

Territorial Edge Computing Enabling Green Tourism and Green Development of CIPP Model Analytics

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Abstract

INTRODUCTION: Eco-development is an essential national strategy, which has become an effective way to sustain China's tourism industry in the new era. Nowadays, the problem of climate change is becoming more and more serious, and the restriction on natural resources and the environment is becoming more and more serious. Improving the economic efficiency of the tourism industry and advancing the reform of its economic efficiency are critical priorities for the high-quality development of the tourism industry. Therefore, it is crucial for edge computing to empower green tourism and green growth.

OBJECTIVES: The purpose is to enhance the development of green tourism in China and promote the sustainable development of China's tourism industry; to solve the problems of severe environmental damage and resource consumption in the development of the tourism industry; and to promote the application of information technology, such as full-area edge computing, in the development of China's tourism industry, and to realize the combination of the CIPP education concept and the concept of green tourism promotion.

METHODS: Firstly, the authors find the necessity of researching the CIPP model of green tourism and green development empowered by the whole domain edge computing by using the study of literature and theory; secondly, the Author analyzes the importance of the education of the concept of green tourism and green development by using the method of analyzing the CIPP model; and lastly, the authors measure and enhance the effectiveness of green tourism and green development by using the mobile whole domain edge computing.

RESULTS: The whole-domain edge computing has better stability for green tourism and green development measurement, and the use of the CIPP model can better deepen tourists' tourism concepts of green tourism and green development and promote green tourism development.

CONCLUSION: The level of innovation in China's tourism industry is improving, and multivariate analysis shows that innovation is the key force driving industrial change and quality development. Therefore, it is essential to continue supporting an innovative and technology-driven tourism industry and continuously improving its innovative technologies and content. Greater emphasis will be placed on training and improving the quality of tourism staff. Tourism talent is the basis for innovation in tourism management and services and a critical factor in the development of an innovative system for tourism.

Keywords: domain-wide edge computing, green tourism, green development, CIPP modeling

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1. Introduction

In 2022, China reaffirmed the importance of green development, which laid the foundation for an excellent

ecological civilization. Realizing the dual-carbon goal also puts forward new and stricter requirements for socio-economic development. Eco-development is an essential national strategy and has effectively sustained China's

tourism industry in the new era. Nowadays, the problem of climate change is becoming more and more serious, and the restrictions on natural resources and the environment are becoming more and more serious. Improving the economic efficiency of the tourism industry and advancing the reform of the economic efficiency of the tourism industry are critical priorities for the high-quality development of the tourism industry(Li & Liu, 2022). Therefore, in the new era, it is necessary to build on China's right to socio-economic development, gain a deep understanding of the core of the green development of China's tourism industry, continuously improve the efficiency of green growth of the tourism industry, coordinate the development of China's economy and other subsystems, and promote social and ecological development.

With the development of human civilization, the Marxist concept of ecological civilization, as an essential exposition of the relationship between human beings and nature, is based on the analysis of the environmental crisis in human society and the practical philosophy of materialism. Building an ecological civilization is a modern civilization for long-term development(Wei et al., 2022). The green development concept is a product of the new development theory put forward by the Marxist theory of ecological civilization based on scientific evaluation of China's national conditions. It is developed and implemented based on people's accurate view of nature. To realize the great rejuvenation of the nation, it is necessary to take a practical approach, synthesize the specific situation of natural resources, population, society, and the environment, make full use of this situation, and effectively mitigate the apparent conflict between economic development and natural resources and the environment. Development is a scientific evaluation of China's current socio-economic development situation based on the Marxist view of ecological civilization.

The conflict between natural resources and the environment is becoming increasingly evident. The sustainable development of tourism must not exceed resources. It follows the objective law of human social development and is an inevitable choice for human social evolution (Johnson, 2022). It can leave room for expansion for future generations and ensure regularity and organic consistency of objectives. Regarding frequency, the rapid growth in demand for natural resources in today's society has made pollution more severe and increased the risk of ecological imbalance. Quota-green development can facilitate human activities, recognize the inherent right to natural growth, ensure that economic activities are consistent with the objective requirements of environmental rights, and promote sustainable and healthy economic and social development(Wang, 2021).

Regarding objectives, green development can help modernize the tourism industry, meet people's needs, and increase prosperity. Improved coordination and transition capacity can help resolve conflicts related to tourism development and increase opportunities for sustainable development. Therefore, green development as such

development limits the economic development of tourism to a certain extent, taking into account not only the needs of modern people but also the needs of future generations. Exploring the effectiveness of green development of tourism, oriented to material benefits and overcoming the limitations of a one-sided view of development, is a theoretical sublimation and innovation of Marxist ecological civilization.

Since the reform and opening up, China's economy has maintained a long-term rapid development pace, changing comprehensive coverage and improving quality and efficiency(Zhengjie. Chen et al., 2022). The GDP growth rate will exceed 10 percent in a few years, and the overall strength will continue to grow. Implementing the Western Development Strategy has opened up new opportunities for the development of the western region, especially in remote ethnic minority areas, and opened a new chapter in the socio-economic development of ethnic minorities. However, in regional development, some areas and enterprises have focused only on immediate local interests, mainly through extensive growth, blind pursuit of material wealth, and neglect of long-term benefits. With the expansion of human activities, the increase in emissions, the intensity of resource consumption, and the gradual development of imbalance and disorganization in effect, these contradictions have led to the proper development prospects(Jiang & Liu, 2021). Given the immense challenge of improving the environment, current resource and environmental challenges must be addressed through innovation. Today, with socio-economic changes, natural resources and the environment are becoming increasingly important, and the sustainable development of tourism has become an important social issue.

