Sustainability in Environment
ISSN 2470-637X (Print) ISSN 2470-6388 (Online)
Vol. 10, No. 2, 2025
www.scholink.org/ojs/index.php/se

Original Paper

China's Green and Low-Carbon Development and the Sustainable Growth of the Oxygen Concentrator Market: Policy Evolution, Theoretical Framework, and Innovative Pathways

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Fund Project

"Oxygen Hope - The Pioneer of Shared Oxygen Machines" (S202412668003)

Received: April 19, 2025 Accepted: May 11, 2025 Online Published: May 28, 2025

doi:10.22158/se.v10n2p122 URL: http://dx.doi.org/10.22158/se.v10n2p122

Abstract

This study examines China's green low-carbon policies and their role in advancing the sustainable development of the oxygen concentrator market. By analyzing 17 policy documents from 2016 to 2024 through textual deconstruction and theoretical framework development, we investigate the evolutionary mechanisms of policy design and market transformation pathways. The results indicate that China's green low-carbon policies, through innovation incentives, industry standardization, and fiscal constraints, have effectively redirected the oxygen concentrator market toward energy-efficient technologies, substantially reducing energy consumption and carbon emissions. A synergistic technology-market-policy dynamic cycle has emerged from the interplay of market factor flows and multidimensional policy interventions, accelerating the integration of green design innovations and driving industrial modernization. From urban-rural integration and regional equilibrium perspectives, we advocate for strengthening green infrastructure systems, optimizing factor mobility mechanisms, and enhancing cross-sectoral policy coherence. These strategies address critical challenges such as regional development gaps and low technology diffusion efficiency, ultimately fostering deeper alignment between the oxygen concentrator market and national carbon neutrality goals. This research offers theoretical and practical contributions to implementing China's distinctive low-carbon strategies in specialized industrial sectors.

Keywords

Green and low-carbon development, oxygen generator market, policy evolution, sustainable development

1. Introduction and Literature Review

1.1 Research Background and Significance

Green low-carbon development represents an essential pathway for China to achieve sustainable development. It is not only critical to addressing national resource, environmental, and ecological challenges but also serves as an intrinsic requirement for building a modernized society characterized by harmony between humanity and nature. China has responded to its citizens' aspirations for improved quality of life by embracing the concept that "lucid waters and lush mountains are invaluable assets," strategically planning development from the perspective of human-nature symbiosis. This approach synergizes high-quality socioeconomic growth with advanced ecological conservation. Green low-carbon development facilitates the coordinated advancement of economic-social progress and environmental protection, drives energy revolution and resource efficiency, systematically promotes clean production, and integrates pollution reduction with carbon mitigation.

As a critical segment of the medical device sector, oxygen concentrators play a pivotal role in green low-carbon development. Widely utilized for oxygen therapy and health maintenance in patients with cardiovascular, cerebrovascular, and respiratory diseases, these devices are deployed across diverse settings including households, hospitals, and rehabilitation centers, significantly enhancing public health outcomes. With China's deepening aging population and rapidly expanding home-based elderly care demand, the domestic market for household medical equipment continues to grow, propelling the oxygen concentrator industry into a phase of accelerated expansion. The sector demonstrates pronounced trends toward environmental sustainability and energy conservation, necessitating corporate investments in high-efficiency energy utilization solutions, low-noise design optimization, and reduced operational environmental impacts to improve energy efficiency ratios. These initiatives align with green low-carbon development principles and contribute to fostering eco-conscious lifestyles.

China's green low-carbon policies exert comprehensive impacts on the oxygen concentrator market, encompassing technological innovation, demand expansion, intelligent transformation, energy conservation considerations, policy support mechanisms, and market opportunity optimization. Collectively, these factors drive the market's transition toward green low-carbon practices, ensuring sustainable industrial advancement.

