China's Roadmap towards Circular Economy:

Insights and Outlook

Context

Refusing its past position of the global waste recycling center, China ceased to accept the entry of 24 categories of solid waste into its territory [1] in 2017. The decision implied the commitment of Chinese government to solve the problems exposed by the recycling system in China. The outbreak of COVID in the early 2020 led governors to have a deeper understanding of the "Profound Changes Unseen in a Century" [1] and therefore, firmly introduced the paradigm of "Great Domestic Circulation" to enhance and integrate current supply chains [2]. Under these circumstances, the definition of "Circular Economy" (hereafter refers to "CE") has expanded to apply in broader scopes and the idea has been greatly emphasized in the Chinese policy making process. Eventually, China officially unveiled the circular economy roadmap for the 14th Five-Years-Plan (hereafter refers to "FYP") between 2021 and 2025. The plan indicates the urgent need to boost domestic production and consumption, increase market competitiveness, and guarantee national resource security and meanwhile offers a concrete plan for the national resource management.

China's Circular Economy Policy

Historical Changes

The concept of CE was introduced from German "*Kreislaufwirtschafts- und Abfallgesetz*" (Circular Economy and Waste Management Act, 1996) [3]. Inspired by the Act, the 3R principle, "Reduce, Reuse, Recycling", has become three key principles of subsequent Chinese circular economy policy. CE was officially accepted by the central government in 2002 as a new development strategy [4]. In 2005, a specific national policy was released for CE [5] and the concept was also included in the 11th FYP. From this first CE policy, the government has released a total of 7 main national policies so far, each followed by sets of matching policies from different ministers. The newly launched 14th FPY even make circular economy a national priority during 2021-2025 [6].

Among all published policies, although the logical structures vary from each other, they all emphasize industries, agriculture, and urban development. In the past, the policies were more about environmental pollution issues; and now, accompanying with rapid economic and social development, the focus has shifted to resource recycling. The 14th FYP aims at the settlement of sustainable industries, the replacement of virgin material with recycled material, and the establishment of a social circular resource system. Generally speaking, the current Chinese CE policies consist of many similar ideas with European CE policies.

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[1] A concept developed before the COVID by Chinese President Xi, illustrating present unprecedented challenges and opportunities globally faced.

History of Circular Economy Policy in China

2005 **Guidance on Accelerating the Development of Circular Economy**
State Council
- Fundamental document of action

2008 **Circular Economy Promotion Law**
NPC
- The start of establishing a legal system

2013 **Short-term action plan and long-term strategy for circular economy**
State Council

Buzz word
- **Industry**: ten key industries, industrial parks
- **Agriculture**: crop production, forestry, animal husbandry and fishery; Agro-Industrial Complex
- **Service industry**: tourism, communication, retail and wholesale, catering and accommodation, logistics
- **Society**: integrated recycling system; appropriate treatment of kitchen waste; eco-friendly building, transportation, consumption, etc.
- **Pilots**: 10 projects, 100 cities/towns, 1000 enterprises/industrial parks

2017 **Action Plan for Circular Economy Development**
NDRC and 13 other ministries
- Chinese Circular Economy Roadmap for the 13th FYP

Buzz word
- **Industrial implementation**: clean production, industrial park, Agro-Industrial Complex
- **Urban implementation:** low- waste recycling, 101 pilot cities
- **Promotion of resource recycling industry**

2018 **Amendment of Circular Economy Promotion Law**
NPC
- NDRC has initiated the second amendment of the law.[7]

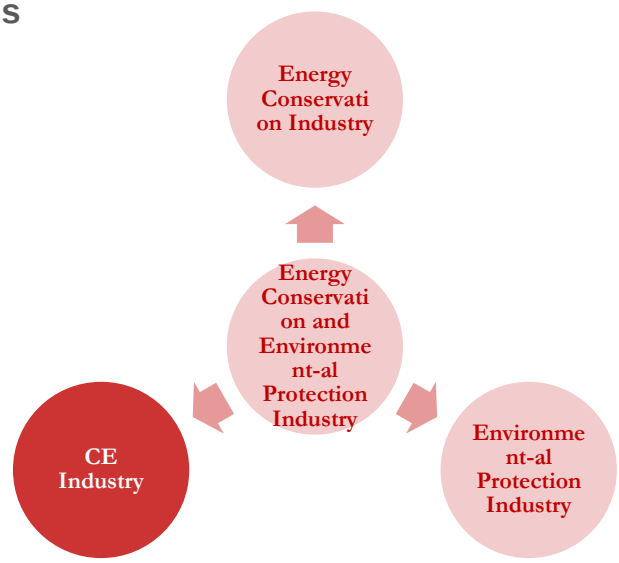
2021 **Guidance on accelerating the establishment of a low-carbon circular economic system**
State Council