Conflicts and difficulties in the human-sustainable development nexus have altered the development characteristics and drivers of the economic model of tourism(Liu et al., 2021). Environmental severe problems and a lack of natural resources have hindered economic development and national progress. Many areas in China are rich in tourism resources but ecologically sensitive. Rapid economic growth has put pressure on natural resources and the environment, which, to some extent, hinders the functioning of the ecosystem. Given the significant changes in the foundations of society and the interdependence and interaction between people and the environment, sustainable development is essential. Implementing sustainable development strategies has entered a new development phase, from planning to total funding. The contradictions and challenges of green growth of the tourism industry urgently require new development concepts and the active development of new tourism forms and new economic development models in combination with specific regional geographic environments(Liu et al., 2021). Therefore, to create a national ecological civilization construction demonstration area, it is necessary to pay attention to and solve the sustainable development of tourism. Sustainable tourism development must be guided by scientific development, planning and programming at the highest

level, integrated development, rational utilization of tourism economic resources, and promoting harmonious development between man and nature.

2. Background of the study

Since the 20th century, the shortcomings and challenges of the traditional economic development model of tourism have increased pressure on ecosystems that no longer meet the high standards of current and future socio-economic development. In some regions, economic development in secondary health care is slowing down. The concept of sustainable development has been a prime example of economic tourism from its inception. Sustainable development strategies are essential in reducing conflicts in complex environmental, economic, and social systems(Pogosyan et al., 2022). Organized strategic planning provides a solid foundation for achieving China's modernization goals. Despite the precise definition of the SDGs by the United Nations Environment Program, the concept of sustainable development remains vague, such as sustainable development, and there are no specific criteria to measure the achievement of this goal. This limits, to some extent, the purpose of sustainable economic and social development. In the new context of rapid global development, it has become a common interest of both domestic and foreign researchers to effectively deal with the complex relationship between economic development, natural resources, and the environment and to promote sustainable and healthy economic and social development. There is an urgent need to find new development prospects and models to facilitate changes and improvements in the tourism industry, enrich the possibilities of sustainable development, and expand the research methods of sustainable development, which is the ultimate goal of sustainable development. At this stage, there are applications for green development. Incorporating greenness and greenery into all aspects of tourism economic development and changing how it develops will increase the most comprehensive social prosperity and provide space for future generations' development and construction (Tian et al., 2022). Therefore, studying the effectiveness of green development in China's tourism industry in a region rich in tourism resources but ecologically fragile can provide new insights and perspectives for sustainable development research and contribute to effectively realizing sustainable development goals.

Tourism dynamics in the new development stage must evolve according to the temporal characteristics of areas with high levels of tourism resources but ecologically sensitive. Tourism can contribute to the shift from simple rough growth to intensive growth, as it is an essential component of the high-quality development of tourism in the region. Over time, tourism has proliferated and achieved great success. To strengthen its sustainability, the tourism industry is gradually entering a phase of high-

quality development. Tourism faces two significant challenges at this critical stage of change: reform and innovation(Ranasinghe et al., 2021). It is necessary to change outdated concepts, introduce an innovative development system, pay more attention to the quality and efficiency of development, effectively reduce tourism's consumption of economic resources, reduce emissions from tourism, and gradually shift to regions rich in tourism resources, which is a two-part investment environment that improves development efficiency. By improving resource efficiency and management techniques, China's tourism economy is transformed into an efficient economy, promoting high-quality growth in tourism. Therefore, in the new stage of development, the critical task of developing China's tourism industry is to realize more efficient development. The global financial crisis has had some impact on the development of tourism. Some countries contributed to the tourism industry's revitalization and prosperity by simplifying visa policies and improving tourism services.

Since the reform and opening-up in 1978, the number and type of factors of production, such as capital and labor, have steadily increased in areas with high tourism resources and ecological sensitivity, effectively sustaining the rapid development of the tourism industry. In the context of sustainable economic growth, factors such as structural adjustment, supply constraints, and increased consumer demand have increased the prices of various aspects of production(Razzaq et al., 2021). As a result, the use of factors of production to promote tourism growth is no longer applicable, jeopardizing the sustainable and healthy development of the economy, particularly in the following three areas. First, resource scarcity has led to a sustained increase in input prices, resulting in higher investment expenditures in tourism and limiting the sustainable growth of tourism in ecologically sensitive areas rich in tourism resources. Second, the increasingly unstable global economic environment requires reforms and innovative development of the tourism industry in China's tourism-rich and ecologically sensitive regions to improve risk tolerance. In addition, declining production has significantly impacted tourism development in China's environmentally sensitive and resource-intensive areas, limiting the sustainable development of investment-driven tourism. Improving the competitiveness of the tourism industry and promoting its transformation and modernization has become a significant current and future trend. This change is based on investing limited resources in the production process to increase productivity and optimize the allocation of economic resources in the tourism industry, thus improving the efficiency of tourism economic development. They are changing the traditional development model to improve the efficiency of tourism. Therefore, exploring the environmental benefits of tourism development can help the tourism industry change from an investment-oriented development model to an efficiency-oriented one, thus systematically changing the old and new drivers in tourism development.

3. Research methodology

3.1 CIPP model theory

American experts proposed the CIPP assessment model during the educational reforms of the 1960s. Basic assessment should include an evaluation of the relevant learning environment, current situation, and competencies, identifying the target group's needs to be assessed, assessing the program's feasibility, and developing a plan for achieving the assessment objectives (Basaran et al., 2021). A basic assessment is a diagnostic assessment of whether the goals of the training program meet the requirements of the participants and the curriculum. The core assessment aims to create a framework for instructional preparation, content, and curriculum. Participants and training units come from various departments with varying content requirements. Peer review is used to create textbooks for different disciplines. After setting goals and training, the purpose is to assess the factors, conditions, and resources that affect program implementation. The initial assessment evaluates whether the personnel, resources, and materials associated with the training program are being used per the objectives and other resources needed to achieve the goals. The first is a constructive assessment of the environment and natural resources. The investment assessment aims to determine whether the training needs are by the plan, assess the feasibility of the project and its training objectives, identify alternatives, and improve the reasonable feasibility and success of the selected program through the assessment. P is a process assessment that evaluates the entire learning program process. As part of this process, an essential evaluation of implementation, progress, resource requirements, and utilization is conducted to identify deficiencies, find causes, and remediate them during performance. The purpose of process evaluation is to collect quantitative information for the training organization through continuous assessment and monitoring of the process so that the organizer understands the different phases of the implementation process, understands feedback, identifies and corrects problems promptly, and aligns the focus of the training program with the training program plan. P refers to the evaluation of the results of a training program through the collection and measurement of data to assess whether the course delivery meets the needs of the participants, whether the training objectives were achieved, whether the training outcomes were achieved, what the benefits of the training modules were, whether the participants were satisfied, whether the program was completed, and whether the desired goals were achieved (Irzan et al., 2021). These are short-term estimates. The purpose of the evaluation is to understand the implementation of the training program by measuring and assessing training outcomes, identifying problems and gaps, gathering lessons learned from future training programs, further improving the quality of education, and laying the foundation for improved recognition and organizational satisfaction. CIPP evaluation covers the