1.2 Research Status at Home and Abroad

Green and low-carbon development has emerged as a global consensus, particularly in addressing climate change and achieving sustainable development goals. Gong and Zhang (2024) emphasized the pivotal role of the "Thousand-Village Demonstration and Ten-Thousand-Village Improvement Project"

in guiding agricultural green and low-carbon development, highlighting its strategic significance for comprehensively advancing rural revitalization and constructing an ecologically civilized China. Concurrently, Chen, Xu, and Wu (2024) investigated the strategic, innovative, competitive, and security logics underlying industrial chain green and low-carbon transformation for realizing dual-carbon goals, further elucidating the scientific connotation and transformational efficacy of this transition. Policy support constitutes a critical driver for green and low-carbon advancement. Ma Gaizhi (2024) discussed the imperative of establishing internationally competitive green and low-carbon integrated transportation hubs, emphasizing that urban green transformation has entered a crucial phase of sustainable development. Additionally, Hao and Gao (2024) analyzed the impact of low-carbon city development on local government behavior, revealing that such initiatives impose robust environmental constraints through promotion incentives and fiscal mechanisms, significantly reducing land allocation ratios for high-energy-consumption/high-emission industries while enhancing green investment attraction.

Technological innovation serves as the core driving force for green and low-carbon development. Lu (2024) proposed green design principles and methodologies that holistically consider energy/resource conservation, emission reduction, and waste management throughout product lifecycles, aiming to minimize greenhouse gas emissions from the design phase. This underscores the critical role of green design strategies in building a low-carbon society. The establishment of scientific and systematic evaluation systems proves essential for advancing green and low-carbon development. Shi, Yang, and Guo (2024) explored the construction of a low-carbon green evaluation system for eco-friendly leather chemical products, emphasizing the necessity for comprehensive coverage across raw material procurement, production processes, product utilization, and waste management to form an integrated framework. Regional coordination constitutes a vital component of green and low-carbon development. Gong, Chen, and Chen (2024) employed coupling coordination models, standard deviation ellipse analysis, and spatial autocorrelation methods to examine the spatial distribution, evolutionary patterns, and agglomeration characteristics of water resource utilization, low-carbon emissions, and green development coordination in the upper and middle reaches of the Yellow River basin, providing empirical insights for regional green and low-carbon strategies.

In summary, green and low-carbon development represents a multidimensional, cross-disciplinary system engineering project encompassing policy frameworks, technological innovation, evaluation mechanisms, and regional coordination. Governments and enterprises worldwide are actively exploring practical pathways to achieve sustainable economic, social, and environmental development. Future research should deepen understanding of green and low-carbon mechanisms, strengthen interdisciplinary collaboration, accelerate technological R&D, and refine evaluation systems and policy frameworks.

As a crucial pathway towards sustainability, the theoretical underpinnings and practical implementations of green and low-carbon development have been extensively examined. Zhang and

Wang (2024) emphasized the significance of agricultural green and low-carbon development while proposing policy support systems, technological innovation strategies, and talent cultivation measures. Wang and Hu (2024) analyzed the impact of climate policy uncertainty on corporate green innovation, highlighting the importance of policy coherence and transparency in fostering low-carbon technological advancements. Tang and Xie (2024) investigated the theoretical mechanisms and optimization pathways through which digital economy empowers green high-quality development, underscoring the transformative roles of digital industrialization and industrial digitization. Liu Anzhi and Yang (2024) developed an indicator system to analyze spatiotemporal characteristics, regional disparities, and influencing factors of agricultural green and low-carbon development in China, revealing consistent national improvement alongside persistent regional imbalances. Tian et al. (2024) evaluated green and low-carbon development levels in the Yangtze River Delta, noting accelerated progress post-regional integration policies despite enduring inter-regional disparities.

Addressing current challenges, scholars have proposed targeted strategies. Zhao et al. (2024) explored urban low-carbon pathways through carbon labeling perspectives, advocating for local specialty product empowerment and green scenario creation. Wang (2024) stressed the imperative of synergistic ecological conservation and green transformation, proposing measures including environmental protection enhancement and green industrial restructuring. While China has achieved notable progress in agricultural and urban green practices, persistent challenges include regional imbalances and incomplete policy frameworks. Future endeavors require strengthened policy support, technological innovation, talent development, and regional collaboration to deepen green and low-carbon transitions.

