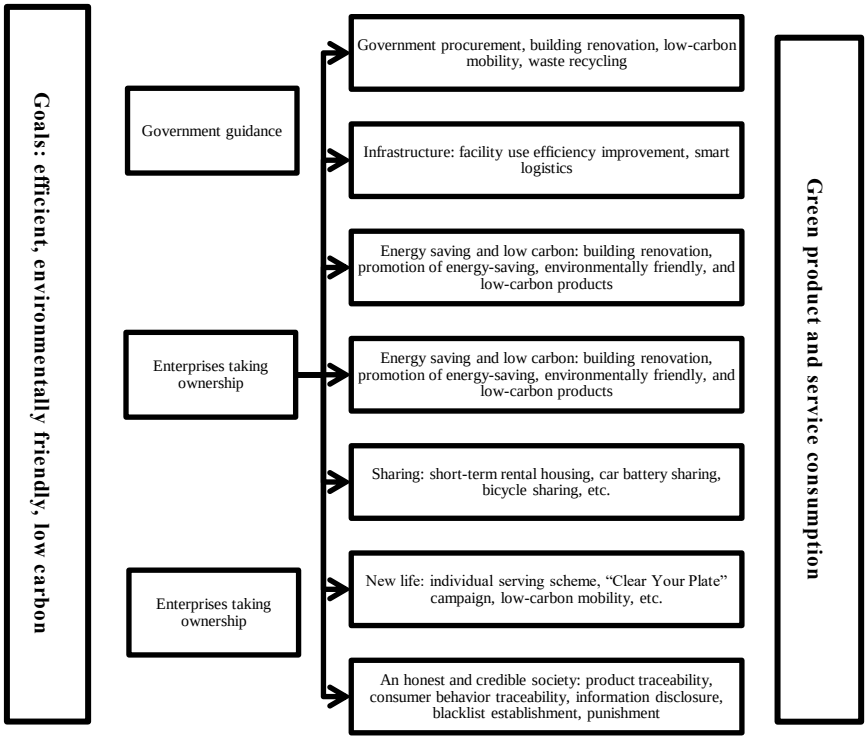

Figure 4-5 Framework of policy measures for the demand side of green consumption

4.2.5 Key policy measures to promote green consumption

Under the overall policy framework for advancing green consumption, China may consider further strengthening some key policy measures during the 14th FYP period.

4.2.5.1 Improve long-term incentive policies for promoting green consumption

Amend relevant laws and regulations. First, consider how to lead the public to appreciate the concept and follow the behavior that "waste no resources no matter how rich you are" through the formulation and implementation of laws and regulations. Second, revise the *Government Procurement Law* to promote mandatory green product procurement. Enterprises and public institutions that use public finances should purchase and use office supplies in accordance with government green procurement regulations. Encourage other social organizations to practice green procurement.

Improve market cultivation and economic incentive policies for green consumption. Establish economic incentives and market-driven systems through prices, taxation, credits, supervision, and market credits to expand the supply of green and ecological products and enrich the green options available for household consumption. Such measures as levying taxes on products with high energy consumption or that are highly polluting and resource intensive can be used to limit developments in corresponding markets. Encourage consumers to purchase alternative products rather than conventional fuel vehicles –by increasing the cost of using conventional fuel vehicles or by giving financial subsidies to electric vehicles, in this way easing the pressure on China's energy supply, reducing environmental pollution, and producing a direct "green effect". Consider the establishment of a waste tax to change the public's littering

behavior and avoid corresponding environmental pollution. Research the point redemption scheme for green consumption, and carry out a step-by-step green consumption point exchange pilot in the financial field, so as to lay a foundation for the future implementation of a point redemption scheme and point exchange at a larger scale.

4.2.5.2 Reinforce efforts to further promote the development of a circular economy

Push forward mandatory implementation of the extended producer responsibility system in the electronics, home appliances, and the express delivery and logistics industries, to lead the reduction in the generation of the huge volume of waste associated with consumption in these areas. At the same time, extend the resource and environmental responsibility of producers to their products from the production process through the entire life cycle to cover product design, production process control, smart logistics, recycling, and waste disposal. Adopt green consumer goods and services measures including ecological design, clean production, and green supply chain management to promote aggregated resource consumption and minimized emissions of pollutants and greenhouse gases; make green consumer goods and services affordable for household consumption, and in this way foster green consumption habits.