entire learning program and features comprehensive processes, diagnostics, and feedback to inform educational institutions and improve the quality of learning. The energy efficiency of the genetic algorithm for full-domain computing is shown in Figure. 1.

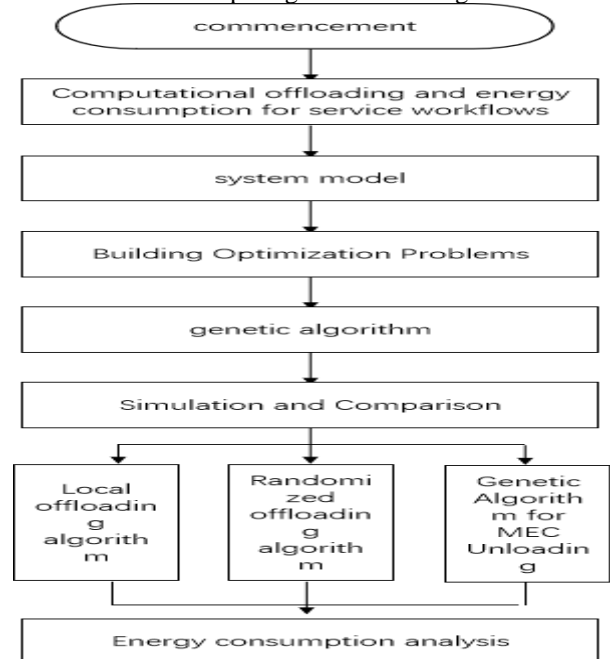


Figure. 1 Genetic algorithm energy efficiency for complete domain computation

In practice, general quality management is often called total quality management. The theory of quality management first emerged in the 1960s. Integrated quality management requires the involvement of all employees to make quality management an integral part of company development, benefiting the organization, its members, stakeholders, and the community. At the same time, quality management responds to the needs of customers and stakeholders to increase satisfaction and achieve long-term sustainability (F. Chen et al., 2021). The facilitator is Fagan Baum, a renowned American management expert who has significantly contributed to creating and developing the theory of Total Quality Management. Total Quality Management is characterized by full participation, process, and scope. Full participation means that all employees of the company play an essential role in the process of product quality control. Product quality is not the task of specific departments or employees but the joint responsibility of all employees in the company. The quality of the product can only be effectively ensured if all employees pay high attention and focus on it. The whole process focuses on preventing and managing every connection and quality process in the company, handling the entire process accurately, investing, and delivering products according to customer needs—establishing strict control and an effective quality management system to strictly control product quality at every stage. The whole industry refers to quality management in product design, production, product support, and quality management to improve

product quality by leading the role of different company departments. Total quality management consists of eight principles: customer-driven leadership, holistic involvement, process approach, systems management, continuous improvement, evidence-based improvement, and mutually beneficial supplier relationships (Gong et al., 2021). At its core is a customer-driven approach, which the company knows and appreciates. Business management not only focuses on product quality but also on improving the quality of customer service and customer satisfaction through various customized approaches. Continuous improvement is part of Total Quality Management.

3.2 Full-domain edge computing

With the growth of mobile business, the need for mobile technology in the Internet era is becoming increasingly urgent. As a new communication technology, 5G provides better performance than 4G. 5G controls the time limit of information communication (Caiazza et al., 2021). People, people, and things can be connected anytime and anywhere. Extended 5G broadband networks, IoT networks, and highly reliable, low-lag telecom connectivity - these three application options will be powerful engines for future socio-economic development. The increasing proliferation of computer applications, including the Internet of Things (IoT), virtual and augmented reality, and smart transportation, are anticipated to impact individuals' lives profoundly. This transformation is being facilitated by the advancements in 5G technology (Fortino et al., 2021). These applications require high computing power and battery capacity compared to traditional applications. However, due to mobile devices' limited battery capacity and computing power, The energy efficiency of the alternating iteration optimization algorithm for full-domain computing is shown in Figure. 2.

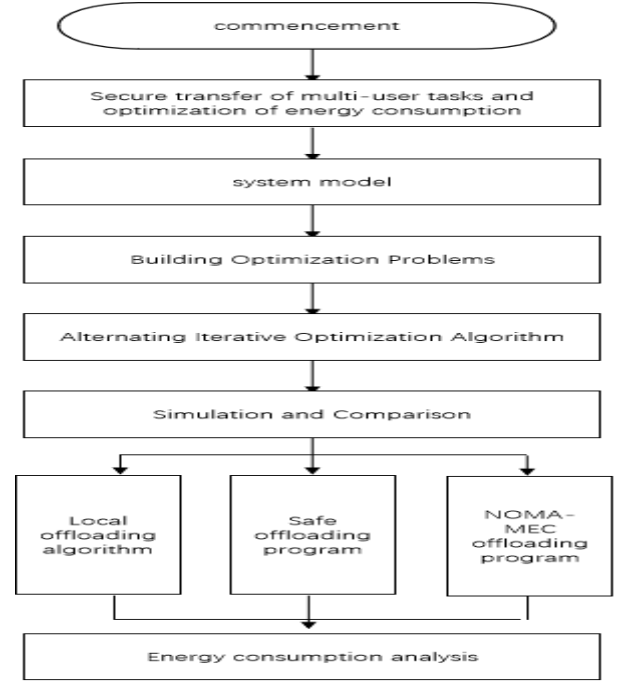


Figure. 2 Energy efficiency of alternating iteration optimization algorithm for complete domain computation. The secrecy rate for full-domain edge computing is denoted as:

$$C_s = \text{MAX} \{i(x; y) - i(x; z)\}^+ \quad (1)$$

The i functions in Equation (1) are all probability distribution functions; those containing y are continuous, and those containing z are discrete.