Notwithstanding China's achievements in agricultural and urban green practices, regional disparities remain significant. Liu and Yang (2024) identified pronounced regional differences in agricultural green and low-carbon development through their comprehensive indicator system. Although Wang (2024) emphasized ecological-economic synergy and proposed transformation measures, existing research inadequately addresses policy system refinement, particularly regarding oxygen concentrator markets. While technological innovation is recognized as crucial, current studies lack sufficient evaluation of its application in oxygen concentrator markets. Though Lu (2024) established green design principles, empirical analyses of green technology applications in oxygen concentrator markets remain scarce.

This study systematically examines the evolution of China's green and low-carbon policies, particularly within oxygen concentrator markets—a novel contribution to existing literature. Through policy evolution analysis, it provides regulatory guidance for market sustainability. The research constructs an integrated theoretical framework connecting green development with oxygen concentrator markets, elucidating their interaction mechanisms—addressing current theoretical gaps. Furthermore, it explores breakthrough pathways encompassing technological innovation, market mechanisms, and policy support for oxygen concentrator market transformation, offering practical strategies for sustainable development.

2. The Background of Chinese-style Green and Low-carbon Policies

2.1 The Evolution of Green and Low-carbon Policies

The evolution of China's green and low-carbon policies can be traced back to the late 20th century, when the intensification of global climate challenges prompted China to gradually prioritize green and low-carbon development. Entering the 21st century, particularly following the 18th National Congress of the Communist Party of China, the nation significantly elevated its commitment to ecological civilization and green, low-carbon growth. In 2015, the Overall Plan for Ecological Civilization System Reform explicitly outlined the imperative to advance green, circular, and low-carbon development (He & Zhu, 2024). Subsequently, China introduced a series of policy frameworks, including Made in China 2025 and the Green Manufacturing Project Implementation Guidelines (2016-2020), marking the progressive refinement of its green and low-carbon policy system (He & Zhu, 2024).

At the international level, China has actively engaged in global climate governance, committing to achieving carbon peaking by 2030 and carbon neutrality by 2060 (Zhang & Wang, 2024). This pledge has further propelled the deepening and expansion of domestic green and low-carbon policies. In 2021, China issued the Guiding Opinions of the Central Committee of the Communist Party of China and the State Council on Fully, Accurately, and Comprehensively Implementing the New Development Philosophy to Achieve Carbon Peaking and Carbon Neutrality, establishing a comprehensive policy framework and safeguards to realize these dual-carbon goals (Chen et al., 2024).

The impact of green and low-carbon policies on the oxygen concentrator market manifests in the following dimensions:

1) Technological Innovation and Industrial Upgrading: China's policies incentivize innovation and industrial advancement, particularly in environmentally critical sectors such as oxygen concentrator manufacturing. Government support for R&D in high-efficiency, energy-saving oxygen generation technologies has accelerated the sector's transition toward green and low-carbon practices (Chen et al., 2024).

2) Shifts in Market Demand: Growing public awareness of green principles and environmental consciousness has increased demand for energy-efficient and eco-friendly oxygen concentrators. Policy-driven priorities compel manufacturers to emphasize green design and low-carbon performance to align with market expectations (He & Zhu, 2024).

3) Industry Standards and Regulations: These policies have catalyzed the formulation and enhancement of technical standards for oxygen concentrators, raising industry entry barriers. This has pressured enterprises to prioritize environmental compliance and energy efficiency, fostering high-quality sectoral transformation (Lu, 2024).

4) Policy Incentives and Constraints: Fiscal subsidies, tax incentives, and other financial mechanisms encourage green technological innovation among manufacturers. Concurrently, stringent environmental

regulations and standards impose binding constraints on corporate practices, driving emission reductions and improved resource efficiency (Chen et al., 2024).

