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NGUYEN QUYNH TRANG

**STATE MANAGEMENT OF ECO-INDUSTRIAL PARK
DEVELOPMENT IN VIETNAM**

DOCTORAL DISSERTATION ABSTRACT

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Assoc. Prof. Dr. Nguyen Quoc Thai

Academic supervisors



1. Dr. Do Tat Cuong



2. Assoc. Prof. Dr. Dinh Cong Hoang

Reviewer 1: Assoc. Prof. Dr. Nguyen Thu Thuy
Thuongmai University

Reviewer 2: Assoc. Prof. Dr. Nguyen Huy Hoang
Graduate Academy of Social Sciences,
Vietnam Academy of Social Sciences

Reviewer 3: Assoc. Prof. Dr. Tran Quang Phu
Ho Chi Minh National Academy of Politics

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INTRODUCTION

1. Rationale for selecting the topic

In the process of industrialization, modernization, and international economic integration, industrial parks (IPs) have become an important component of Vietnam's industrial development space. They have contributed to attracting investment capital, promoting economic restructuring, expanding export-oriented production, creating employment, and forming concentrated production centers in many localities. Alongside these positive contributions, however, the traditional IP model has revealed numerous limitations, particularly inefficient resource use, high energy consumption, generation of industrial waste, increasing pressure on technical and social infrastructure, and the emergence of environmental problems in areas of concentrated production. In the context in which sustainable development, green growth, and the circular economy (CE) are increasingly becoming the dominant orientation of economic development, the continued maintenance of an extensive IP model based primarily on land expansion, investment incentives, and the exploitation of low-cost advantages is no longer appropriate. This creates an urgent requirement to transform the IP development model toward an ecological orientation, in which the State plays a role in providing orientation, creating institutions, regulating resources, conducting inspection and supervision, and supporting the transition process.

An eco-industrial park (EIP) is a model of IP development based on the principles of efficient resource use, emission reduction, enhanced waste reuse, promotion of industrial symbiosis (IS), and harmonization among economic, environmental, and social objectives. Unlike conventional IPs, an EIP is not merely a place where manufacturing enterprises are concentrated; it is also a linked system in which enterprises, infrastructure investors, regulatory authorities, and the community coordinate to optimize flows of materials, energy, water, waste, and supporting services. Therefore, EIP development cannot rely solely on the isolated efforts of individual enterprises. It requires a coherent system of state management (SM), including planning, policies, technical standards, incentive mechanisms, decentralization of management, environmental monitoring, financial and technological support, and effective implementation organization.

The urgency of the topic first derives from the requirement to renew Vietnam's growth model in the new period. The Vietnamese economy is

shifting from rapid growth to sustainable growth, and from attracting investment through cost advantages to attracting high-quality, high-technology, low-emission investment capable of deeper participation in global value chains. In this context, IPs are key sites for implementing the green transition of the industrial production sector. Without appropriate management policies, IPs may continue to concentrate resource-intensive production activities, exert substantial pressure on the environment, and reduce the long-term competitiveness of the economy. Conversely, if managed in an ecological direction, IPs may become drivers of technological innovation, energy saving, emission reduction, CE development, and enhanced competitiveness at both local and national levels.

Second, the rise of environmental standards and sustainable development requirements in international trade and investment is placing considerable pressure on developing countries, including Vietnam. Multinational corporations increasingly prioritize investment locations with green infrastructure, effective environmental treatment systems, access to renewable energy, appropriate labor standards, and sustainable governance mechanisms. At the same time, major export markets are increasingly applying requirements related to carbon emissions, traceability, cleaner production, and environmental responsibility in supply chains. Consequently, EIP development is not only an environmental protection requirement but also a critical condition for Vietnam to maintain its competitive advantage in attracting foreign direct investment, expanding exports, and participating in global supply chains in a sustainable manner.

Third, although Vietnam has initially established a policy and legal framework for EIP development, practical implementation remains subject to many limitations. EIP-related provisions have been mentioned in the legal system governing IPs and economic zones, along with orientations on green growth, the CE, efficient resource use, and environmental protection. However, the transition from traditional IPs to EIPs has proceeded slowly, lacked consistency across localities, and has not yet generated sufficiently strong mechanisms to encourage enterprise participation. Existing problems include EIP recognition criteria that remain difficult to implement on a broad scale; incentive mechanisms that are not sufficiently attractive; limited financial resources for green transformation; the management capacity of some localities

and IP management boards that has not met requirements; insufficient data for monitoring and evaluation; and ineffective coordination among ministries, sectors, localities, infrastructure investors, and secondary enterprises. These limitations indicate that the core issue lies not only in the technical conversion of IPs, but also in the quality and effectiveness of SM over the EIP development process.

From a theoretical perspective, the development of the EIP model creates a need to supplement and improve research on the management of industrial development in a sustainable direction. Whereas SM of traditional IPs has mainly focused on investment attraction, infrastructure development, and management of production activities, SM of EIPs requires a more integrated governance approach, covering resource management, environmental protection, promotion of IS, coordination among participating actors, and support for transition toward the CE. This generates the need for deeper research on the role of the State in institutional design, policy coordination, resource allocation, and ensuring coordination among actors involved in EIP development. Accordingly, SM of EIP development has become a topic of concern to both theoretical researchers and practitioners in order to meet the requirements of green, modern, and sustainable industrial development.

Fourth, from a scientific perspective, SM of EIP development is an interdisciplinary topic combining economic management, environmental management, public policy, development planning, industrial economics, and the CE. However, current studies in Vietnam often focus on environmental engineering, IS models, resource-use efficiency, or experience in EIP development, while specialized studies on SM of EIP development remain insufficient and unsystematic. In particular, there is still a lack of comprehensive studies analyzing the role of the State in such aspects as institutional development, development planning, organizational apparatus, decentralization of management, policy coordination, resource mobilization, inspection and supervision, and assessment of implementation effectiveness. This is the research gap that needs further clarification in both theoretical and practical terms.