In practice, the discrete distribution function and continuity cannot be calculated directly and are separated by the following Equation (2):

$$\begin{aligned} C_s &= \text{MAX} \{i(x, y) - i(x, z)\}^+ \geq \{\max(i(x, y)) - \max(i(x, z))\}^+ \\ &= \{\max(C_d) - \max(C_e)\}^+ = R_s \end{aligned} \quad (2)$$

A related expansion of Equation (2) to Equation (2) shows that the secrecy rate $C >$ transmission rate R .

Again, the probability of interruption is calculated and expressed as a p-value:

$$P_{\text{outage}} = \text{Pr}(R_s < R_{s_{\text{th}}}) \quad (3)$$

The P-value is the probability of interruption, and $R_{s_{\text{th}}}$ is the criterion for fine-grained classification of the secrecy rate.

Calculation of energy efficiency for different algorithms can be performed using Equation (4):

$$T^{\text{loc}}(v_{i,k}) = \frac{\omega_{i,k} C_{i,k}}{f_k^{\text{loc}}} \quad (4)$$

The f function in Equation (4) calculates computer efficacy and compares the total algorithmic efficacy with the computer efficacy to derive the marginal algorithmic effectiveness of Equation (4).

$$T_m^{ser}(v_{i,k}) = T^{tr}(v_{i,k}) + T_m^{ser}(v_{i,k}) = \frac{\omega_{i,k}}{r_k} + \frac{\omega_{i,k} c_{i,k}}{f_m^{ser}} \quad (5)$$

Equation (5) considers the virtual machine's energy consumption with the algorithm's efficiency.

Mobile Edge Computing (MEC) technology has been proposed to address the limited availability of mobile devices. MEC is an edge-computing architecture that places computing resources and storage at the edge of the mobile network and provides faster, more reliable, and more secure services. By implementing business processing and resource planning functions on specific edge nodes, MEC can centralize certain cloud platform functions and services at the edge of the mobile network, significantly improving service performance and user experience. At the same time, bandwidth and power can be saved, and privacy and security can be protected (Huang et al., 2023). Data processing requirements for mobile devices can be processed directly from MEC servers on the local edge network instead of returning results from the underlying network and data center, reducing network performance, which allows users to achieve very low latency and improved user experience—the complete domain edge computing framework, as shown in Figure. 3.

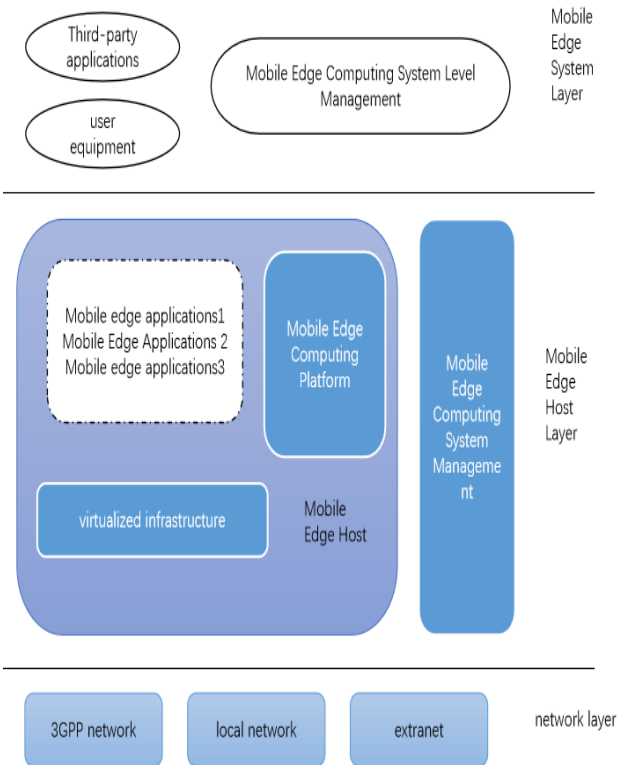


Figure. 3 Framework for domain-wide edge computing Workflows are widely used in face recognition, image processing, big data analytics, and distributed computer-aided augmented reality and consist of hundreds of interrelated tasks. Workflow tasks must consider employment relationships, locations, and relationships between functions to optimize performance and achieve workflow goals. By implementing device execution and resource scheduling capabilities, workflow tasks can be

rationally loaded to neighboring device servers, reducing data and network lag and improving task speed and response time. MEC technology provides efficient workflow planning for tasks with varying IT requirements. The system realizes low-computing-load studies on local devices, transfers high-computing-demand jobs to peripheral servers and sends the results back to the endpoints. However, it is necessary to consider task dependencies, terminal computing power, and execution time in MEC environments due to computer power, battery capacity, and storage space limitations. As business processes become complex, so do the relationships between tasks. In addition, limited computing power and storage capacity of peripheral nodes can restrict task execution. These issues may lead to inefficient task planning or delays in completing specific tasks, thus affecting the efficiency and effectiveness of the entire workflow. Therefore, developing efficient workflow planning solutions to optimize mobile power consumption and lag is the biggest challenge for researchers.

MEC can effectively reduce application power consumption and user device lag; security is one of MEC's biggest challenges. In a MEC environment, data from mobile applications usually involves sensitive data. Due to the frequent data exchanges between user machines and edge servers, some data may be lost or altered during the exchange process, resulting in significant losses to users. Therefore, to ensure wide deployment of MEC applications, it is necessary to ensure that computational tasks are not illegally intercepted during wireless discharge transmission.