Collectively, China's green and low-carbon policies have exerted a transformative influence on the oxygen concentrator market, stimulating technological progress, reshaping demand dynamics, elevating industry benchmarks, and balancing regulatory incentives with constraints, thereby advancing the sector's sustainable and low-carbon evolution.

2.2 The Connection between the Oxygen Generator Market and Green and Low-carbon Development

Green and low-carbon policies aim to drive a comprehensive green transition in socioeconomic development, strengthen ecological governance systems, and advance ecological priority, resource efficiency, and sustainable growth (Decision of the Central Committee of the Communist Party of China on Further Comprehensively Deepening Reforms and Advancing Chinese Modernization). Within this framework, the oxygen concentrator market, as a critical segment of the medical device sector, is directly shaped by policy mandates. The rising demand for portable oxygen concentrators in high-altitude, household, and hospital settings has accelerated the market's shift toward green and low-carbon practices to align with regulatory requirements and consumer expectations (Jiang et al., 2024). Market development now necessitates not only meeting medical needs but also adhering to sustainability trends. For instance, the design of portable solar-powered oxygen concentrators reduces reliance on traditional energy sources and lowers carbon emissions by harnessing solar energy, thereby aligning with green policy objectives (Zhu et al., 2014). Additionally, green design principles—such as the use of lightweight eco-friendly materials, high-efficiency air filtration and oxygen generation technologies, and integrated noise reduction systems—prioritize energy conservation, pollution mitigation, and enhanced environmental performance (Jiang et al., 2024).

The oxygen concentrator market has adapted to green policies through technological innovation. A notable example is the adoption of pressure swing adsorption (PSA) air separation oxygen generation technology, combined with mechatronic design principles, to develop portable solar-powered systems capable of meeting emergency oxygen supply demands in remote or high-altitude environments without external power infrastructure (Zhu et al., 2014).Innovations such as flexible solar panels—which convert solar energy into electricity stored in rechargeable power banks—ensure reliable energy supply and extended operational durations for oxygen concentrators (Zhu et al., 2014). Structurally, market players have embraced integrated designs that consolidate oxygen generation units, solar panels, energy storage systems, and accessories, improving portability and user convenience. Material advancements, including lightweight and recyclable components, further enhance product sustainability and environmental compatibility (Jiang et al., 2024).Government initiatives, including fiscal subsidies, tax incentives, and R&D grants, actively support the development and deployment of green technologies in this sector. Concurrently, the establishment of green product certification systems and market promotion mechanisms guides the reallocation of production factors toward low-carbon priorities (Zhu et al., 2014).

3. The Policy Trajectory and Theoretical Framework of the Green and Low-carbon Oxygen Generator Market Are Proposed

China formally proposed its green and low-carbon development goals in 2020.China announced at the general debate of the 75th session of the United Nations General Assembly on September 22, 2020, China will enhance its nationally determined contributions, adopt more forceful policies and measures, and strive to achieve carbon peaking before 2030 and carbon neutrality before 2060. This commitment marks that China has officially put forward specific goals and timetables for green and low-carbon development.

This article reviews 17 policy documents in recent years (see Table 1), further deconstructs the content of the relevant policy documents involving "green and low-carbon and the oxygen generator market", gradually determines the primary and main categories, and conducts theoretical saturation tests. Based on the above analysis results, Distill the theoretical framework and internal logic of the development of the Chinese-style green and low-carbon oxygen generator market.

3.1 Overall Situation of the Policy

Prior to a detailed deconstruction of green and low-carbon policies and oxygen concentrator market regulations within relevant official documents, this study first synthesizes their overarching patterns across policy texts:

1) Thematic Focus: The majority of documents predominantly prioritize advancing green and low-carbon development alongside the oxygen concentrator market as an integrated agenda, while a minority address these topics through standalone discussions.

