



Considerations for the Integrated Management of the National Territorial–Environmental Planning : A Review

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Abstract

As the time for the revision of the 5th Comprehensive National Territorial Plan and the 5th Comprehensive National Environmental Plan approaches, interest in improving the effectiveness of their integrated management is growing. However, existing studies criticized the effectiveness of integrated management, particularly the consistency of plan contents. Hence, studies that systematically examine the characteristics of national territorial plans and environmental plans with a focus on the five strategies guiding integrated management as its institutional foundation, are needed. This study used content analysis to investigate the considerations for integrated management of the national territorial–environmental planning, focusing on these five strategies. The stages of integration were divided into linkage, interconnection, and integrated management according to the period of time, and the characteristics of considerations for each stage were compared. To this end, 15 research reports on considerations for integrated management were selected from the National Knowledge Information System (NKIS) and analyzed. The analysis indicates that, when classified by stages of integration, integrated management policy in South Korea has progressed from sectoral planning (linkage), to regional development and conservation (interconnection), and most recently, to the implementation of policies across different spatial scales (integrated management). When analyzed by strategy, the results reveal that the only strategy consistently addressed across all stages was “Systematically Managing National Territory to Enhance Connectivity of the National Environment,” with the primary focus on balancing the ecological and development networks at both national and local levels. In addition, two others—“Reforming National Spatial Structure to Address Population Decline” and “Implementing Innovative National Territory and Environment Utilizing Advanced Technologies”—were applied from the interconnection stage to the integrated management stage. “Enhancing Global Stature through Cooperation between North and South Korea and International Partners” was considered only in the integrated management stage.

Keywords National Territorial Plan, Environmental Plan, Linkage, Interconnection, Integrated Management
주제어 국토계획, 환경계획, 연계, 연동, 통합관리

1. Introduction

Increasing interest has emerged in establishing a revised plan for the 5th Comprehensive National Territorial Plan and the 5th Comprehensive National Environmental Plan,

which are subject to the integrated management of the national territorial–environmental planning. Recently, the 3rd National Territorial and Environment Policy Council convened to establish an integrated management policy (Ministry of Land, Infrastructure, and Transport, 2024).

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In the meantime, criticisms have been raised about the effectiveness of integrated management policies (Choi, 2021), and various efforts have been promoted at the national and local levels. However, despite the widespread recognition of the need for the integrated management, practical implementation encounters difficulties due to insufficient review of the criteria for entities responsible for establishing those plans according to the spatial and administrative hierarchy (Yoon and Yeom, 2024).

In Europe, such as Germany, integrated management has been attempted by linking national territorial plans and environmental plans on an equal footing or through the establishment of statutory or non-statutory plans. In Japan, although the two plans are not institutionally linked, integrated management has been applied as a strategy to establish eco-friendly national territorial plans by internalizing environmental plans into national territorial plans (Kim et al., 2019a).

To promote integrated management, South Korea enacted a Joint Decree in 2018 to establish a legal and institutional foundation, and policy efforts have been ongoing to create horizontal linkages between national-level plans and vertical linkages between national and local-level plans (Joint Decree on Integrated Management of the National Territorial Plans and Environmental Plans). In particular, the need to review the integrated management issues of the Joint Decree and improve the integrated management strategies that provide a vision and implementation direction for these issues has been suggested as a key task (Jang et al., 2024).

In comparing integrated management policies domestically and internationally, South Korea needs, in the long term, to develop detailed guidelines that facilitate the hierarchical coordination between national territorial plans and environmental plans, as seen in Germany. In the short term, it is necessary to closely examine implementation-related considerations—particularly for integrated management issues that reflect regional characteristics—through pilot projects, as in the case of Japan (Kim et al., 2019a). Furthermore, following the German example, the current system could be improved to enhance the use of environment-related spatial information in national territorial planning by clearly defining data production standards and mechanisms for its application in the planning process (Kim et al., 2019a).

Studies on the integrated management of the national territorial–environmental planning have mainly used content analysis to examine statutory plans, legal provisions, and related plans in the field of national territory and environment to analyze the connections of the plans (e.g. Kim et al., 2020). In addition, existing studies are characterized by cross-sectional comparisons of plans covering specific or partial periods, such as the 4th National Territorial Plan (e.g. Jang et al., 2024). Lastly, a small number of studies have addressed the connections between plans, focusing on integrated management issues (e.g. Choi et al., 2019c).

However, national territorial plans and environmental plans subject to integrated management, along with their integrated management plans, have often been developed based on the outcomes of research projects conducted by government-funded research institutions in the relevant fields (e.g. Korea Environment Institute). Thus, research reports resulting from these projects, which capture the institutional and regional context involved in integrated management plans, can contribute to understanding the practical implications for integrated management.

In addition, the research reports thoroughly accumulated from the earliest stages of integrated management discussions to the present are relevant for comparing the characteristics of different stages of integration. An analysis of these reports can provide a diachronic perspective on the considerations for integrated management. Furthermore, research is needed that analyzes and compares not only integration management issues but also integration management strategies that provide vision and direction for their implementation.

This study aims to analyze the considerations for each integrated management strategy by examining research reports on the integrated management of the national territorial–environmental planning through content analysis. Furthermore, by reviewing previous studies, this study categorized the stages of integration over time into three stages: linkage¹⁾, interconnection, and integrated management, and compared the characteristics of considerations at each stage. Each stage of integration presents distinct characteristics—such as horizontal and vertical linkages between plans, and linkages in the planning or implementation processes—which can serve as a framework for analyzing policy considerations over time. The results of this study are expected to provide policy implications for the improvement of inte-

grated management strategies and issues in the planning process of the revision of the 5th National Territorial Plan and the National Environmental Plan.

II. Literature Review

1. Institutional Status and Discussion Points

In South Korea, the integrated management of the national territorial–environmental planning is currently being carried out with a focus on the Joint Decree, which serves as the institutional foundation for its implementation.