As a result, mobile devices face many challenges in deploying edge and dense networks for computationally intensive and sensitive tasks. First, mobile devices have limited computing power and battery capacity to handle intense computing tasks. Second, the security of mobile wireless networks is under serious threat, making it necessary to perform computational functions while ensuring communication security. To improve the computational performance of mobile devices, increase the reliability of wireless communication security, and reduce the system latency power consumption, the resource optimization problem under two different network models and methods for computing and executing maintenance workflow tasks are investigated. It is proposed to securely move the physical layer in mobile edge computing to optimize energy consumption.

3.3 MEC architecture

In 2014, ETSI published a reference architecture for mobile edge network virtualization. According to the MEC reference architecture, mobile computing systems are categorized into three levels: system-level management, host-level management, and network-level management. System-level management consists of MEC-level management, user terminals, and a third party

that controls the entire MEC, including resource planning, security management, and user authentication. Host-level management is the management and control of hosts and associated software and hardware in a computer system. MEC hosting includes mobile platforms, applications, and virtualized infrastructure (He et al., 2022). Network-level management provides access to local, external, and 3GPP cellular networks and displays the status of connections between the MEC and external, cellular, or local networks. Network-level management can only provide low-latency and high-quality access through host-level management. Meanwhile, host-level management and network-level management are designed using mobile computing-level management. Therefore, managing mobile peripherals, host level, and network management are interdependent and essential.

The following architecture is based on the basic MEC architecture and provides detailed definitions of the relationships between the different functional units. The Mobile Border System level consists of the Mobile Border System and the Mobile Border Service level. The mobile device layer encompasses many vital components, including the user software lifecycle management module (LCM), the operating system, and the mobile peripheral equipment configuration module (MEO). The LCM oversees the lifecycle of user software, while the operating system serves as the underlying software platform. Additionally, the MEO plays a crucial role in managing several aspects, such as application lifecycle, traffic rules, and service authorization. The mobile device service layer includes several components that provide various services, such as video acceleration, network security, and location services. These service components can be combined and deployed according to the requirements of different application scenarios to provide efficient and reliable services, mainly consisting of mobile platform operators, virtualized infrastructure managers, and MEC servers. When an end-user application requests a manual, the mobile-assisted user software lifecycle management module sends a request to the operating system to determine whether to accept the user's user software lifecycle management module's request. In the case of authorization, the authorization request is sent to the coordinator ME, which allocates MEC resources based on the user's requirements. In the MEC-ME architecture, the Orchestrator interacts with the operating system through the MM1 reference point to run and export applications.

Meanwhile, the ME Orchestrator communicates with the Virtualization Infrastructure Manager through the MM4 reference point to manage application virtualization resources and virtual machine images. This architecture improves the MEC system's resource planning and application delivery efficiency to meet users' changing needs. The MEC working system model is shown in Figure 4.

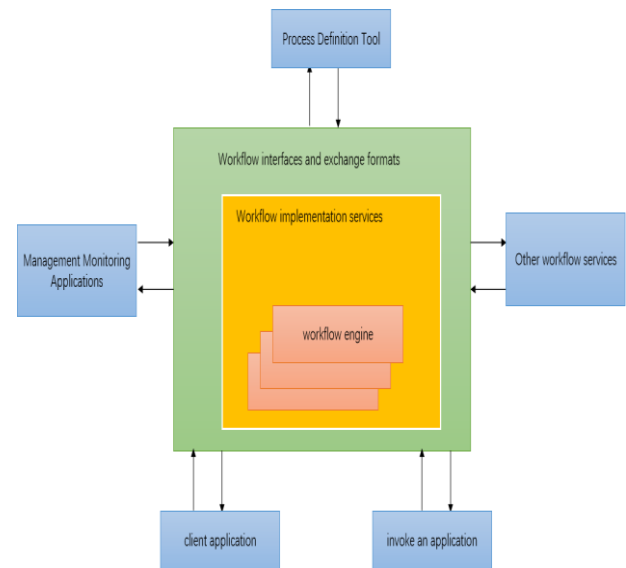


Figure. 4 MEC working system model

4. Results and discussion

4.1 Discussions related to the development concept and tourism industry

The new development concept includes five main ideas: innovation, coordination, ecology, openness, and sharing, which profoundly reflect China's national conditions and historical background. It is necessary to adhere to the new development concept, realize high-quality economic development, and solve the development contradictions and serious structural problems in the country's economic and social development. Interaction, respect for the environment, and communication services show that their industrial nature aligns with the new development concept, which is why tourism realizes the new development concept, promotes its essential role and specific benefits, facilitates its transition to a new era, and becomes the leader of tourism in the new normal. Therefore, this paper proposes a new development concept, establishes a high-quality evaluation system for tourism development, and discusses ideas and practical methods.

Traditional and endogenous growth theories are the core elements of modern economic growth theory, with the difference being whether technological factors should be considered endogenous variables. Among them, the Solow model presents the traditional growth theory. Solow's famous growth model suggests that technological development is an essential driver of economic development but does not consider technical factors as endogenous economic growth variables. Secondly, endogenous growth theory suggests that technological development is endogenous to economic development, and the corresponding contribution of each factor should be an external driver of economic development. In addition, traditional scholarship, such as the knowledge impact model, on-the-job learning, and the three-sector model, emphasize talent, education, and research as

essential drivers of economic development, i.e., the transfer of knowledge and skills to employees through the training process. Knowledge is then translated into research and development. Economic growth theory reveals the inherent drivers of sustainable economic growth and can serve as an essential theoretical basis for tourism development. The primary task of developing high-quality tourism is to strengthen the innovative capacity of the tourism industry in the context of the specific development of the tourism industry, to promote the development and application of technology, and to realize the goal of high-quality tourism development by increasing the innovative and technological content of the tourism industry.