4.2.5.3 Speed up the establishment of a finance system for green consumption

Develop financial standards for green consumption and improve financial incentive mechanisms to advance green consumption. Establish financial standards and statistical systems for green consumption, in which financial management and regulatory agencies incorporate personal green consumption credits into the scope of green credit and green finance, so as to guide commercial banks to innovate and promote green consumer crediting and expand market scale. Set up a system and mechanism for developing green consumer crediting and continue to create innovative green consumer credit products for the targeted market, with the intent of boosting the penetration of green consumer credit into all areas of society, to make green consumer credit more attractive and practical, and to improve people's capacity to engage in green consumption. Encourage and guide financial institutions to provide low-interest or interest-free green consumer loans for the purchase of new energy vehicles, energy-saving and environmentally friendly household appliances, green building materials, and other products that have been accredited by energy-efficiency and environmental certification systems.

4.2.5.4 Improve the governance system for green consumption that is built, governed and shared by all

Clarify the role of relevant government departments in advancing green consumption; develop a corresponding list of green consumption responsibilities for government departments; and establish a cross-sectoral mechanism for coordinated action, so as to form a green consumption governance structure that is built, governed and shared by all. For example, the eco-environment authorities are responsible for developing green standards and supervision; the development and reform departments perform the role of planning and macro-level regulating; the industry and information departments takes charge of facilitating

the production of energy-saving, environmentally friendly and low-carbon products and corresponding services; the commerce departments are responsible for logistics and market construction; and commodity quality supervision departments are to regulate the market. Strengthen the role of consumer associations in promoting green consumption, encourage enterprises to assume more environmental and social responsibilities, and set up a carrot and stick approach to encourage green consumption by the public. All of these efforts will help form a governance structure for green consumption, and achieve the modernization of governance capacities.

4.2.5.5 Propose the launch of a nationwide green consumption and new lifestyle campaign

The government should give effective play to the leading role of positive stars and social celebrities in demonstrating green lifestyles, and enable green consumption to become a social fashion. Integrate the concept of green consumption into related education and training programs for various institutions at various levels, including families, schools, governments, and businesses. Incorporate green consumption initiatives into thematic publicity and education events such as the national energy-saving week, science promotion week, national low-carbon day, and environment day. Establish a green consumption incentive and disciplinary system for the general public; strengthen green consumption information disclosure and public participation; advocate a simple, moderate, green and low-carbon production system and lifestyle; oppose extravagant consumption, excessive consumption (waste), and irrational consumption; and raise green consumption awareness in the whole of society.

4.2.5.6 Strengthen the infrastructure and capacity building for green consumption

Liberalize market access for green and eco-labeled products and services, encourage all types of capital to invest in green industries, and use the “Internet plus” initiative to promote green consumption. Strengthen the standard system and green certification systems for green products and services, step up implementation of the Leader/Top Runner system for energy efficiency, environmental friendliness, and water efficiency, and push forward environmental product labeling schemes. Strengthen the certification of green and ecological products, and improve the standard system and green certification systems for green and ecological products and services.

Establish a sound statistical indicator system for green consumption and enhance monitoring, data collection, statistics and evaluation reporting on green consumption Set up a nationally unified information platform for green consumption; leverage big data resources, publish information on green products and services, improve the transparency in green product production and consumption, and encourage stakeholders to recognize the credibility of green product and service certification / evaluation results. Strengthen capacity building and training on green consumption for governments, social organizations, enterprises and the public; build multi-stakeholder partnership networks; and push forward the participation of multiple stakeholders. Carry out environmental impact and social risk assessment and integrate green consumption into global purchasing chains and value chains in international

infrastructure development projects such as the Belt and Road Initiative and other South-South cooperative programs to further the greening of infrastructure development processes.