For the above reasons, the selection of the topic ***“State Management of Eco-Industrial Park Development in Vietnam”*** is necessary both theoretically and practically. Theoretically, the topic contributes to systematizing and

clarifying the scientific foundations of SM of EIP development under the conditions of an economy transitioning toward green and sustainable development. Practically, the research findings may provide evidence for improving policies, enhancing the effectiveness of implementation organization, strengthening coordination among actors, and promoting the scaling up of the EIP model in Vietnam. In the context in which green development has become an inevitable requirement, this study is significant for contributing to the transformation of Vietnam's IP system toward a modern, ecological, efficient, and sustainable orientation.

2. Research Questions

The dissertation focuses on addressing the following research questions:

- (i) What factors influence state management of eco-industrial park (EIP) development?
- (ii) What criteria can be used to evaluate state management of EIP development?
- (iii) What is the current state of state management of EIP development in Vietnam? What achievements have been made, what limitations remain, and what are the underlying causes of these limitations?
- (iv) What solutions should the State implement to improve state management of EIP development in Vietnam in the coming period?

3. Research Objectives and Tasks

Research Objective

The objective of the dissertation is to clarify the theoretical and practical foundations of state management of EIP development in Vietnam, thereby proposing orientations and a system of solutions to improve state management and promote the development of EIPs in Vietnam in an efficient and sustainable manner, in line with the requirements of green transition, the circular economy, and industrial development in the new context.

Research Tasks

To review previous studies related to the dissertation topic, assess the findings and achievements of existing research, identify research gaps, and establish the specific research approach adopted by the dissertation.

To clarify the theoretical foundations of state management of EIP development, including the identification of evaluation criteria and factors influencing state management of EIP development.

To analyze international experience in state management of EIP development and draw lessons applicable to Vietnam.

To assess the current state of state management of EIP development in Vietnam. On this basis, the dissertation identifies the achievements, limitations, shortcomings, and underlying causes of the limitations in state management of EIP development in Vietnam.

To propose a feasible system of solutions to improve institutions, policies, planning, implementation arrangements, coordination mechanisms, financial resources, management capacity, monitoring systems, and supporting instruments for EIP development in Vietnam.

4. Research Subject and Scope

Research Subject

The research subject of the dissertation is state management of EIPs in Vietnam, including the system of orientations, policies, laws, planning, organizational arrangements, management instruments, coordination mechanisms, inspection and monitoring activities, and state support and regulatory measures aimed at promoting the establishment, transformation, operation, and development of industrial parks toward ecological development, resource efficiency, environmental protection, and sustainability.

Research Scope

Scope of management: The study focuses on state management activities undertaken by the Government and central state management agencies in relation to EIP development in Vietnam.

Geographical scope: The study covers Vietnam nationwide, with consideration of selected industrial parks piloting the transition to the EIP model. In addition, the dissertation examines and analyzes models and practices of state management of EIP development in Thailand and the Republic of Korea.

Time scope: The study covers the period from 2015 to 2025, with solutions proposed through 2035 and a vision to 2050.

Content scope: EIP development is approached through two modes, namely new establishment and transformation. State management is analyzed according to the following functions: planning, policy formulation, implementation, inspection, and monitoring, based on the current legal framework.

5. Theoretical Foundation and Research Methodology

State management of EIP development is closely associated with the formulation and implementation of public policies, the operation of industrial symbiosis mechanisms within industrial parks, and the sustainable development objectives of the EIP model. Accordingly, the dissertation draws upon three theoretical foundations: the Policy Cycle Model, Industrial Symbiosis Theory, and the Three Pillars of Sustainable Development Theory.

The analytical framework examines state management through four basic management functions. These functions influence the promotion of industrial symbiosis linkages within industrial parks while contributing to the sustainable development objectives of EIPs across three dimensions: economic, environmental, and social. The analytical framework provides the basis for developing a set of survey indicators and analyzing the current state of state management of EIP development in the subsequent chapters of the dissertation.

