Digital Economy Empowers Innovative Strategies for Activating Sleeping Resources in the Guangdong-Hong Kong-Macao Greater Bay Area

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Abstract: This study focuses on the innovative pathways through which the digital economy enables the activation of sleeping resources in the Guangdong-Hong Kong-Macao Greater Bay Area (GBA). It demonstrates the effectiveness of digital technologies in revitalizing idle resources by constructing a "Digital Bay Area" collaborative platform, integrating government and enterprise data resources, and analyzing three typical cases: China Mobile's "5G + Smart Agriculture" pilot, Dongguan's "Characteristic Industry IP + Digital Economy" model, and Shenzhen's cross-border logistics upgrading practice. The research finds that resource activation requires supporting institutional innovations to break regional barriers, which can provide practical references for the optimal allocation of resources in the GBA and facilitate the region's high-quality development.

Keywords: Sleeping resources; Guangdong-Hong Kong-Macao Greater Bay Area (GBA); Economic transformation; Digital economy

1. Introduction

As one of the most open and economically dynamic regions in China, the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) undertakes the core strategic mission of national opening-up and regional coordinated development with its "9 + 2" urban agglomeration layout [1]. During the implementation of the Three-Year Action Plan for Building an International First-Class Business Environment in the Guangdong-Hong Kong-Macao Greater Bay Area, the GBA has made continuous breakthroughs in rule alignment and factor mobility. However, sleeping resources such as energy and land have not been fully activated, becoming a key bottleneck restricting high-quality development. As the core engine of global economic growth, the digital economy is explicitly proposed to deeply integrate with the real economy in the 14th Five-Year Plan, providing a new pathway for optimal resource allocation. Based on the GBA's actual development, exploring digital economy-enabled models

in key areas (e.g., modern finance, cultural tourism, technological innovation, and professional services) can not only address the imbalance in regional development but also enhance the GBA's comprehensive competitiveness, fueling the construction of a world-class urban agglomeration. This paper systematically sorts out the current status and challenges of resource activation, proposes targeted innovative strategies, and provides theoretical support and references for practical exploration.

2. Overview of sleeping resources in the GBA

The GBA is an important component of China's five major coastal economic belts, with a "9 + 2" urban agglomeration structure covering nine cities in the Pearl River Delta of Guangdong Province and two special administrative regions (Hong Kong and Macao). It spans a total area of 56,500 square kilometers, accounting for approximately 0.6% of China's total land area. According to the latest 2024 statistics, the GBA's gross domestic product (GDP) exceeded 14 trillion yuan, a year-on-year increase of about 5.5%, with nine mainland cities contributing the majority of the total economic output. Amid rapid regional economic development, the imbalance in internal development has become increasingly prominent. Significant resource idleness exists in eastern, western, and northern Guangdong, involving production factors such as energy, land, tourism, minerals, and water resources. These areas have long relied on traditional agricultural production methods, with relatively backward transportation infrastructure and considerable geographical distance from core cities like Guangzhou and Shenzhen. This has led to insufficient population agglomeration effects, as both the growth rate and increment of the population scale lag behind those of the core urban agglomeration. This developmental imbalance has become a critical bottleneck hindering the coordinated development of the GBA, while these sleeping resources also hold high redevelopment potential [2].

3. Basic status of sleeping resource activation in the GBA
3.1. Main approaches and effects of sleeping resource activation

In recent years, Guangdong Province has continuously promoted industrial transformation and upgrading in northern and western Guangdong through the implementation of the "Green Expansion, Promotion, and Protection" project and the "High-Quality Development Project of 100 Counties, 1,000 Towns, and 10,000 Villages". Northern Guangdong has focused on cultivating characteristic forestry industries such as bamboo, *Camellia oleifera*, economic forests, and southern medicinal herbs. By innovating industrial chain investment promotion models and raising social capital through multiple rounds, it has successfully introduced dozens of forestry projects with cumulative contractual investment exceeding 2.5 billion yuan, driving the development of the local green economy. To address the challenge of sleeping resource activation and promote regional synergy, Guangdong has established five major metropolitan areas centered on Guangzhou, Shenzhen, the west bank of the Pearl River Estuary, Shantou-Chaozhou-Jieyang, and Zhanjiang-Maoming. It has simultaneously advanced the coordinated development of the Beibu Gulf Urban Agglomeration and deepened strategic cooperation with the Hainan Free Trade Port, striving to build a new open regional economic system. These measures have not only accelerated new-type urbanization but also activated county-level economic vitality through factor marketization reforms and industrial gradient transfer. Empirical evidence shows that this multi-level regional coordination strategy is gradually narrowing the development gap between eastern/western/northern Guangdong and the Pearl River Delta core area, injecting new momentum into the GBA's high-quality development.