In 1987, the World Commission on Environment and Development formalized the concept and content of sustainable development. This theory, based on the principles of justice, continuity, and community, emphasizes that economic development must meet modern humanity's legitimate needs without compromising future generations' ability to meet their legitimate needs. In particular, equity implies that sustainable development must consider the equitable distribution of existing and future natural resources. In contrast, the focus of sustainable development means that natural resources are developed and utilized in a way that adapts to environmental conditions and maintains the capacity of ecosystems to regenerate. The concept of sustainable tourism, first introduced in the 1990s, suggests that tourism is not fully compatible with the beautiful premise of a "smoke-free industry," nor is it fully compatible with the "smoke-free industry." The concept of sustainable tourism, first introduced in the 1990s, shows that tourism does not fully conform to the beautiful premise of a "smoke-free industry," nor does it harmonize and regulate the relationship between tourism development, business activities, and environmental protection. The characteristics of the tourism industry also require high-quality development, focusing on capacity and environmental self-regulation, highlighting the long-term benefits of tourism development, and seeking a sustainable development path between the economy, society, and the environment. The current status of green tourism development is shown in Figure 5.

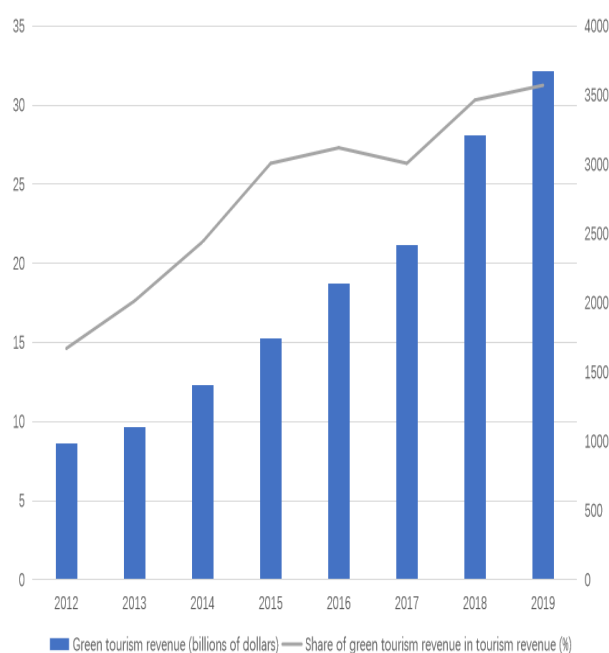


Figure. 5 Current status of green tourism development

In the context of high-quality development, innovation is a fundamental task for comprehensive development, and the concept of innovation is anchored in all aspects of the work of the Party and the State and social life. The promotion of diversified innovation is crucial to global economic and social development. Tourism has also entered a new phase of innovation. The demand for a better life has become the main driver of innovation factors such as tourism companies, finance, technology, and institutions. In the past, promoting high-quality tourism through capital and labor development models was difficult. In the future, it will be necessary to actively promote the integration of tourism technologies, introduce new information technologies to improve the quality of tourism products and services, and introduce new forms of tourism to facilitate the development of tourism products and structures.

Coherent development requires respecting and valuing the universality and comprehensiveness of the story. It enhances the country's soft power, promotes sustainable urban and rural development, and harmonizes meaningful development relationships. A long industry chain, wide scope and strong dynamics characterize tourism. However, the development of China's tourism industry remains unsustainable and insufficient due to differences in tourism resources, infrastructure, and the tourism environment between regions. Therefore, the coordinated development of tourism focuses on the linkages and coordination between tourism and economic, environmental, and urban development systems and on strengthening the weaknesses, gaps, and shared interests of overall development. In addition, it is hoped that the interface between tourism and other sectors and regions with potential for deep integration and development will be actively explored, gathering resources and interests from the different areas to build a regional economic

development complex and ensuring that scientific tourism planning promotes economic growth.

The importance of green development and ecological civilization has become a social consensus. Tourism is an essential means of effectively compensating for the cost of green services, facilitating the transition from green mountains to gold mountains, and playing a vital role in protecting natural resources and the environment. In the past, the development of mass tourism has caused many environmental problems. Therefore, future tourism must be closely linked to an ecological philosophy and promote global sustainability. Tourism development plans should include green concepts and scientific assessments of the potential environmental impacts of tourism. At the same time, public tourism services should be continuously improved, the design and delivery of ecotourism products should be optimized, and tourism conservation and low-carbon eco-consumption should be promoted.

Open development is essential in building China as a genuine economic power. Therefore, it is necessary to follow the trend of open development, grasp the direction of economic globalization, actively share development opportunities and achievements, and gradually enhance the international community's right to speak in a world of cooperation, peace, and win-win situations. In the new era of high-quality development, the development of the tourism industry must continue to improve transparency, realize open development and exchanges at home and abroad, and further enhance international competitiveness. The openness and high-quality development of the tourism industry are reflected in the breakthrough of the traditional tourism model, which is gradually being transformed into an open and comprehensive tourism model that guides the economic development of the tourism industry. In the international arena, it is hoped that the level of tourism opening up to the outside world will be further improved, the domestic and foreign tourism markets will be expanded, the attractiveness of inbound tourism will be enhanced, the story of China's tourism will be told well, and the mutual understanding of human civilization will be promoted.

Sharing is the original and ultimate goal of high-quality development and an essential manifestation of the ideal of shared prosperity. Future economic development must meet the requirements of participation, construction, sharing, the establishment of effective distribution mechanisms, equitable growth, and profitability. Tourism is the most critical welfare sector and source of livelihood and is vital in improving and uplifting people's lives. The concept of CI should be transformed into quality tourism development aimed at improving people's livelihoods, enhancing the quality of the tourism experience, and increasing expectations and aspirations for a better life. Tourism green development drivers, as shown in Figure 6.