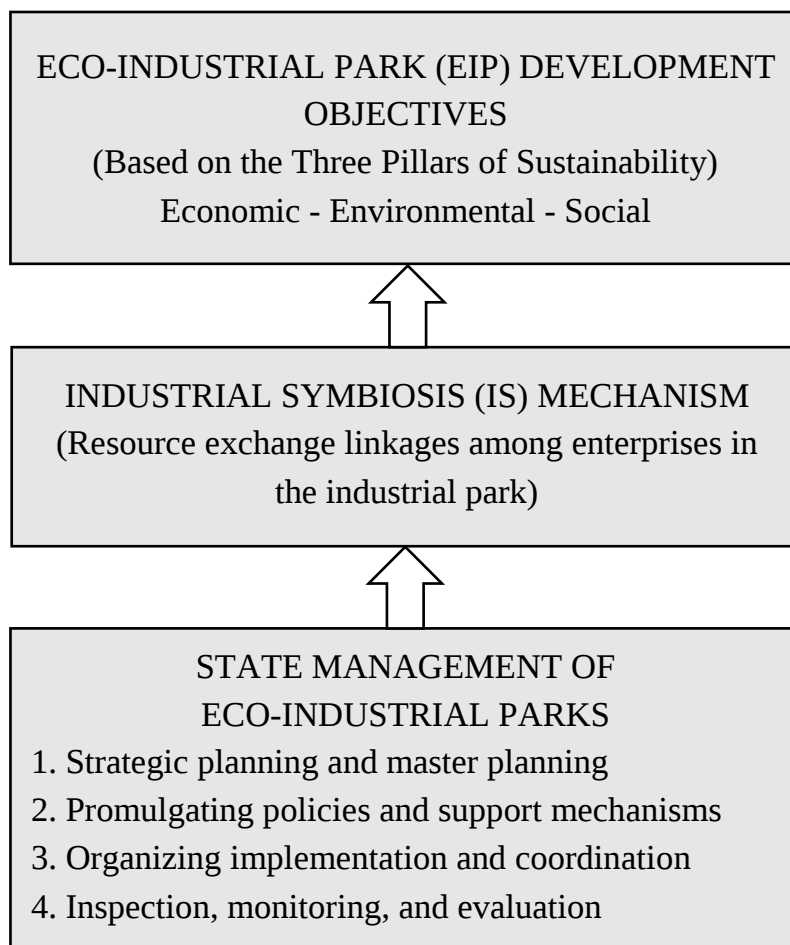


Figure 1. Analytical Framework

Source: Proposed by the author.

The dissertation employs a combination of qualitative and quantitative research methods. The qualitative research includes document analysis and synthesis, historical-logical analysis, comparative analysis, and in-depth interviews with 15 experts to establish the theoretical foundation and clarify practical issues. The quantitative research was conducted through a questionnaire survey comprising 28 observed variables and 156 valid responses to assess state management activities according to the four management functions and the outcomes of EIP development. The data were analyzed using reliability testing of the measurement scale (Cronbach's Alpha) and descriptive statistics.

6. New Contributions of the Dissertation

Theoretical contributions: The dissertation develops and refines a theoretical framework for state management of EIP development that is appropriate to the context of green transition and economic institutional development in Vietnam.

Practical contributions: The dissertation systematically identifies the current state of EIP development and clarifies the nature of the “governance bottlenecks in EIP development” in Vietnam during the recent period.

Policy and practical solutions: The dissertation proposes an integrated ecosystem of management solutions that directly addresses the questions of what the State should do and which policy instruments should be employed to promote the transition toward EIPs.

7. Theoretical and Practical Significance of the Dissertation

Theoretical significance: The dissertation contributes to clarifying the content and research approach to state management of EIP development by developing an analytical framework that integrates the policy cycle, industrial symbiosis mechanisms, and sustainable development objectives.

Practical significance: The findings of the dissertation provide an additional reference basis for state management agencies in formulating and improving policies for EIP development in Vietnam. The analyses of the current situation and the proposed solutions may be considered in the implementation of policies related to EIP development and the transformation of industrial parks toward sustainability.

8. Structure of the Dissertation

The dissertation consists of the following sections: Introduction; the main body, comprising four chapters and 12 sections; Conclusion; List of the author's published scientific works related to the dissertation topic; References; and Appendices.

Chapter 1

OVERVIEW OF RESEARCH ON STATE MANAGEMENT OF ECO-INDUSTRIAL PARK DEVELOPMENT

1.1. OVERVIEW OF RESEARCH WORKS RELATED TO THE DISSERTATION TOPIC

1.1.1. Foundational studies on eco-industrial parks and implications for state management of eco-industrial park development

Research on EIPs has been formed on the foundations of industrial ecology and the principle of industrial symbiosis, and subsequently expanded to governance, institutional and sustainable development dimensions. EIPs are regarded not only as a technical model for optimizing resource use but also as a multi-actor system in which the State's role in coordination and institutional environment creation is increasingly emphasized.

In practice, many international studies have analyzed typical models such as Kalundborg and EIPs in Europe, the United States and Asia. These studies show diversity in formation pathways and affirm the role of policies, planning and coordination mechanisms in EIP development. In addition, assessment methods and criteria for EIPs have increasingly been improved in a quantitative direction.

In Viet Nam, studies have mainly focused on three directions: developing concepts and criteria for EIPs; assessing transformation potential and practical effectiveness; and analyzing institutional and policy aspects. However, implementation still faces many limitations related to costs, data, management capacity and coordination mechanisms.

In general, although the theoretical foundations and practical experience of EIPs have become increasingly rich, research on the role and effectiveness of SM in EIP development, especially from a systematic and empirical perspective, remains limited, creating a research gap that needs further clarification.

1.1.2. Studies on state management of eco-industrial park development

International studies indicate that SM plays an important role in EIP development, from establishing orientations, building legal frameworks and issuing support tools to organizing implementation, monitoring and evaluation. Many studies approach SM according to the policy cycle and analyze groups of management tools, such as legal-institutional policies, economic policies, capacity-building policies and environmental policies.

In addition, studies employ various approaches, models and methods to analyze the role of the State, including institutional, systems and policy-cycle approaches; sustainable development assessment models and agent-based

simulation models; as well as qualitative and quantitative research methods. However, most studies tend to assess EIP development outcomes or the conditions for forming IS networks rather than directly measuring the effectiveness of SM activities.

In Viet Nam, studies on SM of EIP development remain relatively limited, focusing mainly on policy analysis, international experience review and assessment of implementation in selected localities. Existing works have initially identified inadequacies in the policy framework, coordination mechanisms and implementation conditions, but there are not many studies that systematically evaluate the effectiveness of SM of EIP development according to specific management functions. This is a research gap requiring further investigation.

1.2. GENERAL ASSESSMENT OF RESEARCH WORKS RELATED TO THE DISSERTATION TOPIC

1.2.1. Issues on which consensus has been reached

EIPs are formed on the foundations of industrial ecology and industrial symbiosis, associated with sustainable development objectives. Enterprises establish linkages to improve resource-use efficiency and reduce environmental impacts.

The role of the State is acknowledged as a key factor in EIP development, reflected in institution building, policy development and coordination among actors, usually associated with the combination of multiple policy instruments.

In Viet Nam, the legal and policy framework for EIPs has gradually been established, creating a basis for pilot implementation and orienting the transformation of the IP model.