The Joint Decree (2023) was enacted to establish the necessary provisions regarding the scope of application, linkage methods, and coordination procedures for the integrated management of national territorial and environmental planning. First, it mandates the temporal alignment of national and local-level plans. Second, it stipulates the establishment of a Planning Coordination Council at both the national and local levels to review whether integrated management is properly reflected in the formulation of national territorial and environmental plans. Third, it specifies key integrated management issues that must be incor-

porated into both plans during their development. Additionally, the decree outlines the integration of information systems and the implementation of monitoring to ensure the effective execution of this integrated management framework.

Regarding the integrated management issues, the initial Joint Decree (2023) included eight issues, such as natural ecosystems and energy, while the 2023 revision added two more issues, incorporating future social changes. In 2019, five integrated management strategies were established to implement the issues, centered on the National Planning Coordination Council. The strategies were organized under the themes of (1) Reforming national spatial structure to address population decline, (2) Systematically managing national territory to enhance connectivity of the national environment, (3) Establishing a low-carbon national environment in response to climate change, (4) Implementing innovative national territory and environment utilizing advanced technologies, and (5) Enhancing global stature through cooperation between North and South Korea and international partners (see <Table 1>).

For the discussion point on the integrated management, critics argue that it should not be equated with the institutional merger of independent planning systems, but rather

Table 1. Five core strategies for operationalizing integrated management

Strategy	Planning elements
Reforming national spatial structure to address population decline	(Smart decline) Prioritized utilization of urban inner sites and creation of green spaces
	(Eco-friendly management) Re-naturalization of unused and abandoned spaces and restoration of declining areas
Systematically managing national territory to enhance connectivity of the national environment	(Connectivity) Strengthening national environmental networks such as the Baekdu Bridge
	(Ecological space) Prevention of ecological damage and restoration of disconnected areas
Establishing a low-carbon national environment in response to climate change	(Low carbon) Establishing green infrastructure to reduce greenhouse gas emissions
	(National resilience) Responding to climate disasters and expanding the safety management network for disasters
Implementing innovative national territory and environment utilizing advanced technologies	(Smart infrastructure) Dissemination of smart green infrastructure incorporating advanced technology
	(New industry base) Fostering eco-friendly industries
Enhancing global stature through cooperation between North and South Korea and international partners	(North-South cooperation) Connecting and restoring main ecological networks on the Korean peninsula
	(International cooperation) Strengthening the role of international organizations and implementing the new climate regime

Source: Joint Decree on Integrated Management of National Territorial Plans and Environmental Plans

the establishment of a cross-reference system to improve the integration between plans (Kim et al., 2019b). Hence, improving the effectiveness of integrated management requires research that systematically examines the characteristics of national territorial and environmental plans, centered on the integrated management strategies and issues outlined in the Joint Decree (Jang et al., 2024).

As another discussion point, numerous studies in South Korea have analyzed the characteristics of integrated management with a focus on environmental planning, but consideration of national territorial planning remains relatively limited (Jang et al., 2024). A key distinction is that national territorial planning aims to enhance the environmental quality of space, whereas environmental planning seeks to promote spatialization to support integrated management (Kim et al., 2019a). Furthermore, national territorial planning primarily focuses on space and infrastructure, while environmental planning mainly addresses environmental resources and space (Choi et al., 2019c). Given these differences, space should serve as a central element in both plans to ensure effective integrated management.

2. Previous Studies

Prior research on the integrated management of the national territorial–environmental planning has focused on the planning process and plan content, which are the management areas suggested by the Joint Decree (Jang et al., 2024). Before the enactment of the Joint Decree in 2018, studies mainly concentrated on the planning process (e.g. Chun, 2006). Afterward, studies shifted to the content of the plans, focusing on items to be considered when implementing both plans (e.g. Lee, 2020).

As a key example, Heo et al. (2018) reviewed 16 environmental plans, including the 4th Comprehensive National Environmental Plan, to derive 420 indicators. They ultimately selected 74 indicators considering the linkages with the seven UN SDGs. In addition, Kim et al. (2020) analyzed the detailed provisions of major laws in the field of national territorial and environmental planning, such as the Framework Act on National Territory, to review the provisions highly relevant to the integrated management and derive features according to the spatial hierarchy (macro and micro levels). Cho and Kim (2021) analyzed laws and regu-

lations related to landscape planning and spatial data to propose a plan for establishing landscape-friendly spatial planning, focusing on the interconnection of multifunctional aspects of landscape (ecology, recreation, aesthetics, and climate) and spatial data.

As a study reflecting integrated management issues, Kim et al. (2019a) analyzed the 4th Comprehensive National Environmental Plan, the 3rd National Basic Plan for Sustainable Development, and the National Sustainable Development Goals to derive indicators corresponding to integrated management issues and examine their relevance to national territorial plans. Additionally, Choi et al. (2019c), through a review of relevant literature and cases, proposed indicators and spatialization measures of the Comprehensive National Environmental Plan (e.g. institutional improvement of urban parks and green space) that can be reflected in the Comprehensive National Territorial Plan (e.g. sprawl management of urban areas) among integrated management issues to ensure consistency between plans. Jang et al. (2024) used topic modeling to derive planning features that emerged through separate analysis and integrated analysis for the 5th Comprehensive National Territorial Plan and Comprehensive National Environmental Plan, comparing the results of the integrated analysis with integrated management issues.

In sum, research on integrated management of the national territorial–environmental planning has mainly utilized content analysis to analyze statutory and non-statutory plans, legal provisions, and related plans (e.g. the Basic Plan for Sustainable Development) in the field of national territory and environment. However, in many cases, the national territorial and environmental plans and strategies for integrated management in South Korea are based on research projects by government-funded research institutes. Identifying the considerations of integrated management through research reports that capture the institutional and regional context in which the integrated management plans or strategies were formulated is crucial. These reports provide insights into the practical implications of integrated management.