Buzz word
- **Production system**: promote sustainable approaches in industry, agriculture, and service industry; boost green industry; build sustainable industrial parks, establish green supply chain
- **Circulation system**: green logistics, recycling system, green trade
- **Consumption system**: boost eco-friendly products, low-carbon lifestyle
- **Infrastructure**: employ sustainable energy systems, promote the construction of eco-friendly infrastructures in suburb areas

2021 **The 14th Five-Year Plan on Circular Economy Development**
NDRC
- Chinese Circular Economy Roadmap 2021-2025

CE Industry Growth promoted by Policies

Taking advantages from released policies, **the CE industry [2] has developed rapidly**. In 2012, the CE industry, the energy conservation industry, and the environmental protection industry combined and formed "energy conservation and environmental protection industry" [3], which is one of the 7 strategic emerging industries [9] with national emphasis and support. The CE industry has then expanded unceasingly: In 2015, the production value of CE industry was CNY 1.8 trillion; in 2020, the goal was to reach CNY 3 trillion (the actual value was not published); and in 2025, the goal is to reach CNY 5 trillion.



Indicators of the 14th FYP on CE

Similar to European approach, China also came up with a set of indicators to provide quantitative measures on the way to achieve the final goal. However, published indexes can't represent the whole picture and the indicators are not consistent but changing from time to time, which restrains a systematic and long-term tracking. This may attribute to the deletion of the fulfilled indicator from the list, but also points to the unscientific design of the evaluation index. The other contributing factor would be the strong relevance of the "achievement level of the settled goals" to the current Chinese governance system [4], which tires officials' personal career advancement with the extent to fulfill given indicators. Thus, in many cases, in assigned fields of certain officials, the indicators would be carefully picked to present and measure previously matured fields. On the other hand, "Key Tasks" are more representative and expressive of newborn fields or fields currently underdeveloped but meanwhile, are the future governmental emphasis. For these new tasks, the government is likely to start some pilot projects in chosen areas.

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[2] CE industry here refers to resource recycling industry.

[3] In July 2021, Green Transport and Equipment Manufacture Industry entered the catalog of energy conservation and environmental protection industry [8].

Comparison of CE Indicators in the 13th and 14th Five-Year Periods

13th Five-Year Roadmap			14th Five-Year Roadmap		
Indicator	**2015 Achieved**	**2020 Goal**	**Indicator**	**2020 Achieved**	**2025 Goal**
Common Indicators					
Primary resource output rate [4]	CNY 5994/t	CNY 6893/t	Primary resource output rate	CNY 7552/t	CNY 9062/t
Production value of resource recycling industry	CNY 1.8 trillion	CNY 3.0 trillion	Production value of resource recycling industry	-	CNY 5.0 trillion
recovery rate index of crop straw	80.1%	85%	recovery rate index of crop straw	>86%	>86%
Similar Indicators					
Energy output rate	CNY 14028/tce	CNY 16511/tce	Energy consumed per unit of GDP	Significant decline	13.5% less than 2025
Water output rate	CNY 97.6/m^3	CNY 126.8/m^3	Water consumed per unit of GDP	28% less than 2015	16% less than 2025
Different indicators					
Major waste recycling rate	47.6%	54.6%	Bulk solid waste[5] recovery rate	56%	60%
Land for construction output rate	CNY 1.54 mil./ha	CNY 2.00 mil./ha	Construction waste recovery rate	50%	60%
General industrial solid waste[6] recovery rate index	65%	73%	Sum of wastepaper reutilized	54.9 mil. t	60 mil. t
Above-scale industrial enterprise[7] water reuse rate	89%	91%	Sum of scrapped steel reutilized	260 mil. t	320 mil. t
Recovery rate of major renewable resources	78%	82%	Sum of recycled nonferrous metals	14.5 mil. t	20 mil. t
City kitchen waste recycling rate	10%	20%	Among them: Recycled copper	3.25 mil. t	4.0 mil. t
City reclaimed water reuse rate	—	20%	Recycled aluminum	7.4 mil. t	11.5 mil. t
			Recycled lead	2.4 mil. t	2.9 mil. t