Domestic studies have initially reflected the practice of EIP implementation, identified both benefits and difficulties, and proposed several policy orientations to promote the development of this model.

1.2.2. Scientific values inherited by the dissertation

From the overview of domestic and international research works, the dissertation can inherit several major scientific values.

First, the dissertation inherits the theoretical foundations of EIPs from industrial ecology, industrial symbiosis, CE and sustainable development, thereby identifying EIPs as a production-organization model based on optimizing material, energy, water and waste flows and cooperation among enterprises. The dissertation also inherits empirical findings on EIP models in selected countries, showing the important role of planning, coordination mechanisms, support policies, assessment standards and State monitoring systems.

In addition, the dissertation inherits research approaches to SM based on the policy cycle, management tools and multi-actor governance as a basis for developing its analytical framework. Domestic studies on criteria, policies, pilot programs and barriers to EIP development in Viet Nam also provide important references.

1.2.3. Research gaps

First, existing studies mainly approach EIPs from the perspectives of industrial ecology, IS, environmental techniques or resource-use efficiency, while SM of EIP development has not been studied as an integrated management whole.

Second, studies on SM of EIP development remain fragmented by individual policies or separate tools and have not fully analyzed the policy cycle from planning and policy promulgation to implementation, inspection, monitoring and evaluation.

Third, international experience in EIP development has not been sufficiently analyzed in relation to Viet Nam's institutional characteristics, management decentralization and conditions for transforming existing IPs.

Fourth, domestic studies still lack a systematic assessment of the effectiveness and efficiency of SM of EIP development and lack integrated management solutions suitable to Viet Nam's context.

1.3. ISSUES SELECTED FOR RESEARCH IN THE DISSERTATION

- Develop a theoretical analytical framework for SM of EIP development by combining the policy cycle, IS theory and sustainable development.
- Analyze and assess the current state of SM of EIP development in Viet Nam during 2015-2025 according to basic management functions.
- Propose solutions to improve SM in order to enhance management effectiveness and promote EIP development toward sustainability.

Chapter 2

THEORETICAL AND PRACTICAL FOUNDATIONS OF STATE MANAGEMENT OF ECO-INDUSTRIAL PARK DEVELOPMENT

2.1. ECO-INDUSTRIAL PARKS AND ECO-INDUSTRIAL PARK DEVELOPMENT

2.1.1. Eco-industrial parks

- Concept: An EIP can be understood as an IP in which enterprises establish linkages to use resources efficiently, promote cleaner production and implement IS, thereby pursuing sustainable development objectives.

- Characteristics of EIPs: EIPs operate according to circular principles, aiming at resource reuse, optimization of material and energy flows, and waste reduction. IS is the core mechanism, requiring linkages among enterprises, appropriate technical infrastructure and coordination among multiple actors. The ultimate objective of EIPs is sustainable development, balancing economic efficiency, environmental protection and social benefits.

- Classification of EIPs: EIPs may be classified according to their formation origin, the structure of linkages among enterprises within the IP, and the central coordination mechanism in the IS system.

2.1.2. Eco-industrial park development

- Concept: EIP development is the process of forming or transforming IPs according to the principles of industrial ecology, aiming at efficient resource use, emission reduction and sustainable development.

- Modes of EIP development: Through the transformation of existing IPs and through the establishment of new EIPs.

- Contents of EIP development by mode: Development of the technical and environmental infrastructure of IPs; promotion of IS linkages among enterprises; and improvement of the management and coordination mechanism for EIP operations.

2.2. STATE MANAGEMENT OF ECO-INDUSTRIAL PARK DEVELOPMENT

2.2.1. Concept and foundational theories of state management of eco-industrial park development

The research clarifies the theoretical foundations of SM of EIP development. Accordingly, SM of EIP development is understood as the process by which the State uses public authority and policy instruments to orient, regulate, promote and supervise the formation and operation of IPs according to the principles of industrial ecology and IS. Unlike the management of conventional IPs, SM of EIPs does not focus only on planning, infrastructure investment and environmental control; it also includes organizing IS linkages, optimizing flows of materials, energy, water, by-products and waste within IPs.

In terms of theoretical foundations, the study employs four main approaches. First, institutional theory emphasizes the role of the legal framework, policies, standards, incentive mechanisms and coordination mechanisms in establishing the “rules of the game” for actors participating in EIP development. Second, industrial ecology theory indicates that EIPs should be approached as connected production systems in which waste or by-products from

one enterprise can become inputs for another. Third, CE theory provides the basis for analyzing the State's role in promoting resource reuse, emission reduction, shared infrastructure, green finance and data-based monitoring systems. Fourth, sustainable development theory orients the evaluation of EIPs across economic, environmental and social dimensions.

On this basis, the dissertation determines that SM of EIP development should be implemented in an integrated, synchronous and systemic manner, combining industrial policy, environmental policy, investment policy, land policy, science and technology policy and labor policy. This provides the foundation for developing the analytical framework, assessing the current situation and proposing solutions to improve SM of EIP development in Viet Nam.

2.2.2. Object and target of state management of eco-industrial park development

The study clarifies the difference between the object and target of SM of EIP development. Accordingly, the management object is the entire process of EIP development in the economy, including the establishment of new IPs with an ecological orientation, the transformation of existing IPs into ecological models, and the organization and operation of IPs according to the principles of industrial ecology and IS. In this case, SM does not focus on managing each enterprise separately, but aims to regulate, orient and control the process of IP development according to the ecological model.

The management targets include the economic, technical and environmental factors and relationships arising in the process of EIP development, such as resource and energy use, material and energy exchanges among production facilities, and the environmental impacts of industrial activities. In addition, actors participating in EIP development, including IP infrastructure investors and production facilities operating in IPs, are also targets affected by SM policies and instruments. Clearly identifying the object and target of management is an important basis for defining the scope, content and methods of SM of EIP development toward sustainability.