Additionally, existing studies tend to analyze plans cross-sectionally, covering specific or partial time periods only (e.g. the 4th National Comprehensive Territorial Plan and the 4th Comprehensive National Environmental Plan),

which limits their ability to provide a holistic view of integrated management considerations. On the other hand, extensive research reports on integrated management discussions at the national and local levels from the beginning to the present provide a good source for analyzing considerations by comparing the characteristics of different stages of integration. While few studies have analyzed the connections between plans based on integrated management issues at lower levels, research that analyzes integrated management strategies at higher levels, which provide vision and direction for their implementation, and compares them to the issues is needed.

III. Methods

This study examines domestic research reports on the integrated management of the national territorial–environmental planning to identify key considerations for each integrated management strategy. <Figure 1> illustrates the process for data collection based on the typical phases in literature review protocols, namely identification, screening, and eligibility (Liberati et al., 2009). For identification, the reports were collected using the National Knowledge

Information System (NKIS), a searchable database of research outputs from government-funded research institutes in South Korea. In the NKIS, a search term “integrated management of the national territorial–environmental planning” or “integrated management of the national territorial–environmental plan(s)” retrieved a total of 20,543 documents, including research reports (11,631), policy and research materials (1,372), periodicals (6,955), seminar materials (532), video materials (3), collection materials (47), and Policy Research and Information System (PRISM) materials (3) (covering all publication periods as of May 22, 2024).

From these, the research reports (11,631) and PRISM materials (3), of which research results are classified as research reports, were selected (a total of 11,634). For screening, 17 reports containing terms related to “integration”, “interconnection”, “linkage”, or “consistency” of the national territorial–environmental planning in their titles, abstracts, and keywords were chosen to extract highly relevant literature on the research topic. For eligibility determination, the full text of the selected reports was thoroughly reviewed, and 15 reports (hereafter referred to as R1-15, as shown in <Table 2>) addressing considerations for integrated management were finally selected. The remaining two reports were excluded (e.g. Systematic Introduction of Environmental and Ecological Planning for Urban Development Projects).

Content analysis, used in numerous previous studies (Runhaar et al., 2009; Choi, 2021; Choi and Kim, 2021), served as the analytical technique. Among representative techniques of literature review, systematic literature reviews aim to understand the general characteristics and scope of the discourse, while content analysis identifies core themes and considerations of the discourse (Khirfan et al., 2020). Given this study’s objective to identify the main considerations for integrated management in terms of the five core strategies guiding integrated management and other strategies that do not correspond to these five, content analysis was utilized.

No general analytic procedure exists for performing content analysis; however, this study used Harris’s (2001) content analysis procedure (Jang and Gim, 2023). The procedure involves (1) selecting the research topic and data, (2) determining the categories and units of analysis (e.g. word, phrase, and sentence), and (3) analyzing and reviewing the

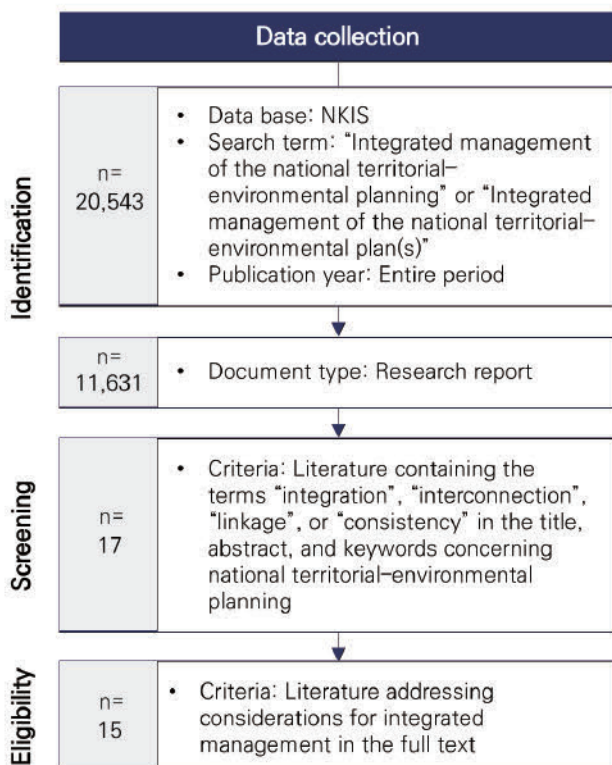


Figure 1. Data collection process

Table 2. Selected literature for analysis

ID	Title	Author	Year	Publisher	Stage
R1	A Study on the Linkage of Spatial Planning and Environmental Planning System toward Sustainable Development	Choi et al.	2002	Korea Research Institute for Human Settlements	Linkage
R2	Harmonization between Legal System of Environmental Planning & Land Planning	Chun	2004	Korea Legislation Research Institute	Linkage
R3	Spatial Environmental Planning Guidelines based on Environmental Information Systems (I)	Choi et al.	2009	Korea Environment Institute	Linkage
R4	Spatial Environmental Planning Guidelines based on Environmental Information Systems (II)	Choi et al.	2010	Korea Environment Institute	Linkage
R5	A study on the change of land development policy and direction for development of the spatial environment policy	Choi et al.	2012	Korea Environment Institute	Linkage
R6	The Introduction of Ecological Network for the Spatial Plans Aiming to Balance the Development and the Environment of Korea	Park et al.	2014	Korea Research Institute for Human Settlements	Inter connection
R7	A Study on the Urban Planning Measurement by Linking between National Land Plan and Environment Plan	Wang et al.	2015	Korea Research Institute for Human Settlements	Inter connection
R8	Measures to improve the strategic environmental impact assessment in response to the development-environmental plan linkage system: focusing on the urban management plan	Lee et al.	2017	Korea Environment Institute	Inter connection2)
R9	Planning Policy Agenda for the Integrated Management of Territorial Plan and Environmental Plan	Kim et al.	2019a	Korea Research Institute for Human Settlements	Integrated management
R10	Preparation of a Spatial Environment Basic Plan for Integrated Management of the National Territorial–Environmental Plan (I)	Choi et al.	2019a	Korea Environment Institute	Integrated management
R11	Preparation of a Spatial Environment Basic Plan for Integrated Management of the National Territorial–Environmental Plan (II)	Choi et al.	2019b	Korea Environment Institute	Integrated management
R12	A Study on Integration of Spatial and Environmental Planning to Mitigate Particulate Matter: Focusing on Ventilation Corridors	Park et al.	2019	Korea Research Institute for Human Settlements	Integrated management
R13	Establishing a Foundation for Integrated Management of Local Governments' National Territorial–Environmental Plans: Developing an Integrated Management Model for Metropolitan Governments	Choi et al.	2020	Korea Environment Institute	Integrated management
R14	A study on linking national land use planning and environmental planning to improve the environmental aspects of housing supply policy	Lee et al.	2020b	Korea Environment Institute	Integrated management
R15	Integrated Diagnosis and Improvement of Ecological Networks for Reasonable Spatial Planning of National Environment	Son et al.	2023	Korea Environment Institute	Integrated management