[4] Primary resource output rate = GDP (constant prices) ÷ primary resource consumed

Primary resource comprises fossil energy (coal, oil, natural gas), iron and steel, non-ferrous metal (copper, aluminum, lead, zinc, nickel), non-metal resources (limestone, phosphorus, sulfur), and biomass resources (wood, grain).

[5] Bulk solid waste includes 7 categories of solid waste each with an annual production capacity of more than 100 million tonnes, including coal gangue, coal ash, tailings, industrial by-product gypsum, smelting slag, construction waste and crop straw.

[6] General industrial solid waste, such as coal ash, gangue, and slag, refers to the solid wastes generated from industrial activities that are not included in the National Hazardous Waste Directory or not detected to have hazardous characteristics according to National Standards.

[7] Above-scale industrial enterprise refers to the enterprise with an annual revenue above CNY 20 million in the industrial sector.

Key Tasks of the 14th FYP on CE

Compared to indicators, "Key Tasks" of the 14th FYP are more representative and expressive of newborn fields or fields currently underdeveloped but meanwhile, are the future governmental emphasis. For these new tasks, the government is likely to start some pilot projects in chosen areas. Furthermore, some of the key tasks such as batteries and vehicles, plastic and packaging, and end-of-life electronic devices can also be found in EU "*Circular Economy Action Plan*".

Comparison of CE Indicators in the 13th and 14th Five-Year Periods

Three Key Missions	**Industry**	Eco-design, clean production, industrial parks, comprehensive resource utilization, waste co-treatment	
	Social Life	Recycling system, resource recycling, second-hand goods market, remanufacturing industry	
	Agriculture	organic waste recycling, agricultural equipment recycling, sustainable agriculture model	
Five Major Projects	**Urban Recycling System**	60 pilot cities; digital recycling terminals, transfer stations, and sorting centers; resource recycling centers (for iron and steel, non-ferrous metals, vehicles, PV module and wind turbine blades, household appliances, batteries, tires, wood products, textiles, plastics, paper, glass, kitchen waste)	NDRC, MofCom, MNR, MIIT, MoHURD
	Industrial Park	energy cascade; centralized treatment system for sewage; waste recycling; information service platform for industrial parks	NDRC, MIIT
	Bulk Solid Waste	100 pilot recycling centers	NDRC, MIIT, MEE, MARA, NFGA
	Construction Waste	50 pilot cities, waste segregation management, certification system for recycled products	MoHURD, NDRC
	Technology	Key technology and equipment innovation	MoT, NDRC
Six Actions	**Remanufacturing**	Expanding the application of machine tools, industrial motors, industrial robots; remanufacturing of vehicle accessories; 10 remanufacturing industry clusters; remanufacturing industry production value to reach CNY 200 billion	NDRC, MIIT
	Recycling of Electrical and Electronic Equipment	Online and offline collection system, EPR pilots with different approaches to build recycling system, standardized dismantling procedures, high value-added recycling	NDRC, MIIT, MEE, MofCom, ACFSMC
	Full Life-Cycle Management of Vehicles	EPR pilots; information exchange system along the value chain; certification and information inquiry system for (remanufactured) vehicle accessories	NDRC, MIIT, MEE, MofCom, MPS, MoT, GACC
	Plastic Pollution Management in Perspective of Full Value Chain	Biodegradable plastics, mulch film, residual plastic waste segregation and recycling, marine litter cleanup	NDRC, MIIT, MEE, MofCom, MoHURD, MARA, SAMR, SPB, ACFSMC
	Green Transition of Delivery Packaging	Reduction, stop duplicate packaging, green product certification system, recyclable packaging, standardized logistic container	NDRC, SPB, MIIT, MEE, MoT, MofCom, SAMR
	Recycling of Power Batteries	Tracking platform, standardized cascade utilization, standardized recycling system	NDRC, MIIT, MEE