2.2.3. Objectives of state management of eco-industrial park development

- Orient IP development toward ecological and sustainable models.
- Promote the process of forming and transforming EIPs.
- Improve resource-use efficiency and minimize environmental impacts in IPs.
- Create a favorable institutional environment for the formation and operation of EIPs.

2.2.4. Contents of state management of eco-industrial park development

The dissertation identifies four basic groups of contents of SM of EIP development, reflecting the State's management functions in orienting, supporting, implementing and controlling the development of this model. First, formulating strategies and planning for EIP development is foundational, aiming to establish long-term orientations, development roadmaps and spatial organization of the IP system according to the ecological model. This content includes not only the planning of IP locations and scale, but also links with sectoral structure, the potential to form IS linkages, demand for environmental infrastructure, energy infrastructure, transport and related regional plans.

Second, promulgating support policies for EIP development is the process of concretizing strategic orientations and planning into legal regulations, technical standards and policy instruments. The State needs to improve criteria for identifying EIPs, mechanisms for recognizing and managing EIPs, and incentive policies relating to finance, green credit, investment support, technological innovation, cleaner production and efficient resource use. Technical support policies, training, consultancy and information provision on material, energy and by-product flows within IPs also play an important role in promoting IS linkages among enterprises.

Third, organizing the implementation of EIP development is the stage of translating orientations and policies into practical activities. This content includes implementing programs for the development of new EIPs, transforming existing IPs into ecological models, and mobilizing and allocating financial, technical and human resources for environmental infrastructure development, clean technology adoption and resource-use efficiency improvement. At the same time, SM needs to establish coordination mechanisms among management agencies, IP management boards, infrastructure investors, manufacturing enterprises and technical support organizations to ensure that implementation is coherent, effective and consistent with sustainable industrial development objectives.

Fourth, monitoring, evaluation and policy adjustment for EIP development ensure the effectiveness and efficiency of SM. These activities are not limited to checking compliance with legal regulations; they also monitor the extent to which objectives on efficient resource use, emission reduction, waste reuse, environmental infrastructure development and IS linkages are achieved. Based on evaluation indicators and monitoring data, the State can promptly adjust criteria, support policies and management measures to fit practical conditions.

Thus, the four contents, namely strategy and planning formulation, support policy promulgation, implementation organization, and monitoring, evaluation and policy adjustment, constitute a unified SM process for EIP development. They also provide an important theoretical basis for the dissertation to develop an analytical framework, assess the current situation and propose solutions to improve SM of EIP development in Viet Nam.

2.2.5. Criteria for evaluating state management of eco-industrial park development

The criteria for evaluating SM of EIP development consist of two groups: criteria for evaluating the management process and criteria for evaluating results and impacts. The first group is associated with strategy formulation, policy promulgation, implementation organization, and monitoring and evaluation. The second group reflects the economic, environmental and social impacts of SM on EIP development. On this basis, the dissertation develops observed variables and survey questions to assess the current situation and management effectiveness.

2.2.6. Factors affecting state management of eco-industrial park development

- Objective factors: These include institutions and macro-policy orientations; economic and market conditions; international commitments and trends on sustainable development; and social participation and consensus.
- Subjective factors: These include the characteristics of existing IPs; the capacity and awareness of the management staff; the organizational apparatus and coordination mechanisms; administrative procedures and management tools; and financial resources and support mechanisms.

2.3. EXPERIENCE OF STATE MANAGEMENT OF ECO-INDUSTRIAL PARK DEVELOPMENT IN SELECTED COUNTRIES AND LESSONS FOR VIET NAM

2.3.1. Experience in state management of eco-industrial park development in Thailand

Thailand is a country that implemented EIPs early, with the State playing a central role throughout the policy cycle:

- Strategies and planning: Thailand integrates EIPs into the national strategy for 2018-2037, develops a system of criteria and orients development according to a multi-level model covering the IP, city and ecological region.
- Support policies: Thailand promulgates a system of criteria, economic instruments such as tax incentives and green credit, provides technical support and integrates EIPs into the BCG strategy.

- **Implementation:** Implementation is conducted through a multi-actor coordination mechanism, with the Industrial Estate Authority of Thailand (IEAT) playing a coordinating role; pilot projects are promoted and the model is replicated.

- **Monitoring and evaluation:** Thailand develops a multi-level indicator system, combines State monitoring, third-party monitoring and community monitoring, and applies digital technology in environmental monitoring.

2.3.2. Experience in state management of eco-industrial park development in South Korea

South Korea is a pioneer in Asia in EIP development, mainly through the transformation of existing IPs under a national program implemented from 2005 following a pilot-expansion-completion roadmap.

- **Strategies and planning:** EIP development is linked with green growth strategies, the low-carbon economy and national industrial planning, combining central orientation with flexible local implementation.

- **Support policies:** South Korea develops a legal framework, provides financial support through co-financing mechanisms, technical assistance, training and evaluation criteria systems to encourage enterprises to participate in IS.

- **Implementation:** A multi-level coordination mechanism is established, with the Ministry of Trade, Industry and Energy (MOTIE), Korea Industrial Complex Corporation (KICOX) and regional centers acting as coordinators; enterprises are the direct actors implementing IS projects.

- **Monitoring and evaluation:** South Korea develops data and periodic reporting systems to monitor economic, environmental and social indicators, combining central and local monitoring with policy-learning mechanisms.

2.3.3. Lessons for Viet Nam

- **Strategies and planning:** It is necessary to integrate EIPs into national industrial development and green growth strategies to ensure unified orientation.