data for reliability. In this study, the conditions for implementing each integrated management strategy in the selected literature were defined as considerations. Keywords related to each strategy (e.g. Reforming national spatial

structure to address population decline → spatial structure and population decline) were searched in the full text of the reports using words as the unit of analysis, and the suitability of meanings regarding the considerations was reviewed

through the sentences containing the keywords. Subsequently, a quantitative analysis was conducted to examine the frequency of each strategy by integration stage, and a context-based qualitative review was used to derive the specific content of each strategy.

For analysis, this study distinguished the stages of integration according to the time period and categorized the considerations by stage for comparison. According to Kim et al. (2019a), in South Korea, the history of integrated management of the national territorial–environmental planning can be divided into three periods: (1) the late 1990s to 2012, when discussions began; (2) 2013 to 2016, when its foundation was laid; and (3) 2017 and beyond, when integrated management started to be implemented. Also, Choi et al. (2020) compared the difference between interconnection and integrated management, noting that the former aims for horizontal linkages between plans, while the latter aims for both horizontal and vertical linkages. Relevant literature indicated that the main terms used in each period are linkage (Choi et al., 2002; Lee and Song, 2002; Park, 2003), interconnection (Wang et al., 2015; Yi et al., 2017), and integrated management (Choi et al., 2019c; Jang et al., 2024; Jang and Kim, 2024), consistent with previous studies’ classifications (e.g. Kim et al., 2019a). Thus, this study categorized the stages of integration into linkage, interconnection, and integrated management according to the time period, as shown

in <Table 3>. Using this categorization, it compared the characteristics of the considerations. The stage of each selected literature, determined based on its period, content, and characteristics (see <Table 3>), is presented in the right column of <Table 2>. In addition, the frequency of each strategy was presented by integration stage, and strategies retained, omitted, or emphasized at each stage were examined.

IV. Results

This section reviewed the main contents of the selected literature, focusing on the five integrated management strategies and other strategies that do not fall into this category, and compared their characteristics according to the stages of integration: linkage, interconnection, and integrated management.

<Table 4> shows the frequency of occurrence and representative examples for each strategy identified in the reports, with the frequencies organized by integration stage. The analysis indicates that the most frequently mentioned strategy was “Systematically managing national territory to enhance connectivity of the national environment” (82 occurrences), followed by “Other strategies” (47 occurrences) and “Establishing a low-carbon national environment in response to climate change” (37 occurrences).

Table 3. Classification of integration stages by time period

Category	Linkage	Interconnection	Integrated management
Period	From the late 1990s to 2012	From 2013 to 2016	From 2017 to the present
Content	Start the discussion for integrated management	Lay the foundation for integrated management	Implement integrated management
Characteristics	Growing social awareness of the environment emphasizes the need for eco-friendly national development	A plan to promote the interconnection for the national territorial–environment plan was established	The measure for integrated management has been discussed between the Ministry of Land, Infrastructure and Transport and the Ministry of Environment
	Horizontal linkage between plans	Horizontal linkage between plans	Horizontal and vertical linkage between plans
	Linkage of the planning process	Linkage of the planning process	Linkage the planning process and implementation plan
Main laws and policies	Legislation of laws in the national territory and environment sectors to harmonize development and conservation	Establishment of a legal basis for linkage in the Framework Act on National Territory and the Framework Act on Environmental Policy	Establishment of a Joint Decree to reflect integrated management in the formulation of both 5th comprehensive national plans

Source: Adapted from Kim et al. (2019a), with modification

Table 4. Frequency of strategy occurrence by integration stage

Strategy	Keyword	Frequency				Example
		Linkage	Inter connection	Integrated management	Total	
Reforming national spatial structure to address population decline	Spatial structure, Population decline	0	3	8	11	Enhancing vitality in declining areas through regeneration and ecological restoration (R9: 125)
Systematically managing national territory to enhance connectivity of the national environment	Management of national territory, Connectivity	21	15	46	82	Establishing spatial structures that incorporate national and regional ecological corridors (R13: 105)
Establishing a low-carbon national environment in response to climate change	Cow-carbon national environment, Climate change	5	0	32	37	Spatial planning in the air quality sector to reduce emissions of air pollutants (R3: 135-136)
Implementing innovative national territory and environment utilizing advanced technologies	Innovative national territory, Advanced technology	0	1	9	10	Expanding smart green infrastructure (R9: 125)
Enhancing global stature through cooperation between North and South Korea and international partners	Inter-Korean cooperation, International cooperation	0	0	6	6	Promoting an integrated peace-belt model in border regions such as the DMZ (R11: 141)
Other strategies	-	21	8	18	47	Advancing spatial planning in the energy and waste sectors such as energy and waste maps (R3: 163-164)

Note: The frequency indicates the total number of occurrences of each strategy across the 15 reports. “Other strategies” refers to content that is not classified under the five strategies but still reflects principles of integrated management (e.g. enhancing integrated management through spatial planning in the area of urban disaster prevention).