3.2. Typical cases of sleeping resource activation

Jiaoling County, an important bamboo-rich region in Guangdong Province, is renowned as the "Bamboo Sea of Eastern Guangdong". Boasting abundant bamboo resources with individual bamboo forest scales ranging from 300 to 3,000 mu (1 mu ≈ 0.067 hectares), the local government has fully leveraged its resource endowments to successfully establish a provincial-level modern agricultural industrial park for Moso bamboo (*Phyllostachys edulis*). By developing an intensive bamboo processing industrial chain, fostering characteristic planting and breeding economies under bamboo forests, and launching bamboo forest ecotourism projects, it has constructed a new "primary-secondary-tertiary industry integration" development model. According to the overall deployment of the Guangdong Provincial Bamboo Industry Development Plan (2021–2035), the province aims to maintain a stable bamboo forest area of over 8 million mu by 2025, with the comprehensive output value of the bamboo industry reaching 60 billion yuan [3]. Looking ahead to 2035, it strives to increase the comprehensive output value to over 120 billion yuan, establishing itself as a key green economic growth pole in South China.

3.3. Challenges in sleeping resource activation

Under the "One Country, Two Systems" framework, administrative divisions and legal system differences among Guangdong, Hong Kong, and Macao have hindered the cross-border flow of resource factors, creating institutional barriers to sleeping resource activation. These institutional differences are mainly reflected in policy gaps in land management, property rights definition, and environmental standards, severely restricting the efficiency of cross-regional resource integration. Meanwhile, regional industrial homogenization has become increasingly prominent. Analysis of industrial similarity indices reveals that nine Pearl River Delta cities exhibit fierce homogeneous competition in strategic emerging industries such as high-end equipment manufacturing and electronic information. This leads to fragmented resource allocation, making it difficult for less developed areas (e.g., eastern/western/northern Guangdong) to effectively undertake industrial transfers and form a gradient development pattern. The per capita GDP gap between the core and peripheral regions remains significant. Additionally, the integrated development of culture, commerce, and tourism faces three major challenges as follows:

(1) The policy system is characterized by "emphasizing planning over implementation" with a lack of detailed operational guidelines and standardized construction norms;

(2) Cross-regional resource sharing mechanisms are inadequate, resulting in resource misallocation; and tourism product innovation is insufficient, with low satisfaction among young people aged 18–35;

(3) The development of characteristic resources such as industrial heritage and Lingnan culture remains superficial, where most cultural tourism projects merely replicate architectural symbols like " wok-ear walls" without delving into cultural connotations, leading to prominent product homogenization.

4. Feasibility analysis of digital economy-enabled sleeping resource activation

4.1. Feasibility of data factor-driven activation

Theoretically, data factor-driven activation is supported by modern information and communication technology (ICT) infrastructure. Through carriers such as 5G, the Internet of Things (IoT), and cloud computing, digital technologies including artificial intelligence (AI) and big data analytics are deeply integrated with the real economy. Following the logic of "technology penetration-efficiency enhancement-value creation", it promotes the all-round transformation and digital upgrading of traditional industries, thereby significantly improving total factor productivity (TFP). In agriculture, the driving effect of data factors is reflected in three dimensions: precise

transformation of production links (e.g., satellite remote sensing-based precision agriculture and IoT-enabled intelligent irrigation systems), digital restructuring of circulation links (e.g., agricultural e-commerce platforms and blockchain traceability systems), and financial technology empowerment of service links (e.g., big data-based rural credit evaluation systems and digital inclusive finance products). Empirical studies show that agricultural digitalization can increase land output rate by 18–25% and agricultural input efficiency by 20–30%. This marginal benefit increment constitutes the core of new output driven by the digital economy. From a policy perspective, it is essential to construct a "trinity" promotion mechanism of "infrastructure-technological innovation-application scenarios" to fully release the multiplier effect of data factors. Some mountainous areas with inconvenient transportation once faced difficulties in agricultural product sales. In recent years, with the rapid development of e-commerce, live-streaming e-commerce for agriculture, rural areas, and farmers (Three Rural Issues) has emerged as a new model [4]. Leveraging digital technologies such as big data, AI, blockchain, intelligent supply chain technology, VR/AR, and 5G-IoT, it utilizes AI algorithms, digital human hosts, and AI after-sales robots to realize virtual scene interaction and real-time data display during live broadcasts. This effectively drives regional digital economic development in four dimensions (digital infrastructure, industrial digitalization, data technology, and digital service quality), promotes the digital development of rural cultural resources, and enhances digital service levels [4].