- **Support policies:** Viet Nam should develop a coherent policy system that combines legal regulations with financial incentives and technical support to encourage enterprise participation.

- **Implementation:** A clear coordination mechanism should be established among relevant agencies and actors to enhance implementation effectiveness.

- **Monitoring and evaluation:** A system of indicators and monitoring mechanisms should be developed to evaluate effectiveness and promptly adjust policies.

Chapter 3

CURRENT STATE OF STATE MANAGEMENT OF ECO-INDUSTRIAL PARK DEVELOPMENT IN VIET NAM

3.1. CURRENT STATE OF ECO-INDUSTRIAL PARK DEVELOPMENT IN VIET NAM

3.1.1. Stages of eco-industrial park development in Viet Nam during 2015-2025

The period 2015-2019 (pilot phase): Pilot projects were implemented with support from UNIDO, focusing on transforming existing IPs through cleaner production and the initial formation of IS.

The period 2020-2025 (expansion phase): The implementation scope was expanded through the Global Eco-Industrial Parks Programme (GEIPP), promoting IS, resource management and integration of CE; several initiatives emerged from infrastructure enterprises.

General characteristics: EIP development in Viet Nam mainly involves transforming existing IPs, while the establishment of new EIPs remains limited; the model is still pilot-oriented and dependent on external support.

3.1.2. Scale, types and distribution of eco-industrial park development in Viet Nam

- Scale: By 2025, only about 9 out of 447 IPs, approximately 2%, were being implemented toward the EIP model. The scale therefore remains small and the model is not yet widespread.

- Distribution: EIPs have appeared in several regions, from the North to the Central and Southern regions, but they are concentrated in industrially developed localities and have not yet formed large linkage clusters.

- Types: The dominant type is the transformation of existing IPs through pilot programs and international projects. Some IPs have been developed by investors voluntarily in an ecological direction, but these initiatives remain voluntary and not yet standardized.

- Sectoral characteristics: The sectoral structure is diverse, creating favorable conditions for IS and efficient resource use.

Overall, EIPs in Viet Nam remain in an initial stage, with small scale, dispersed distribution and dependence on more developed IPs; their spillover capacity remains limited.

3.1.3. Results of eco-industrial park development in Viet Nam according to sustainability pillars

- Economic pillar: Enterprises have reduced costs and improved resource-use efficiency, with savings amounting to tens of billions of Vietnamese dong per year. Green investment has initially been attracted, but impacts remain limited to pilot areas and aggregate data are lacking.

- Environmental pillar: This is the clearest result, including savings in energy and water, reductions in chemicals, significant reductions in CO₂ emissions, and the initial formation of IS.

- Social pillar: Impacts mainly involve raising awareness, training human resources and improving the working environment; long-term impacts such as green jobs and community engagement have not been clearly quantified.

In summary, EIPs in Viet Nam have generated initial effectiveness, most notably in the environmental dimension, followed by the economic dimension; however, the social pillar and the scale of implementation remain limited.

3.2. CURRENT STATUS OF STATE MANAGEMENT DIMENSIONS FOR ECO-INDUSTRIAL PARK DEVELOPMENT IN VIETNAM

3.2.1. Current state of strategy and planning formulation for eco-industrial park development

The State has integrated EIPs into green growth and sustainable industrial strategies, initially creating macro-level orientations. However, there is no specialized strategy or planning for EIPs, and the scale of implementation remains very limited, at approximately 2% of IPs. Planning is mainly integrated into broader documents, lacks data and inter-sectoral coordination, and therefore the level of transformation from orientation into practice remains low. In general, the current situation is strong in terms of orientation but weak in concretization and implementation.

3.2.2. Current state of policy promulgation and support mechanisms for eco-industrial park development

Inspection, monitoring and adjustment activities for EIP development in Viet Nam have initially been formed through tools such as evaluation criteria, periodic reports, inter-sectoral inspections and environmental monitoring, together with a relatively clear legal basis under Decree No. 35/2022 and a decentralization mechanism between central and local levels. Implementation focuses on monitoring compliance with environmental and resource-use requirements, initially improving effectiveness in pilot IPs. However, the system

remains fragmented, monitoring data and technology are not yet synchronized, transparency is insufficient and policy feedback mechanisms remain slow, which limits the effectiveness of adjustment.

3.2.3. Implementation organization and coordination of eco-industrial park development

Viet Nam has established an implementation and coordination mechanism for EIPs based on a multi-level and multi-sectoral model, with the Ministry of Planning and Investment playing a central role and with the participation of localities, enterprises and international organizations. Implementation has mainly occurred through pilot programs and technical assistance, initially producing positive results and shifting from experimentation toward standardization. However, inter-sectoral coordination remains limited, local capacity is uneven and there is still substantial dependence on external support, making implementation effectiveness not yet sustainable.

3.2.4. Inspection, monitoring and adjustment of eco-industrial park development

Viet Nam has initially established a system of inspection, monitoring and adjustment for EIPs through evaluation criteria, periodic reporting, inter-sectoral inspection and environmental monitoring. These activities help monitor compliance, improve environmental performance and provide data for policy adjustment. However, the system still mainly operates in a one-way manner, lacks data transparency and rapid feedback mechanisms, and has limited levels of technological application and spillover. In general, monitoring has an initial foundation, but the effectiveness of coordination and policy adjustment remains limited.

3.3. GENERAL ASSESSMENT OF STATE MANAGEMENT OF ECO-INDUSTRIAL PARK DEVELOPMENT IN VIET NAM

3.3.1. Achievements

State management of eco-industrial park (EIP) development in Viet Nam has achieved several initial results, creating an important foundation for the transformation of conventional industrial parks toward the EIP model. A basic management framework has gradually been established across four main functions: strategic orientation and planning, policy formulation, implementation and coordination, and monitoring and evaluation. This indicates that EIP development has begun to be recognized as an integral part of green growth, circular economy and sustainable industrial development.