2) Structural Organization: In most policy iterations, content related to green and low-carbon initiatives and the oxygen concentrator market is embedded as discrete sections with limited elaboration. A subset of documents briefly references these themes, whereas only a small proportion treats them as dedicated thematic priorities through independent chapters.

Table 1. Overview of the Contents of urban-rural Integration in Relevant Policy Documents

Release time	Policy Name	Related content	Involved chapters
July 2024	Opinions of the Central Committee of the Communist Party of China and The State Council on	Promote the green and low-carbon development of the economy and society, accelerate the comprehensive green transformation of	Chapter One General

	Accelerating the Comprehensive Green Transformation of Economic and Social Development	economic and social development, and form a spatial pattern, industrial structure, production mode and lifestyle that save resources and protect the environment.	Requirements
March 2024	Strengthen ecological civilization construction and promote green and low-carbon development	We should deeply implement the concept that green mountains and clear waters are as valuable as mountains of gold and silver, and promote carbon reduction, pollution control, green expansion and economic growth in a coordinated manner to build a beautiful China where humans and nature coexist in harmony.	Chapter Nine: Strengthening Ecological Civilization Construction and Promoting Green and Low-Carbon Development
May 2024	Notice of The State Council on Printing and Distributing the "Action Plan for Energy Conservation and Carbon Reduction from 2024 to 2025	Energy conservation and carbon reduction are important measures for actively and steadily promoting carbon peaking and carbon neutrality, comprehensively advancing the construction of a beautiful China, and	Chapter One General Requirements

		facilitating the comprehensive green transformation of economic and social development.	
July 2024	The Ministry of Ecology and Environment released the "National Carbon Market Development Report (2024)".	The report reviewed progress in national carbon trading and voluntary emission reduction markets, highlighting achievements in market development and operations.	The Whole text
February 2024	Notice of the National Development and Reform Commission and Other Departments on Issuing the "Guidance Catalogue for Green and Low-Carbon Transformation Industries (2024 Edition)	To fully implement the spirit of the 20th National Congress of the Communist Party of China, cultivate and expand new drivers of green development, and accelerate the green transformation of the development mode.	Notice Section
November 2022	Report on Green and Low-Carbon Development of China's Industry and Information Technology 2022	The specific practices and achievements of China's industrial and information technology sector in green and low-carbon development over the past year have been	Preface

		systematically sorted out and summarized.	
January 2023	The Information Office of The State Council has released the white paper "China's Green Development in the New Era"	Tell the Chinese story of promoting green development in the new era to the world and reflect in a panoramic way the concepts followed, major measures taken and historic achievements made by China in promoting green and low-carbon economic and social development since the 18th National Congress of the Communist Party of China.	Preface
	Opinions of the Central Committee of the Communist Party of China and The State Council on Fully,	This policy has established a systematic framework for China to achieve its "dual carbon" goals, set the overall goals and implementation paths for addressing climate change and green and low-carbon development, and	

September 2021	Accurately and Comprehensively Implementing the New Development Philosophy and Doing a Good Job in Carbon Peaking and Carbon Neutrality	emphasized driving the comprehensive green transformation of the economy and society with the new development concepts, accelerating the construction of a resource-conserving and environment-friendly industrial system and lifestyle.	Chapter One General Requirements
December 2021	Ten departments (the Ministry of Industry and Information Technology, the National Health Commission, the National Development and Reform Commission, etc.) have released the "14th Five-Year Plan for the Development of the Medical Equipment Industry".	This plan involves the development of the medical equipment industry, including medical devices such as oxygen generators, aiming to promote the high-quality development of the industry.	Chapter Two Development Environment
September 2021	Opinions of the Central Committee of the Communist Party of China and The State Council on Fully, Accurately and Comprehensively Implementing the New Development	This document provides a comprehensive roadmap, policy system and safeguard measures for China to achieve its carbon peaking and carbon neutrality goals. It clarifies the overall	Chapter One General