Supportive Policy	**Legal and Regulatory Standards**	Amendment of laws, revision of (regional) regulations, standards, and norms	
	Evaluation System	Statistical system, measuring methodology, evaluation index system	NDRC, STATS, MIIT, MofCom, MEE
	Fiscal and Financial Instruments	Green procurement, corporate income tax deduction, green investment, green credit, green bonds, green funds, green insurance	
	Market Regulation	standardized regulatory management of recycling enterprises; supervision and punishment of illegal dismantling and recycling procedures, as well as nonstandard biodegradable plastics and banned plastic products	

At present, China's CE development still faces problems, such as low efficiency of resource utilization and lacking integrated recycling system [10]. Although currently in many developed countries already exist well-established recyclable waste management system, industrial parks, and remanufacturing industry, it is still a challenge for China. This may ascribe to the fact that most of the international exchanges or cooperation for now only concentrate on specific part/step of the value chain instead of seeing it as a whole. Thus, exploiting **a new Cooperative Ecosystem** would be the future focus.

Outlook for International Cooperation

China actively seeks international cooperation in CE

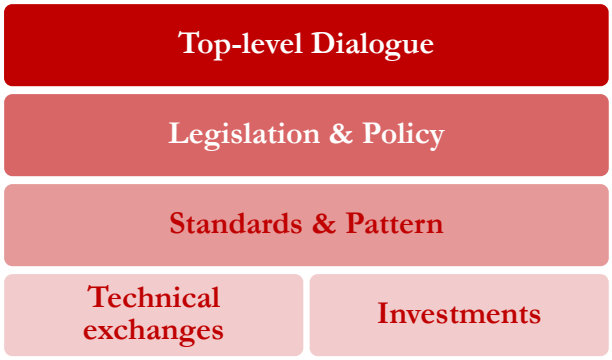
In international cooperation and idea exchanging processes, CE has become a significant topic for China [11]. By indicating the necessity of having deeper international collaboration in a key document "*Guidance on accelerating the establishment of low-carbon circular economic system*" [12] in Feb. 2021, the State Council plans to strengthen policy dialogues, technology exchanges, projects cooperation, and trainings.

Since Europe has advanced policies and best practices in CE, it is indispensable for China to obtain inspirations. In 2018, China and EU jointly signed MOU about CE cooperation. The MOU mainly aligns key circular economy mechanisms, including strategies, legislation, policies, and research areas of mutual interests [13].

As Germany is on the lead of CE policy making and practices, FECO published an article about "resource efficiency and circular economy in Germany and their enlightenments" in 2021 [14] and suggested to have further collaboration with Germany. In fact, China can learn from German experiences from following aspects: recognition the characteristics of individual system as well as sector and as consequences pushing special handling with fitting policies respectively; establishment of national information and consultancy platform for certain aspects in CE (like DERA and NeRess in Germany); and encouraging a sustainable lifestyle.

International Cooperative Ecosystem for China

Based on published policies, news and articles from government, the aspects of international cooperation proposed by China could be summarized as follows:



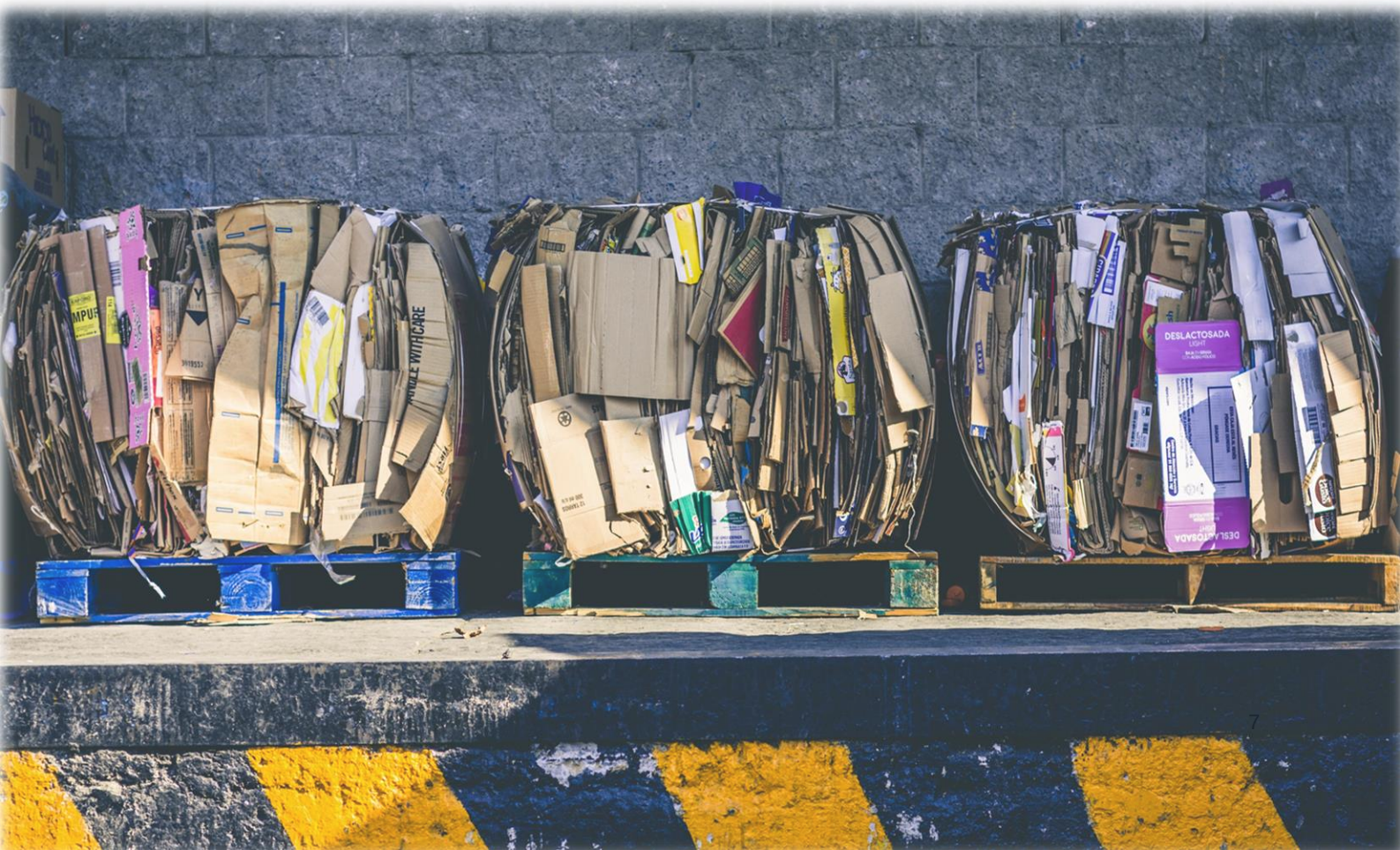
- **Top-Level Dialogue:** These dialogues touch on macro policy coordination, qualitative indicator and quantitative measuring index system, and determination of future focused areas. For GIZ China, currently there already exists partnerships for energy conservation industry under the framework of Sino-German Energy Partnership; and environmental protection industry through the Sino-German Environmental Partnership respectively. However, there's no present partnership for CE built and no top-level dialogues planned, which is a gap that should be filled to start Sino-German CE collaboration.

- **Legislation & Policy:** Innovative management tools or schemes in eco-design, eco-label, EPR, and eco-friendly supply chain etc.; fitting policies taking distinct characteristics of individual system and sector into account and using EU's best practices as references.

- **Standards & Patterns**: Unified standards between EU and CN based on applied research results to facilitate smooth trade; sustainable development practices in different sectors.

- **Technical Exchanges**: Technology transfer, pilot and replication, capacity building.

- **Investments**: Investment in infrastructure construction and market collaboration.