The legal and policy framework has also been initially improved, providing a basis for identifying, supporting and managing EIPs. Pilot programs have

generated positive outcomes, particularly in resource-use efficiency, cleaner production, waste reduction and emission mitigation. These results have contributed to raising awareness among state management agencies, infrastructure investors and enterprises, while providing practical experience for expanding the EIP model in the coming period.

3.3.2. Limitations

Despite these achievements, state management of EIP development in Viet Nam still has several limitations. First, there is no specialized national strategy or master plan for EIP development; current orientations are mainly integrated into broader policies on green growth, circular economy and environmental protection. Therefore, objectives, roadmaps and implementation mechanisms remain insufficiently specific.

Second, the policy system remains fragmented and has not formed a coherent support package for EIP transformation. Incentives related to finance, green credit, technology, land use and industrial symbiosis remain limited. Third, inter-sectoral coordination and information sharing among central agencies, local authorities, industrial park management boards, infrastructure investors and enterprises are still weak. In addition, local management capacity is uneven, particularly in areas such as industrial symbiosis, circular economy, resource-flow management and environmental monitoring. Monitoring and data systems are also not yet synchronized, making it difficult to assess performance and adjust policies in a timely manner.

3.3.3. Results and impacts of state management on eco-industrial park development in Viet Nam

State management has produced initial positive impacts on EIP development, although these impacts remain uneven. The environmental dimension shows the clearest results, reflected in energy savings, reduced water consumption, waste minimization and lower emissions in several pilot industrial parks. The economic dimension has also shown certain improvements, as enterprises can reduce production costs through resource efficiency, cleaner production and, in some cases, industrial symbiosis.

However, these impacts remain limited in scale and are mainly concentrated in pilot sites. The social dimension is less evident, mostly reflected in awareness improvement, training and better working conditions. Broader social outcomes, such as green job creation, community engagement and long-term social sustainability, have not yet been clearly measured.

3.3.4. Causes of limitations

The limitations arise from both objective and subjective causes. Objective causes include the incomplete institutional framework, the relatively new and complex nature of the EIP model, high transformation costs and uneven awareness among stakeholders. Subjective causes include limited management capacity, weak coordination mechanisms, insufficient financial and technical resources, and the absence of integrated data-based monitoring tools.

Overall, state management has created an initial foundation for EIP development in Viet Nam, but this foundation is not yet sufficiently strong to generate broad diffusion across the entire industrial park system. Further improvement is therefore needed in strategic planning, policy coherence, implementation capacity, coordination mechanisms and monitoring systems.

Chapter 4

ORIENTATIONS AND SOLUTIONS TO IMPROVE STATE MANAGEMENT OF ECO-INDUSTRIAL PARK DEVELOPMENT IN VIET NAM

4.1. CONTEXT AND ORIENTATIONS FOR IMPROVING STATE MANAGEMENT OF ECO-INDUSTRIAL PARK DEVELOPMENT IN VIET NAM

4.1.1. International and domestic context of opportunities and challenges for eco-industrial park development in Viet Nam

The international and domestic context is setting new requirements for SM of EIP development in Viet Nam. Internationally, trends in sustainable development, CE, carbon emission reduction and ESG standards in trade and investment require IPs to shift from traditional production models to models characterized by efficient resource use, emission reduction, by-product reuse, energy saving and compliance with green standards. This requires the State to improve the institutional framework, evaluation criteria, certification mechanisms and monitoring systems for EIPs in line with international practices.

Domestically, policies on green growth, CE and the management of IPs and economic zones have created a legal basis for EIP development. However, implementation still requires inter-sectoral coordination, resource allocation, result monitoring and enhancement of local management capacity. In particular, the two-tier local government model creates opportunities for shortening administrative procedures and strengthening management accountability, while also creating challenges in defining functions and avoiding overlaps or

responsibility gaps in the management of planning, infrastructure, environment, emissions data and IS.

4.1.2. Orientations for improving state management of eco-industrial park development in Viet Nam

Orientations for improving SM of EIP development in Viet Nam need to be implemented synchronously from strategic orientation, planning and policies to implementation and monitoring. First, EIP development should be integrated into industrial development strategies, industrial spatial planning, energy planning, environmental infrastructure and urban-service development. At the same time, the policy system should be improved by combining legal regulations with economic incentive instruments, green credit, support for technological innovation, environmental infrastructure development and the promotion of IS.

In addition, coordination among management agencies, IP management boards, infrastructure enterprises, manufacturing enterprises and technical support organizations should be enhanced. Implementation capacity at local-government level should be strengthened through professional training and the development of databases and digital platforms for managing resources, the environment and emissions. The EIP monitoring and evaluation system should be based on economic, environmental and social indicators, ensuring data transparency and timely policy feedback. In addition, public-private partnerships and international integration should be promoted to mobilize resources, technology and management experience and to better meet green standards in global supply chains.

4.2. SOLUTIONS TO IMPROVE STATE MANAGEMENT OF ECO-INDUSTRIAL PARK DEVELOPMENT IN VIET NAM

4.2.1. Group of solutions to improve strategy and planning formulation for eco-industrial park development in Viet Nam

- Improve strategic orientations: Clearly define the position of EIPs in the green industrial strategy; develop quantitative targets and phased roadmaps for 2025-2030 and 2030-2035; and develop a national data system and monitoring indicator set to enhance feasibility and consistency in implementation.

- Improve EIP planning: Shift toward integrated, multi-sectoral, inter-regional and data-based planning; link EIP planning with energy, environmental and infrastructure planning; and apply digital tools such as MFA/MEFA and GIS to identify IS potential and improve planning quality.