	Philosophy and Doing a Good Job in Carbon Peaking and Carbon Neutrality	requirements, main goals and key tasks for achieving carbon peaking and carbon neutrality, including promoting the optimization and upgrading of the industrial structure and building a clean, low-carbon, safe and efficient energy system.	Requirements
October 2021	The State Council has issued the "Action Plan for Carbon Dioxide Peaking Before 2030".	This plan clearly defines China's specific action plan for achieving carbon peaking before 2030, including optimizing the energy structure, controlling and reducing greenhouse gas emissions, and enhancing carbon sink capacity, etc.	Chapter One General Requirements
November 2016	The General Office of the State Council has issued the "Opinions of The General Office of the State Council on Establishing a Unified Green Product	Guided by the concepts of innovation, coordination, green development, openness and sharing, based on supply-side reform, we will strengthen the strategic role of standard certification, innovate the ecological system, expand the supply of green	Chapter One General Requirements Chapter Two Key Tasks

	Standards, Certification and Labeling System".	products, guide green production and consumption, and enhance the quality and efficiency of development. Build a unified green product standard certification system, improve the evaluation and supervision mechanism, strengthen technical support and international mutual recognition, and promote high-quality development of the green economy.	
September 2016	The Ministry of Industry and Information Technology has issued the "Implementation Guidelines for the Green Manufacturing Project (2016-2020)".	This guideline sets out the implementation goals, key tasks and safeguard measures of the green manufacturing project, aiming to promote the construction of a green manufacturing system, including the development of green factories, green products, green parks and green supply chains.	Chapter Three Key Tasks
		This catalogue clearly defines the development direction	

		and key areas of the green industry, providing policy guidance and support for the development of the green industry, including energy conservation and environmental protection, clean energy, ecological environment and other industries.	
February 2019	The National Development and Reform Commission has released the "Green Industry Guidance Catalogue (2019 Edition)".		General requirements
February 2016	The National Development and Reform Commission has issued the "Guiding Opinions on Promoting Green Consumption"	This opinion aims to promote green consumption, facilitate the consumption of green and low-carbon products, and enhance the public's environmental awareness, including measures such as promoting green products and strengthening green consumption education.	The third point is to focus on fostering a green consumption concept
March 2020	The National Development and Reform Commission has issued the "Opinions on Accelerating the Establishment of a	This opinion sets out the goals and measures for accelerating the establishment of a legal and policy system for green production and consumption to promote green and low-carbon	Chapter One General

	Legal and Policy System for Green Production and Consumption".	development, including improving the green product standard system and strengthening the green consumption incentive mechanism, etc.	Requirements
November 2024	The Ministry of Ecology and Environment has released the 2024 annual Report on China's Policies and Actions for addressing Climate Change	he report proposed enhancing historical data governance and upgrading carbon market infrastructure (e.g., management platforms, registration/trading systems), while accelerating the inclusion of cement, steel, and aluminum industries into the national carbon market.	The fifth point is to steadily advance the expansion of the industry coverage of the carbon market

3.2 Content Deconstruction

This study employs a coding-based approach to deconstruct green and low-carbon policies and oxygen concentrator market regulations within official documents (as shown in Table 2). The analytical process proceeds as follows:

1) Frequency-driven categorization: High-frequency terms related to green and low-carbon principles in policy texts are first identified and classified under the thematic category of "Practicing Green Development Concepts".

2) Conceptual refinement: Redundant or synonymous expressions within this category are eliminated through conceptual abstraction.

3) Iterative categorization: Remaining terms unclassifiable under the initial category are systematically grouped into new thematic domains.

4) Taxonomy generation: This iterative process yields six primary categories: ① Practicing Green Development Concepts. ② Establishing Green Market Transaction Mechanisms. ③ Accelerating Industrial Green Transitio. ④ Promoting Green Product Production and Consumption. ⑤

Strengthening Environmental and Ecological Protection. ⑥ Developing Green and Low-Carbon Legal-Policy Frameworks.