The strategies that appeared across all stages were “Systematically managing national territory to enhance connectivity of the national environment” and “Other strategies”. Strategies found in both interconnection and integrated management stages were “Reforming national spatial structure to address population decline” and “Implementing innovative national territory and environment utilizing advanced technologies”. In contrast, “Enhancing global stature through cooperation between North and South Korea and international partners” was found only in the integrated management stage. Notably, “Establishing a low-carbon national environment in response to climate change” was included in both linkage and integrated management stages, but was absent from the intermediate stage (interconnection).

Accordingly, the strategies addressed in the early stage included “Enhancing connectivity of the national environment” and “Establishing a low-carbon national environ-

ment”. Following the interconnection stage, “Reforming national spatial structure” and “Implementing innovative national territory and environment” began to be addressed. A strategy related to “Cooperation between North and South Korea and international partners” was found only in the final stage.

1. Systematically Managing National Territory to Enhance Connectivity of the National Environment

The results indicate that considerations for enhancing the connectivity of the national environment through integrated management were addressed in all but R5. Considering the publication period, connectivity of the national environment has been a key theme in reports at all stages of integration.

First, at the stage of linkage, considerations were mainly

addressed for preventing ecosystem disconnection and damage to the natural environment by development in the planning process (R1: 197-198). The creation of biotope maps to spatialize environmental planning and the establishment of landscape ecological plans to link planning systems were highlighted as means to achieve this (R1: ix, 213; R2: 32; R3: 28). In the linkage stage, the networks of national territorial plans mainly corresponded to economic corridors and the networks of environmental plans to eco-corridors, so consideration of intersection or conflict points between the networks was emphasized (R2: 144; R3: 36).

Subsequently, the literature at the interconnection stage focused on considerations for setting networks at the regional level reflecting the nature of both plans, such as the national ecological network and the national development network (R7: 153), and the regional ecological network (R6: 112-113). In particular, the use of spatial information and other means to strengthen the environmental aspects of urban planning and the spatialization of environmental planning was emphasized in setting the networks of the spatial structure to improve the consistency between the plans (R7: 81). In addition, to manage or remove green belts due to the increasing demand for large-scale development projects, it was proposed to consider a regional green network and to differentiate the conservation value of areas based on their environmental characteristics (R8: 8, 132).

Finally, while the previous stages mainly emphasized connectivity at the national level, the integrated management stage stressed connectivity at the regional and local levels. Its main strategies included the establishment of regional and urban ecological networks (R9: 125), the integration of spatial environmental management strategies by region with the national ecological network (R10: 112; R11: 137), and the establishment of local ecological networks (R15: 138) and urban ecological networks (R13: 105). In particular, based on the national ecological network, it was emphasized to secure the basis for linkages between regions by considering their environmental issues, but also to ensure regional diversity as well as unity of space (R11: 137). Through this, it was required to present a spatial environmental strategy for each region that can be utilized in planning at the regional and local levels.

2. Establishing a Low-Carbon National Environment in Response to Climate Change

The majority of the literature (R3-5, R9-13) addressed considerations for preparing the national environment in response to climate change. With the exception of the linkage stage, the strategy was discussed in reports that fall under the linkage (R3-5) and integrated management (R9-13) stages.

In the linkage stage, spatial planning strategies for reducing emissions of air pollutants were mainly presented in the atmosphere sector (R3: 32; R4: 111). The spatial planning strategies can be utilized for planning green space management systems in metropolitan urban plans, land use plans in city and county-level plans, and planning parks and green spaces for microclimate mitigation in urban management plans (R4: 111). In particular, it was pointed out that environmental planning should be linked to urban planning to reduce the volume of development that degrades air quality or to limit areas designated for development, but it is mainly focused on managing the emission of air pollutants in the target year (R3: 32). In addition, in relation to the 4th Comprehensive National Territorial Plan, it was called for strengthening the linkage between spatial policy and environmental policy to respond to climate change, such as predicting the increase and decrease of greenhouse gases caused by changes in the spatial structure of the national territory (R5: 39, 76).

Whereas the literature at the linkage stage mainly addressed considerations for low carbon and greenhouse gas emissions, those of the integrated management stage also discussed a range of issues related to the national resilience to climate disasters (R9: 125; R10: 84-85; R11: 141; R13: 105). In terms of space and infrastructure, implementation strategies that should be addressed in the 5th Comprehensive National Territorial Plan included the creation of urban wind corridors, and strategies for the 5th Comprehensive Environmental Plan included strengthening policy support for climate change vulnerable areas (R9: 125; R10: 85). In addition, at the national level, an effort to promote green infrastructure-based resilience by linking the Ministry of Land, Infrastructure, and Transport's urban regeneration projects and the Ministry of Environment's urban ecological restoration projects in targeted vulnerable areas was

proposed (R11: 141). Finally, it was discussed that national territorial plans and environmental plans should be mutually reviewed to ensure the proper distribution of environmental load among regions, including urban infrastructure and environmental infrastructure (R13: 105).

3. Reforming National Spatial Structure to Address Population Decline

The results show that few reports (R8, R9, R13) addressed considerations of spatial restructuring in response to depopulation through integrated management. Considering the publication period, the literature at the interconnection (R8) and integrated management (R9, R13) stages dealt with strategies for depopulation.

First, at the interconnection stage, it was stressed that measures should be arranged to control the sprawl that can occur until national territorial plans and environmental plans are substantially interlinked (R8: 1). For example, it was argued that in non-urban areas with continuously declining populations, a trend of deregulation of location and sprawl persists, and systematic planning of development and conservation is needed to reconcile them (R8: 1). In particular, the need to assess whether development available land and conservation areas are appropriately set up was emphasized. This includes considering the designation of sites for urbanization that are appropriate to the size of the planned population in the urban master plan and the environmental value of the area (R8: 115-116).