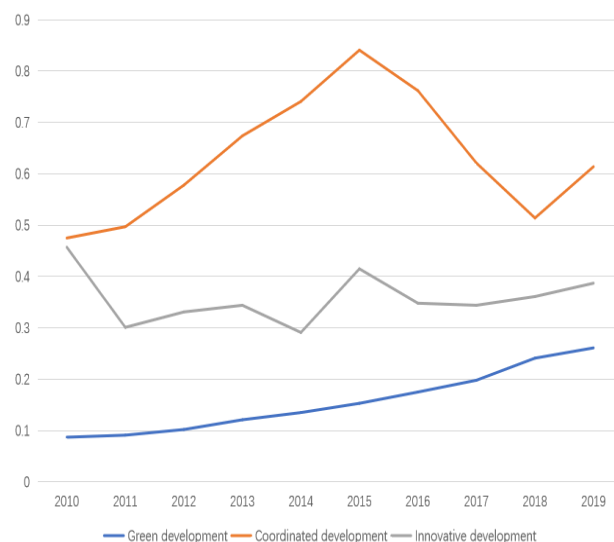


Figure. 6 Tourism greening drivers

4.2 Discussion on quality development of the tourism sector

The annual average value of innovative development in tourism increased from 0.135 to 0.264, with an overall growth rate of 94.12% and an average yearly growth rate of 7.65%, which indicates that despite the relatively low level of innovative development in the domestic tourism industry, it remains the main driver for the development of high-quality tourism. At the regional level, only the eastern region exceeds the national average, with significant differences between the three areas, indicating that the eastern part is the most advanced in innovation and tourism. However, there are substantial shortcomings and deficiencies in developing tourism innovation in the central and western countries. By region, Beijing, Shanghai, Guangdong, Jiangsu, and Zhejiang are the top regions for innovation and tourism development (5 on average). Notably, the innovation centers are located on the east coast of China, connected to critical economic regions such as the Beihai, Sheep Farms, and the Pearl River Delta. These regions have a strong foundation for innovation and were the first to focus on economic change and innovative development, which is why tourism is leading the way in technological innovation, change, and adoption. Overall, only 11 regions have a higher level of creation than the national average. Among them, Beijing has the highest standard, and Ningxia has the lowest average of 2,226 times, which fully reflects the significant differences in the development of innovative tourism in different provinces.

On average, the tourism industry's coordinated development level was high, and growth was stable in 2010-2019. The average growth rate increased from 0.493 to 0.601, with an overall growth rate of 21.9%, reflecting the overall coordinated dynamics of the tourism industry. At the regional level, the development of the eastern and central regions has exceeded the national average and is

very close to it, indicating that the coordinated development of tourism in the central and east areas is gradually optimized. Regional balance is slowly improving. Guangdong, Zhejiang, Shandong, Yunnan, and Sichuan are hotspots for the coordinated development of China's tourism industry, suggesting that tourism can play a good leading role in these provinces and that the overall development of tourism and related sectors is coordinated. The eastern coastal region includes Guangdong, Zhejiang, Shandong, Yunnan, and Sichuan, where tourism is an important economic pillar. Both provinces are central tourism provinces in the west and are rich in tourism natural resources. They have demonstrated tremendous growth, stability, industrial connectivity, and structural rationality in tourism development, laying a solid foundation for regional coordination and tourism quality development. Overall, the level of coordinated tourism development in 19 provinces is higher than the national average. The difference between Guangdong's maximum value and Qinghai's minimum value is 1,092 times, indicating that the domestic tourism industry is highly coordinated, but regional differences still exist. MEC's analysis of the role of green tourism and green development enhancement is shown in Figure 7.

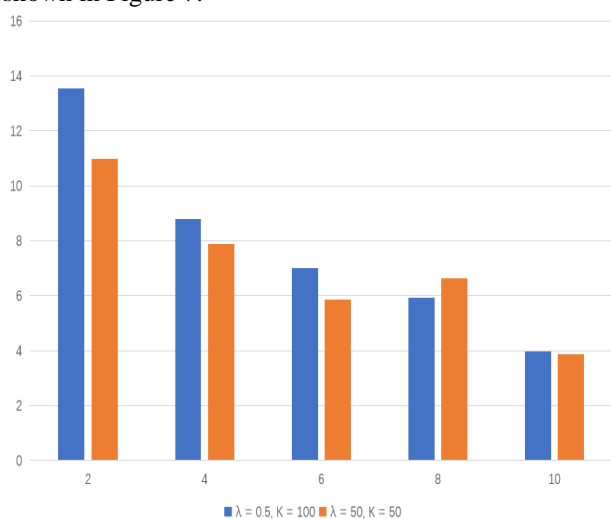


Figure. 7 Analysis of MEC's role in enhancing green tourism and green development

Developing green tourism was the only subsystem with a negative average annual growth rate, from an average of 0.432 to 0.406, with an overall rate of change of 5.95%, indicating that the tourism industry has neglected the importance of developing ecotourism and green tourism, harmonizing business interests and local economic development. And the associated problems of overexploitation and pollution. At the regional level, only the eastern region is above the national average. Product in the different areas is quantitatively similar, indicating a relatively high overall level. The development of domestic tourism has relatively slight regional variation. Hainan, Qinghai, Chongqing, Jiangxi and Ningxia are hotspots for green tourism development at the provincial level. These provinces have favorable environments and

resources, with Hainan, Qinghai, and Ningxia leading the country in ecotourism development. Chongqing and Jiangxi provinces have significant advantages in nature conservation, urban greening, and environmental protection, while Guizhou, Shanxi, Yunnan, Henan, and Jiangsu provinces are cold areas for developing green tourism. Among them, tourism pollution has improved in Shanxi, Henan, and Jiangsu provinces, while environmental protection is relatively weak in Shanxi and other provinces, and the level of green tourism development is relatively low. Regarding regional differences, the difference between the maximum value of Hainan Province and the minimum value of Guizhou Province is 0.853 times.

The average level of development of the tourism industry in this period increased from 0.174 in 2010 to 0.158 in 2014 and then gradually increased to 0.204 in 2019, with an overall level of 17.24%, which on the other hand reflects the relatively low level of openness and development of the domestic tourism industry. It also demonstrates the sensitivity of the open tourism industry, which is less affected by the international environment and more unstable. The western region has the highest level of development, while the eastern and central areas are slightly below the national average. At the provincial level, the main development sites for domestic tourism are Yunnan, Qinghai, Inner Mongolia, Beijing, and Shaanxi, while the cold regions are Ningxia, Henan, Hebei, Jiangxi, and Gansu. In the cold areas, tourism development is mainly limited by local conditions and foreign tourism development. The popular provinces are famous tourist destinations at home and abroad with good attractions and popularity.