Table 2. Content Deconstruction of Urban-Rural Integration

Serial number	Primary category	Extraction and conceptualization of document expression words
1	Practice the concept of green development	(1) Promote the green and low-carbon development of the economy and society. (2) Deeply practice the concept that green mountains and clear waters are as valuable as mountains of gold and silver. (3) Energy conservation and carbon reduction are important measures to promote carbon peaking and carbon neutrality. (4) China's roadmap, policy system and safeguard measures for achieving the goals of carbon peaking and carbon neutrality. (5) Firmly establish the development concepts of innovation, coordination, green development, openness and sharing.
2	Establish a green market trading mechanism	(1)Progress in the construction of carbon emission trading markets and voluntary greenhouse gas emission reduction trading markets. (2) Promote the upgrading of infrastructure functions such as the national carbon market management platform, registration and filing system, and trading system.
3	Accelerate the green transformation of industries	(1) Green and low-carbon development practices and achievements in the industrial and information technology sector. (2) High-quality development of the medical equipment industry. (3) Promote the optimization and upgrading of the

		industrial structure. (4) Implementation goals, key tasks and safeguard measures of the green manufacturing project.
4	Promote the production and consumption of green products	(1)Unify the connotation and evaluation methods of green products. (2) Construction of a green product standard, certification and labeling system. (3) Green consumption education and promotion. (4) Supply mechanism of green product evaluation standards and assessment of certification effectiveness.
5	Strengthen environmental and ecological protection	(1) Build a beautiful China where humans and nature coexist in harmony. (2) Promote carbon reduction, pollution control, green expansion and growth in a coordinated manner. (3) Enhance carbon sink capacity.
6	Establish a green and low-carbon legal and policy system	(1)Accelerate the establishment of a legal and policy system for green production and consumption. (2) Improve the standard system for green products. (3) Strengthen the incentive mechanism for green consumption.

Source of information: Compiled based on relevant policy documents.

3.3 Determine the Main Category

This study integrates primary categories to derive the core category of "Chinese-Style Green and Low-Carbon Sustainability in the Oxygen Concentrator Market", subsequently constructing a structural model of its components (see Table 3). The rationale for this core category selection is threefold:

1) Conceptual Centrality: The Chinese-style sustainability framework comprehensively subsumes all primary categories identified through inductive coding, occupying a central position within the conceptual hierarchy.

2) Contextual Distinctiveness: Grounded in China’s unique policy discourse, this framework demonstrates marked inclusivity and contextual specificity, diverging from Western-centric theories of green and low-carbon market sustainability and prevailing universal paradigms.

3) Relational Coherence: As a core category, it exhibits strong relational connectivity with other constructs (e.g., partial alignment with theoretical domains such as "Coordinated Green Development" and "Green Integration"), facilitating interdisciplinary theoretical dialogue.

Table 3. Content Structure Model of Chinese-style Green and Low-Carbon and Sustainable Development of Oxygen Generator Market

Overall dimension	First-level indicator	Secondary specific indicators
The sustainable development of the Chinese-style green and low-carbon oxygen generator market	Green protection is coordinated and interactive	Practice the concept of green development
		Accelerate the green transformation of industries
	Green elements promote each other	Establish a green market trading mechanism
		Promote the production and consumption of green products
	The multi-dimensional development and interaction of green policies	Strengthen environmental and ecological protection
		Establish a green and low-carbon legal and policy system

4. The Fundamental Logic of Chinese-Style Green and Low-Carbon Development and the Oxygen Concentrator Market

4.1 Foundational Role of Policies in Safeguarding the Oxygen Concentrator Market

China's green and low-carbon policies provide robust foundational safeguards for the oxygen concentrator market. These policies not only drive the research, development, and application of green and low-carbon technologies but also incentivize enterprises to pursue green technological innovation through fiscal subsidies, tax incentives, and other supportive measures. The coherence and transparency of these policies are critical in fostering corporate green innovation. Simultaneously, environmental regulations and standards impose binding constraints on corporate practices, compelling reductions in pollutant emissions and improvements in resource efficiency. Collectively, these policies furnish both strategic direction and operational support for the market's green and low-carbon transition, ensuring its sustainable and healthy development.