In the integrated management stage, the mutual review of national territorial plans and environmental plans was suggested to ensure the integration of both plans, emphasizing the need to secure the validity of the plans based on current population status and future population change forecasts (R13: 105). Considering the long-term population decline across the entire country, including both metropolitan and rural areas, the eco-friendly utilization of unused and abandoned spaces due to population outflow, such as community gardens, was highlighted as a fundamental direction for integrated management (R9: 125). Additionally, due to regional disparities in population growth and decline, regional needs and utilization of space vary significantly. Therefore, the revitalization through space regeneration and restoration was proposed, particularly targeting

declining rural areas, such as the creation of recreational healing villages (R9: 125).

4. Implementing Innovative National Territory and Environment Utilizing Advanced Technologies

Few reports (R8-9) addressed considerations for the advanced technology-based creation of national territory and environment through integrated management. As with the above spatial restructuring strategy in response to population decline, related issues were addressed in the literature at the interconnection (R8) and integrated management (R9) stages.

First, in the interconnection stage, a proposal was made to create a high-tech logistics complex in the existing city center, considering the demand for warehouses, which has been a major cause of damage to the green belt (R8: 133). Expansion of a high-tech logistics infrastructure inside the city will result in smaller and more efficient logistics centers than typical ones, enabling the reduction of logistics costs and fine dust and pollutants due to shorter transportation distances.

In the integrated management stage, the basic directions for integrated management included expanding smart green infrastructure, creating eco-friendly new industrial bases, spreading renewable energy facilities, and expanding eco-friendly intelligent transportation infrastructure (R9: 125). In particular, the strategies to be implemented through national territorial plans included eco-friendly smart cities, expanding the use of eco-friendly transportation, and eco-smartization of industrial complexes. Meanwhile, the strategies through environmental plans incorporated building a smart environmental city infrastructure, promoting smart villages and smart farms, and fostering startups, ventures, and small and medium-sized enterprises in the environmental field (R9: 125).

5. Enhancing Global Stature through Cooperation between North and South Korea and International Partners

The results illustrate that few documents (R9, R11) mentioned the consideration of increasing global stature

through integrated management. Unlike the other strategies, only the literature at the integrated management stage addressed these considerations, indicating that this is a relatively recent strategy.

First, the implementation strategy of integrated management for North-South Korean cooperation included consideration of connecting the major ecological networks of the Korean peninsula. To this end, the implementation of the peace belt in the border areas, including the DMZ, was proposed to strengthen cooperation in the field of environment and the new economy of the Korean peninsula (R9: 125). The integrated model for the peace belt can be built by linking the Ministry of Land, Infrastructure and Transport's Border Economic Belt project with the Ministry of Environment's national ecological network. This requires ongoing support for hub regions at the national level (R11: 141).

In terms of international cooperation, the basic direction of integrated management required expanding Northeast Asian cooperation in the field of environment and establishing South Korea as a leading country in environment-related international cooperation (R9: 125). Its implementation strategies included achieving the UN SDGs, expanding participation in global environmental conservation action programs, and leading the new climate change system (R9: 125). Furthermore, increased cross-border cooperation was needed to respond to transboundary environmental issues such as air pollution (R9: 123). Thus, the emphasis was on cooperation at the national level rather than strengthening the role of international organizations as a planning element of the integrated management strategy.

6. Other Strategies

In addition to the above five integrated management strategies, the living environment (R10) was identified as a main one, as well as energy (R3-4), waste (R3-4, R9), and water (R3-4, R9), which correspond to the integrated management issues of the Joint Decree. Energy was addressed at the linkage stage, water and waste were addressed at the linkage (R3-4) and integrated management (R9) stages, and finally, the living environment was addressed only at the integrated management stage.

First, in the energy and waste sectors, at the linkage stage, it was suggested to create an energy and waste map to iden-

tify visualized information on the regional characteristics of facility locations with a focus on spatial planning (R3: 163-164). Spatial environmental management plans in these sectors can be used for planning spatial structure and waste treatment facilities at metropolitan city planning, and for planning spatial structure and waste treatment and energy supply facilities at urban master plans (R4: 145). At the integrated management stage, national territorial plans addressed waste generation, treatment, and facility location, but lacked direct linkages, while environmental plans addressed the realization of a low-carbon circular economy as a major strategy in terms of resource circulation (R9: 114, 119).

The water sector was addressed in the linkage stage, focusing on water quality management and spatial planning related to groundwater. Water quality management was highlighted as an approach to spatialize data on the status of water quality by region to enable a comprehensive approach to determining water environmental impacts at the basin management level (R3: 144-145). In the field of groundwater, it was proposed to link groundwater management with land use, along with the illustration of related data (R4: 76). In addition, in the integrated management stage, it was suggested that achieving the target water quality of the four major rivers and integrated water quality management through the total water pollution system were highly relevant to urban development (national territorial plans) in terms of securing clean water (R9: 119). The reduction of environmental factors that are hazardous to health was a major strategy in environmental plans (R9: 114).

Finally, strategies related to the living environment were addressed in the integrated management stage, focusing on the establishment of management zones to improve environmental quality (R9: 78, 83). Based on the major issues of the living environment, strategies for improving space, policies, and programs to resolve the causes were proposed (R9: 77). Areas with a high density of pollution-generating facilities by source and high population density were designated as environmental quality management zones (R9: 83). Furthermore, these strategies included the expansion of data-driven environmental infrastructure to enable scientific assessment of the impacts of environmental hazards, the establishment of environmental surveillance and monitoring systems, and increased community participation (R9: 112).