Meanwhile, transportation and hospitality facilities related to local tourism are relatively advanced, especially in Yunnan, Beijing, and Shaanxi, creating a good foundation and scale for domestic and foreign tourism development. Tourism in Qinghai and Inner Mongolia also has good advantages and development opportunities in the Belt and Road region. As far as regional differences are concerned, 11 provinces have higher than average rates. The highest rate in Yunnan is 3,075 times higher than Ningxia's lowest rate, reflecting regional differences in domestic tourism development.

Tourism development's average annual growth rate increased from 0.257 to 0.337, with an average yearly growth rate of 3.05% staying only in the innovative development subsystem. Therefore, the development of the Ministry of Tourism also plays an essential role in the quality of tourism development. Tourism has significantly improved services and people's demand for a better life. At the regional level, the country's average regional level of tourism co-development is that the differences between the overall zones are moderate. As a whole, tourism hotspots are Beijing, Zhejiang, Inner Mongolia, Hebei, and Qinghai. Eastern coastal provinces such as Beijing and Zhejiang have a solid regional base and great tourism potential, providing residents with quality public services and tourism products and services. These regions also

have more minor differences in tourism consumption and a relatively high share of tourism due to sustainable rural and urban development. In relatively underdeveloped areas such as Inner Mongolia and Qinghai-Harbin, tourism development has effectively revitalized the countryside, reduced poverty, and addressed the region's employment, income, and infrastructure issues. Considerable progress has also been made in disseminating achievements. Anhui, Guizhou, Guangxi, Chongqing, and Tianjin are cold development areas for cooperative tourism, which indicates significant differences among these provinces in terms of tourism participation and goals for cooperative and joint tourism. Regarding regional differences, each section generally has a higher share of tourism, with 17 regions exceeding the national average but with even more significant variations. The CIPP model analysis of the role of green development on green tourism is shown in Figure 8.

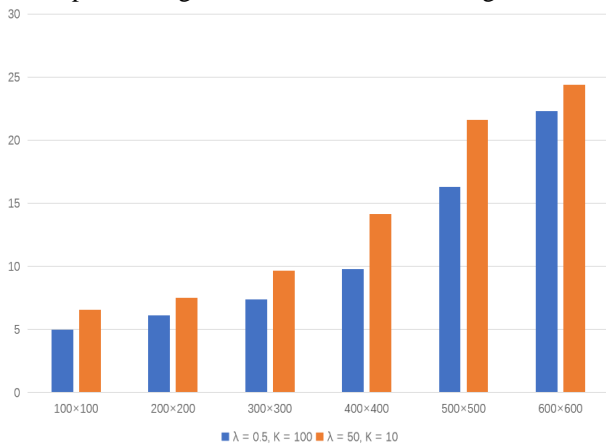


Figure. 8 CIPP model analysis of the role of green development on green tourism

Regarding the average annual development level, the overall efficiency of tourism quality varied between 2010 and 2015, decreasing from 0.224 to 0.204. Between 2015 and 2019, the growth trend was rapid, with average annual growth rates of 6.64% and 0.263%, respectively. This reflects that 2015-2019 is a period of immediate improvement in the overall quality and efficiency of the tourism industry, which continues to drive dynamic demand for domestic tourism. There is a growing focus on the quality of tourism services, rapid market access improvement, and tourism industry efficiency. Guizhou, Sichuan, Jiangxi, Anhui, and Shandong provinces and cities are high-quality and efficient tourism hotspots in China, indicating that these regions generally have high tourism dynamics, supply quality, and productivity. In particular, tourism in Guizhou Province has shown explosive growth in recent years. The number of tourists and total tourism revenue in other regions grew by more than 30% annually from 2016 to 2019, which clearly shows that the abundance and quality of local tourism products have made local tourism departments more efficient in managing tourism products and quality. Unpopular provinces are Ningxia, Qinghai, Gansu, Heilongjiang, and Shanghai. Improving the quality and

efficiency of tourism in these regions is mainly limited by the dynamism of demand and the rate of local tourism supply.

Meanwhile, Shanghai has been successful in terms of the supply and productivity of tourism products and the quality and efficiency of tourism, mainly due to the slow growth of local tourism demand. Regarding regional differences, the quality and efficiency of tourism in China's 15 provinces is generally higher than the national average, while the provinces with higher and lower overall levels are relatively average. However, the difference between the maximum value in Guizhou and the minimum value in Ningxia is 2,068 times, showing a clear development gap.

5. Conclusion

The new development concept provides essential guidelines for the high-quality development of tourism, but China's tourism industry still has a long way to go. Research shows that from 2010 to 2019, the annual growth rate of high-quality development of China's tourism industry was only 2.24%. Although the growth rate of the domestic tourism industry is ideally improving, the growth rates of quantitative indicators such as tourism revenue and tourism volume are still much lower. China still has a long way to go to develop quality tourism. Based on the results of previous research, this paper puts forward several suggestions for decision-making on the high-quality development of China's tourism industry. Research has shown that the level of innovation in China's tourism industry is increasing, and multivariate analysis suggests that innovation is a crucial force driving industrial change and quality development. It is, therefore, essential to continue supporting an innovative and technology-driven tourism industry and continuously improving its innovative technologies and content. Greater emphasis will be placed on training and improving the quality of tourism staff.

Tourism talent is the basis for innovation in tourism management and services and a critical factor in developing the tourism innovation system. It is necessary to reform the tourism talent system in colleges and universities, strengthen the training of multidisciplinary professionals, optimize the existing tourism talents, actively create an atmosphere of tourism innovation, and improve the management mechanism of tourism patent protection. Lay the foundation for the transfer and transformation of innovative knowledge. Actively manage the in-depth integration of modern technology and tourism. The new Crown Pneumonia pandemic and other emergencies in 2019-2019 also contributed to creating new tourism models. Using new technologies is a crucial way to bring innovative tourism products to the market, improve the quality of services, develop smart tourism, and promote industrial change. Using technologies such as the Internet of Goods and geographic information systems (GIS) in tourism enterprises will contribute to the

transformation of tourism services, marketing, and management.

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