4.2 Factor Mobility in the Oxygen Generator Market under Green and Low-Carbon Policies

Green and low-carbon policies have facilitated the flow of key factors in the oxygen generator market, including technology, capital, and information. As these policies continue to evolve, there is a growing demand for energy-efficient and environmentally friendly oxygen generators, prompting manufacturers to place greater emphasis on green design principles and low-carbon performance in their products. Technological innovations, such as high-efficiency energy utilization systems and low-noise design features, have significantly reduced the environmental impact of oxygen generator operations while

enhancing overall energy efficiency. The dynamic movement of these factors not only addresses emerging market demands but also contributes to the broader green and low-carbon transformation of the oxygen generator industry.

4.3 Multidimensional Interaction between Green and Low-Carbon Policies and the Development of the Oxygen Generator Market

A multidimensional interactive relationship exists between green and low-carbon policies and the development of the oxygen generator market. These policies not only provide a foundational framework for market operations but also drive the green and low-carbon transformation of the industry through multiple pathways, including technological innovation, shifts in market demand, enhancement of industry standards, and the implementation of policy incentives and regulatory constraints. This interaction is manifested in how policies influence market structure, corporate behavior, and consumer choices, as well as how market dynamics, in turn, inform and shape policy formulation and adjustment. The result is a dynamic and reciprocal process that underscores the interdependence between policy and market evolution.

5. Green and Low-Carbon Transition and the Future Reform Directions for Sustainable Development of the Oxygen Generator Market

5.1 Enhancement and Improvement of Green Foundational Safeguards

A key direction for future reform is the enhancement and improvement of foundational safeguards. This includes strengthening policy support and market regulation to ensure stability and sustainability in the oxygen generator market during its green and low-carbon transition. The coherence and transparency of policies are critical for fostering corporate green innovation; thus, the policy framework must be further refined to provide clear guidance and incentives that encourage enterprises to pursue green technological advancements. Additionally, the formulation and enforcement of environmental regulations and standards must be prioritized to effectively constrain corporate environmental practices, reduce pollutant emissions, and improve resource utilization efficiency. These measures are essential for the healthy development and green low-carbon transformation of the oxygen generator market.

5.2 Facilitation of Green Factor Mobility Channels

Another critical reform direction is the establishment of smooth channels for factor mobility. This involves enabling the free flow of factors such as technology, capital, and information within the oxygen generator market. Policies should encourage and support technological innovations, such as high-efficiency energy utilization systems and low-noise designs, to minimize environmental impacts and enhance energy efficiency ratios during oxygen generator operations. Simultaneously, policies must promote capital allocation toward green and low-carbon projects, supporting the industry's sustainable upgrades. Equally important is the facilitation of information flow, which enables market participants to better understand policy requirements and evolving market demands, thereby making

informed decisions. Streamlined factor mobility channels can drive innovation and competitiveness in the oxygen generator industry, accelerating its green and low-carbon development.

5.3 Coordinated Advancement of Green Development Systems

The integrated promotion of urban-rural development systems is pivotal to achieving sustainable growth in the oxygen generator market. This requires addressing disparities and specific needs between urban and rural areas in policy design and implementation to ensure balanced application of green and low-carbon policies. Policies should focus on raising green and low-carbon awareness in rural regions, strengthening infrastructure development, and improving access to and maintenance capabilities for oxygen generators. Meanwhile, urban areas should serve as pioneers in adopting green and low-carbon technologies, leveraging their demonstration effect to drive rural development. Coordinated urban-rural development not only fosters equitable market growth but also facilitates a societal shift toward green and low-carbon lifestyles, harmonizing socioeconomic progress with ecological conservation.

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