4.2. Feasibility of digital technology empowerment

The widespread application of digital technologies not only provides farmers with comprehensive and real-time agricultural product sales information for live-streaming e-commerce but also supports scientific and precise planting. Real-time monitoring and data collection have become core components of agricultural information services. Using sensors, IoT devices, and satellite remote sensing technology, farmers can capture key parameters (e.g., soil moisture, temperature, and meteorological conditions) and detailed crop growth data in real time. This information is transmitted via cloud platforms, offering timely and scientific references for farmers to accurately grasp farmland conditions and take targeted measures. The introduction of decision support systems (DSS) enhances the intelligence of agricultural information services. Through data analysis and AI, farmers gain access to in-depth information such as soil analysis results, crop growth predictions, and pest risk assessments. Comprehensive analysis by DSS provides scientific recommendations and decision-making schemes, helping farmers optimize production plans and improve efficiency. The popularization of digital technology-supported social media and mobile applications has expanded agricultural information dissemination channels. Farmers can share and exchange information through these platforms, establish agricultural communities, and form an information-sharing ecosystem [5]. Mobile apps also enable farmers to access information anytime and anywhere, making services more aligned with on-the-ground agricultural practices and farmers' operational habits.

4.3. Feasibility of industrial integration and innovation

With the release of the Digital Agriculture and Rural Development Plan (2023–2025), the digital economy has made substantial progress in empowering agricultural production. At the same time, farmers' digital literacy has improved, as reported in the 2023 Report on Chinese Farmers' Mobile Phone Usage, while consumers have gradually developed the habit of purchasing agricultural products online, according to JD.com's 2023 Fresh E-Commerce Trend Report. Low-latency 5G networks ensure smooth live broadcasts, big data analytics enable precise matching between user profiling and supply-demand, and traceability technologies enhance consumer

trust. AR/VR technologies provide immersive displays of agricultural planting environments, allowing consumers to better understand product quality and truly participate in the production and processing experience. AI-powered voice interaction functions can resolve language communication barriers caused by dialects for farmers in real time. The government-enterprise cooperative China Mobile "5G + Smart Agriculture" pilot project has continuously strengthened rural infrastructure construction. Drawing on the model of Jiangsu Muyang's "Village Broadcasting Academy", it has cultivated a large number of localized digital talents for less developed areas in the GBA.

5. Innovative strategies for digital economy-enabled sleeping resource activation in the GBA

5.1. Constructing a "Digital Bay Area" resource collaborative platform

Although the GBA's advantage in digital economy talents is not prominent, restricting the region's digital economic development to a certain extent, the digital economy has nonetheless introduced new resource coordination models, which enabled resource integration and upgrading. With the in-depth advancement of the national rural revitalization strategy, rural tourism has gradually become an effective way to address the Three Rural Issues and narrow the urban-rural gap [6]. Luoba Town, Guangdong Province, features overlapping mountains and steep terrain, with slightly wide and flat areas along the banks of the Luoba River and Liuzhangjiashan River, forming a small basin edge landscape. Drawing on rural homestay experiences from developed countries, the local government has proposed the rural construction concepts of "farmhouse complex" and "homestay +" based on rural development needs and folk economic laws. This aims to continuously improve regional land use efficiency and realize the coordinated integration of culture and tourism. The local homestay industry has further enhanced consumer participation and satisfaction through the integration of hot spring resources and Miao ethnic medicine.

5.2. Building an integrated ecosystem of "Characteristic Industry IP + Digital Economy"

Against the backdrop of "Internet +", drawing on the development experience of Shandong Boxing's straw and willow weaving industry, the innovative transformation of traditional industries has become particularly critical [7]. It is necessary to continuously explore new pathways closely integrated with modern life to achieve sustainable and healthy industrial development. As consumers' demand for online shopping grows year by year, Guangdong's "Trendy Toy Capital" can promote cooperation between Pop Mart (a leading trendy toy brand) and Dongguan manufacturing enterprises. By utilizing digital twin technology to optimize blind box production lines and develop AR collection certificates, it can deepen research on consumer aesthetics and demands, upgrade products through the integration of characteristic industry IP and the digital economy, and establish digital communities on platforms such as Bilibili and DeWu to encourage user participation in IP co-creation. This will promote manufacturing upgrading, improve production efficiency, and reduce defect rates through digital twin-enabled production line optimization.

5.3. Continuously upgrading GBA cross-border logistics and warehousing

In recent years, the concept of energy conservation and low-carbon development has driven the transformation of the comprehensive energy consumption structure toward low carbonization. With the deepening of green and low-carbon energy use in production and life, the demand for peak shaving and valley filling of various energy sources has increased year by year, prompting price-based demand response mechanisms to guide consumers in adjusting their energy use plans through energy price regulation [8]. Addressing the land shortage in Shenzhen's Luohu

District, inefficient warehousing spaces can be transformed into automated three-dimensional warehouses, and underground logistics channels in the Sungang-Qingshuihe area can be planned to connect community distribution terminals. By dynamically scheduling new energy vehicles, charging piles, and warehousing electricity through IoT and AI algorithms, referencing the construction experience of the "source-grid-load-storage" collaborative system in Shenzhen Airport Bonded Logistics Park, energy consumption costs can be reduced by 30%.

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