7. Synthesis

Overall, as shown in (Table 5), the linkage stage—characterized by an emphasis on horizontal coordination between plans and alignment within the planning process—is considered to have centered on the spatialization of sectoral environmental plans (e.g. air, energy, waste). The subsequent interconnection stage maintained a similar focus on integration but differed in that related policies were directed

toward regional development and conservation, particularly in areas such as restricted development zones and planned urbanized areas. In contrast to the earlier stages, the integrated management stage emphasized vertical coordination between plans and alignment in the implementation process, highlighting the application of policies across different spatial scales—such as the Korean Peninsula, regions, sub-regions, and cities—as well as the management of environmentally vulnerable areas. These findings indicate that

Table 5. Summary of the results

Strategy	Stage	Consideration	
Systematically managing national territory to enhance connectivity of the national environment	linkage	Spatialization of environmental planning	
		Balancing the development and ecological networks	
	Inter connection	Spatialization of environmental planning	
		Balancing the development and ecological networks	
	Integrated management	Managing and lifting green belts	
		Establishment of regional and urban ecological networks	
Establishing a low-carbon national environment in response to climate change	linkage	Presentation of spatial environmental strategies by region	
		Establishment of spatial planning strategies for the atmosphere sector	
	Integrated management	Linking spatial and environmental policies to respond to climate change	
		Creation of urban wind corridors	
		Support for areas vulnerable to climate change	
		Distribution of environmental loads among regions	
Reforming national spatial structure to address population decline	Inter connection	Designation of planned urbanized areas considering the planned population size	
		Evaluation of the appropriateness of selecting development available land and conservation areas	
	Integrated management	Securing the feasibility of the plan based on population status and future population change forecasts	
		Eco-friendly utilization of unused and abandoned spaces	
		Regeneration and restoration of spaces in declining areas	
		Creation of high-tech logistics complexes in urban centers	
Implementing innovative national territory and environment utilizing advanced technologies	Integrated management	Expansion of smart green infrastructure	
		Creating a foundation for eco-friendly new industries	
	Integrated management	Connecting major ecological networks on the Korean peninsula	
Enhancing global stature through cooperation between North and South Korea and international partners	Integrated management	Expanding northeast Asian cooperation in the environmental field	
		linkage	Spatial environmental management planning in the energy and waste sectors
	Other strategies	linkage	Water quality management and spatial planning in the groundwater sector
			Realization of a low-carbon circular economy for resource circulation
		Integrated management	Integrated water quality management and reduction of environmental factors hazardous to health
			Establishment of management zones to improve environmental quality in living environments

South Korea's integrated management policies have progressed from sector-based environmental planning, to regionally focused development and conservation, and more recently, to the adoption of policies across different spatial scales.

When analyzed by strategy, first, the one that has been consistently addressed from the linkage stage to the integrated management stage was "Systematically Managing National Territory to Enhance Connectivity of the National Environment". This included considerations of the balance of networks in the fields of national territory and environment and the spatialization of environmental planning. Strengthening connectivity at the local government level was emphasized more in the integrated management stage than in the linkage stage.

Secondly, the strategy discussed in both the linkage and integrated management stages was "Establishing a Low-Carbon National Environment in Response to Climate Change". It covered spatial planning in the atmosphere sector and support for climate change vulnerable areas. Compared to the linkage stage, the integrated management stage was mainly concerned with micro-scale spatial applications.

Third, the strategies that have been addressed from the interconnection stage to the integrated management stage were "Reforming National Spatial Structure to Address Population Decline" and "Implementing Innovative National Territory and Environment Utilizing Advanced Technologies". The former emphasized the feasibility of selecting preservation areas and development areas in the interconnection stage, while the eco-friendly utilization of unused spaces and declining areas, such as smart decline, was stressed in the integrated management stage. Therefore, the integrated management stage was characterized by detailed utilization plans for specific spaces and areas. The latter emphasized environmental effects through the creation of a high-tech logistics complex in the interconnection stage, and the establishment of eco-friendly industries and infrastructure that apply smart technology in the integrated management stage. While the interconnection stage was characterized by a focus on the complex level, the integrated management stage emphasized the macro scale, particularly in terms of industry and infrastructure.

Fourth, the strategy that has been addressed since the

integrated management stage was "Enhancing Global Stature through Cooperation between North and South Korea and International Partners". This involved consideration of connecting the ecological network of the Korean peninsula in terms of North-South cooperation and Northeast Asian cooperation in the environmental sector. Finally, strategies that did not fall under the above five strategies incorporated spatial planning in the areas of water, energy, and waste in the linkage stage, and consideration of the living environment in the integrated management stage. Thus, it can be seen that while the spatial planning of separate environmental sectors was the main focus of the linkage stage, in the integrated management stage, considerations were combined with more detailed topics such as resource circulation and the living environment.

V. Discussions

The results show that the strategy that has been consistently addressed from the initial stage to the present was "Systematically Managing National Territory to Enhance Connectivity of the National Environment." The main focus of this strategy was the balancing of the ecological and development networks at the national and local levels. This is likely due to the fact that the degradation of the natural environment by development, especially the major ecological network, in national territorial plans was a key background for integrated management, resulting in the establishment of relevant legislation and the direction of linkages between both plans (Lee et al., 2020a).

To this end, it is important to elevate the institutional status of urban ecological maps to ensure their practical use in planning and policymaking processes. Currently, these maps are utilized only voluntarily by some provincial and local governments, highlighting the need for institutional measures—such as designating them as mandatory reference materials in national territorial and urban planning, or including them in legal review procedures during the formulation of other relevant plans. Additionally, efforts can be made to standardize the criteria for their production, specify update cycles to maintain data currency, and establish a nationally integrated data platform.

On the other hand, the strategies that have been addressed from the interconnection stage to the present were

“Reforming National Spatial Structure to Address Population Decline” and “Implementing Innovative National Territory and Environment Utilizing Advanced Technologies.” The former, in particular, dealt with the regeneration and alternative utilization of unused spaces, considering the population size and environmental value of the region. This can be related to the recent proposal of environmental conservation strategies with smart decline targeting declining areas for the expansion of green infrastructure in not only national territorial plans but also environmental plans (Joint Ministry of Related Ministries, 2019).

In response to this, it can be considered to institutionalize a shrinkage-based spatial management plan tailored to depopulated areas, along with legal and institutional reforms that require the re-evaluation of ecological values and the consideration of environmental restoration based on land use in these areas. Furthermore, integrated guidelines may be developed to ensure substantive integration between national territorial and environmental plans and the basic plans for responding to depopulation regions. A planning information platform can also be established to enhance consistency across plans and to lay the institutional foundation for implementing transition strategies, such as the ecological restoration of abandoned land and the expansion of green infrastructure.