- Improve mechanisms for selection, transformation and replication: Develop criteria for selecting priority IPs; develop leading EIP models; and

establish assessment systems and mechanisms for review and replication in order to shift from piloting to systematic implementation.

Overall, it is necessary to synchronously improve strategy, planning and implementation mechanisms to ensure effective and diffusive EIP development.

4.2.2. Group of solutions to improve policies and support mechanisms for eco-industrial park development in Viet Nam

- Improve investment incentives, green credit and transformation support: Develop a specialized policy package for EIPs; increase incentives for green infrastructure; standardize green credit criteria to improve access; and implement technical and financial support programs for the transformation of existing IPs.

- Improve land and infrastructure policies: Allocate land funds for environmental infrastructure, energy facilities and IS; design flexible and multifunctional land use; and establish priority mechanisms and cost-sharing arrangements for green infrastructure investors.

- Improve technical standards and regulations: Promulgate standards for IS infrastructure; standardize the legal framework for by-product transactions; and establish mechanisms for classifying and certifying secondary resources to promote resource circulation.

- Improve human-resource and social policies: Develop social assessment indicators; promote green-skills training; and establish mechanisms for monitoring and disclosing information to ensure workers' interests and social sustainability.

The focus is to establish a specialized, coherent and feasible policy system that creates strong incentives for EIP transformation and replication.

4.2.3. Group of solutions to improve implementation organization and coordination of eco-industrial park development in Viet Nam

- Strengthen inter-sectoral coordination mechanisms: Clearly identify a central focal agency; institutionalize inter-sectoral coordination regulations; and maintain periodic coordination among the central government, ministries, sectors and localities to ensure unified and continuous coordination.

- Enhance the capacity of management agencies: Strengthen specialized training on IS, CE, resource and data management; standardize the capacity of IP management staff; and improve skills in coordination, enterprise support and policy analysis.

- Improve mechanisms for coordination, data sharing and technical support: Develop an integrated data system on EIPs; standardize information-sharing procedures among stakeholders; and strengthen technical support linked to domestic needs and the capacity to replicate the model.

The focus is to improve implementation capacity, inter-sectoral coordination and data infrastructure, thereby ensuring coherent and effective EIP implementation.

4.2.4. Group of solutions to improve inspection, monitoring and adjustment of eco-industrial park development in Viet Nam

- Improve indicators, data and monitoring platforms: Develop a unified indicator set covering economic, environmental and social dimensions; develop electronic reporting systems and integrated databases; and implement these first in pilot IPs before expanding them to the whole system.

- Improve transparency and feedback mechanisms: Regulate the disclosure of monitoring information at appropriate levels; establish regular feedback channels from enterprises and localities; and link monitoring results with policy adjustment.

- Improve mechanisms for policy adjustment and piloting: Establish periodic policy review mechanisms based on data and practical evidence; and apply controlled pilots for new models and technologies, such as IS, reuse and smart infrastructure, to provide a basis for policy improvement.

The focus is to build a data-based, transparent and policy-flexible monitoring system to ensure timely and effective adjustment.

4.3. RECOMMENDATIONS

- For the National Assembly: Improve the legal system in a more coherent and flexible direction; create conditions for ecological infrastructure projects, IS, waste reuse and digital infrastructure in IPs; and strengthen supervision of the integration of EIP objectives into relevant laws.

- For the Central Committee of the Communist Party of Viet Nam: Identify EIP development as an important orientation in the transition toward a green, circular and low-emission economy, linked with industrial development strategies, regional development and local accountability.

- For the Government: Improve the national governance mechanism for EIPs, focusing on financial resources, databases, inter-sectoral coordination and periodic policy review in order to enhance the effectiveness of IP transformation toward ecological models.

The focus is to ensure coherence among institutions, strategic orientations and implementation resources for EIP development.

CONCLUSION

The dissertation was conducted to study and propose solutions to improve SM of EIP development in Viet Nam for the period up to 2035, with a vision to 2050. On the basis of the stated research objective, the dissertation clarifies theoretical foundations, analyzes the current situation and proposes orientations and solutions to improve SM of EIP development in the context of transforming the growth model toward sustainability.

First, the dissertation reviewed domestic and international research works on EIP development and SM of EIP development. On that basis, it identified research gaps, particularly the absence of studies approaching SM of EIP development according to economic management functions in the Vietnamese context.

Second, the dissertation systematized theoretical foundations and developed an analytical framework for SM of EIP development by applying the policy-cycle model, IS theory and sustainable development theory. The analytical framework is structured around four functions: strategy and planning formulation; promulgation of policies and support mechanisms; implementation and coordination; and inspection, monitoring and adjustment.

Third, the dissertation analyzed the current state of SM of EIP development in Viet Nam during 2015-2025, pointing out initial results in the formation of the legal framework and pilot implementation, while identifying limitations in strategy, support policies, implementation organization, coordination and monitoring.

Fourth, the dissertation proposed orientations, solutions and recommendations to improve SM of EIP development in Viet Nam in the context of green transformation. The solutions focus on improving strategy, planning, support policies, implementation organization, coordination mechanisms, inspection, monitoring and policy adjustment. In general, the research results contribute to clarifying the theoretical and practical foundations of SM of EIP development in Viet Nam, while providing additional scientific evidence for the improvement of policies and management mechanisms in this field.

Although the research objectives have been achieved, the dissertation still has certain limitations. Due to constraints in accessing detailed data from enterprises in IPs, in-depth analysis of the specific economic efficiency of IS models remains difficult. In addition, the research scope mainly focuses on SM at the central level, while the role of local authorities in managing and implementing EIPs has not been analyzed in depth. Future studies may further clarify financial mechanisms for EIP transformation, multi-level governance models in EIP development and evaluation indicator systems for EIP development effectiveness suitable to Viet Nam's conditions.

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