Appendix: Abbreviations of Chinese Ministries

NPC	National People's Congress
NDRC	National Development and Reform Commission
MoST	Ministry of Science and Technology
MIIT	Ministry of Industry and Information Technology
MPS	The Ministry of Public Security
MoF	Ministry of Finance
MNR	Ministry of Natural Resources
MEE	Ministry of Ecology and Environment
MoHURD	Ministry of Housing and Urban-Rural Development
MoT	Ministry of Transport
MARA	Ministry of Agriculture and Rural Affairs
MofCom	Ministry of Commerce
GACC	General Administration of Customs
SAMR	State Administration for Market Regulation
STATS	State Statistics Bureau
NFGA	National Forestry and Grassland Administration
SPB	State Post Bureau
ACFSMC	All-China Federation of Supply and Marketing Cooperatives

Reference

[1] General Office of the State Council, PRC. (2017, July 18). *禁止洋垃圾入境推进固体废物进口管理制度改革实施方案 [Action Plan for Prohibiting the Importing of Waste and Accelerating the Reformation of the Solid Waste Import Administration System]*. MEE. https://www.mee.gov.cn/ywgz/fgbz/gz/201707/t20170728_418692.shtml

[2] National People's Congress, PRC. (2021, May 12). *Outline of the People's Republic of China 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2035*. CSET Original Translation. https://cset.georgetown.edu/publication/china-14th-five-year-plan/

[3] Jin Yong, Feng Zhijun, & Chen Dingjiang. (2010). Circular economy: Ideas and innovation. *Strategic Study of Chinese Academy of Engineering*, *12*(1), 4–11.

[4] Will McDowall, Yong Geng, Beijia Huang, Eva Barteková, Raimund Bleischwitz, Serdar Türkeli, René Kemp, & Teresa Doménech. (2017). Circular Economy Policies in China and Europe. *Journal of Industrial Ecology*, *21*(3), 651–661.

[5] The State Council, PRC. (2005, July 2). *关于加快发展循环经济的若干意见 [Guidance on Accelerating the Development of Circular Economy]*. http://www.gov.cn/zhengce/content/2008-03/28/content_2047.htm

[6] Ou Yang Shijia. (2021, July 8). *Circular economy gets 5-year regulator boost*. The State Council, PRC. https://english.www.gov.cn/policies/policywatch/202107/08/content_WS60e639b0c6d0df57f98dc92b.html

[7] NDRC. (2021, October 27). *循环经济谋划全面升级 [Enhance Strategy for Circular Economy Comprehensively]*. https://www.ndrc.gov.cn/xwdt/ztzl/sswxhjjfzgh/202110/t20211027_1301010.html?code=&state=123

[8] State Statistics Bureau, PRC. (2021, July 26). *节能环保清洁产业统计分类（2021）[Statistical Classification of Energy Conservation, Environmental Protection and Green Industry (2021)]*. http://www.gov.cn/gongbao/content/2021/content_5649735.htm

[9] The State Council, PRC. (2012, July 9). *"十二五"国家战略性新兴产业发展规划 [The 12th Five-Year Plan on National Strategic Emerging Industry Development]*. http://www.gov.cn/zwgk/2012-07/20/content_2187770.htm

[10] NDRC. (2021, July 1). *"十四五"循环经济发展规划 [The 14th Five-Year Plan on Circular Economy Development]*. https://www.ndrc.gov.cn/xxgk/zcfb/ghwb/202107/t20210707_1285527.html?code=&state=123

[11] Mo Xin & Zhu Liyang. (2022, April 8). *深入学习领会习近平总书记对循环经济的系列重要论述 [In-depth study and understanding of General Secretary Xi Jinping's series of important discussions on circular economy]*. CSSN. http://econ.cssn.cn/jjx/jjx_xzyc/202204/t20220408_5402749.shtml

[12] The State Council, PCR. (2021, February 2). *关于加快建立健全绿色低碳循环发展经济体系的指导意见 [Guidance on Accelerating the Establishment of Low-carbon Circular Economic System]*. http://www.gov.cn/gongbao/content/2021/content_5591405.htm

[13] Gethin Roberts. (2018, July 17). *China and EU sign memorandum of understanding on circular economy*. Resource Magazine. https://resource.co/article/china-and-eu-sign-memorandum-understanding-circular-economy-12744

[14] Zhang Nan, Wang Menghan, Yang Yuchuan, & Wang Xin. (2021). Resource efficiency and circular economy in Germany and their enlightenments. *World Environment*, *188*(01), 72–75.

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