The strategy addressed in the most recent integrated management phase is “Enhancing global stature through cooperation between North and South Korea and international partners”. It included consideration of connecting the major ecological networks of the Korean peninsula and expanding Northeast Asian cooperation in the environmental field. This is thought to be due to the emphasis on setting and restoring the national key ecological networks, such as the Baekdu-Daegan mountain range and DMZ (demilitarized zone), and the discussion of major policy issues for connecting the ecological networks of the Korean peninsula with those of Northeast Asia (Son et al., 2023).

In this regard, the authority and procedures to establish management plans for transboundary ecological corridors—centered on key ecological areas such as the Baekdu-daegan Protected Area—could be formally stipulated and linked to higher-level legislation, such as the Framework Act on the National Land or the Natural Environment Conservation Act. In addition, a long-term spatial manage-

ment roadmap based on intergovernmental cooperation could be developed to ensure the integration of ecological corridor restoration projects and biodiversity information-sharing into national territorial and environmental planning, particularly in preparation for expanded inter-Korean cooperation.

Other strategies that did not fall under the integrated management strategies were those for water, energy, waste, and living environment. The first three environmental sectors are considered to have relatively high importance among the ten integrated management issues (securing clean water, increasing energy conservation and efficiency, and reducing waste emissions), which were addressed as considerations at a strategy level. The living environment-related strategy was not addressed at an issue level, but this may be due to the emphasis on improving infrastructure and services to enhance the quality of life of residents in the environmental sectors, as found by Jang et al. (2024) in their analysis of the 5th Comprehensive National Plan.

For these sectoral strategies to result in practical integrated management, institutional mechanisms can be required to link and coordinate the currently fragmented regulations on water, energy, and waste within the comprehensive integrated management framework. In particular, a legal foundation could be established to utilize integrated management indicators related to water cycle restoration, energy efficiency, and resource circulation in the formulation of both plans. Furthermore, in the context of the living environment, the introduction of a living environment impact assessment system that evaluates and improves the quality of urban environmental services could provide a basis for systematically managing everyday environmental factors.

V. Conclusion and Further Research

As the time for the revision of the 5th Comprehensive National Territorial Plan and the 5th Comprehensive National Environmental Plan approaches, interest in improving the effectiveness of integrated management has grown. Thus, this study analyzed the considerations for implementing integrated management strategies through content analysis of research reports on the integrated

management of the national territorial–environmental planning. For this purpose, the stages of integration were divided into linkage, interconnection, and integrated management, and the characteristics of considerations according to the stages were compared.

By synthesizing the results, the following future research directions can be proposed. First, to strengthen the connectivity of the national environment, which has been actively discussed since the early stages of integrated management, policy efforts should focus on balancing ecological and development axes across different spatial hierarchies (national, metropolitan, urban) and regions. To achieve this, future research can develop quantitative models to evaluate the interactions between ecological and development axes using GIS-based spatial analysis and remote sensing data. Additionally, research is needed to explore policy coordination mechanisms and governance systems that transcend administrative boundaries to ensure effective linkages between ecological and development axes at each spatial level.

Second, ensuring the eco-friendly utilization of space in response to population decline requires the establishment of a system to accurately assess the environmental value of unutilized spaces in declining areas. To this end, IoT sensors and AI-based monitoring systems can be developed to identify the current status of unutilized spaces and predict the extent of their future decline. Furthermore, smart shrinkage strategies can be considered to repurpose unutilized spaces into green infrastructure, making them environmentally sustainable while simultaneously improving the quality of life for local communities.

Third, as the recently introduced integrated management strategy on inter-Korean cooperation and international cooperation lacks specificity in content, it is necessary to establish planning elements by linking them with related plans (e.g. the Phase II Strategy for the Conservation and Restoration of the Ecological Axis of the Korean Peninsula). To achieve this, research can comprehensively review existing policies and plans related to international environmental cooperation and border area management and define a direction for inter-Korean and Northeast Asian cooperation in the context of the integrated management. In particular, a governance model for cross-border cooperation can be proposed, focusing on major ecological corridors such as

the DMZ and the Baekdu-Daegan mountain range. Additionally, strategies can be developed to integrate conservation and development efforts by leveraging international organizations and multilateral cooperation frameworks.

Finally, in terms of the living environment, current integrated management strategies primarily focus on national, regional, and urban levels, overlooking micro-scale factors that directly impact daily life. Future research can explore ways to incorporate micro-level considerations into integrated management issues. This includes developing an indicator system to assess the quality of micro-scale living environments and linking it with integrated management strategies. For instance, models can be developed to analyze factors influencing residents' health and quality of life, such as air quality, noise levels, access to green spaces, availability of living amenities, and residential safety, while considering both the environmental quality of space and the spatialization of environment.

As for the limitations of this study, first, this study utilized research reports as analytical materials, and it is necessary to validate the results by comparing them with studies using other types of materials. Hence, further research may expand the scope of analytical data to include journal articles, theses or research reports published prior to 2002, thereby enhancing the reliability of the results and the academic contribution of the findings. Furthermore, additional analytical methods (e.g. text mining) can be employed to validate the results of the content analysis, including the frequency of each strategy. Second, this study compared the characteristics of considerations by separating the stages of integration according to the time period, but in the future, it is necessary to investigate the characteristics according to the spatial hierarchy, such as national, regional, and local levels. Third, further research is needed to identify opportunities and obstacles for domestic integrated management policies through comparison with international cases that are promoting integrated management of the national territorial–environmental planning. Finally, future studies could aim to analyze the linkages between the five strategies and the core literature by applying theories related to integrated management, thus complementing the academic implications for its implementation.

Note 1. In this study, the term ‘linkage’ indicates *yeongye* and *yeondong* for interconnection in Korean.

Note 2. The integration stage of R8 was classified as interconnection rather than linkage according to its content and publication period (January, 2017).

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