Master's Thesis of Science in Agriculture

Policy Coordination for Forest Management in North Korean Legislation

- Focusing on Ecosystem Services –

산림 관리를 위한 정책조정: 북한 법제를 중심으로

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Suyeon Min

Department of International Agricultural Technology

Graduate School of International Agricultural Technology

Seoul National University

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Supervised by

Prof. Mi Sun Park

Submitting a master's thesis of Science of Agriculture

Major of International Agricultural Development and Cooperation

Department of International Agricultural Technology

Graduate School of International Agricultural Technology

Seoul National University

Confirming the master's thesis written by

Suyeon Min

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Chair	Seongtae Ji, Ph.D.	_____
Vice Chair	Mi Sun Park, Ph.D.	_____
Examiner	Taeyoon Kim, Ph.D.	_____

Abstract

Forests have a wide variety of functions, which makes it necessary to ensure that they receive appropriate care and management. Coordinating forestry management into a broader framework that includes rural development, agriculture, landscape management, and environment protection has become a key priority in forest governance. This study examines policy coordination between the forest and non-forest sectors in forest management in North Korean law. A total of 239 general laws from North Korea were collected, and 223 forest-related provisions and 56 laws were selected and analyzed. To comprehend the status of policy coordination in forest management, this study focuses on two approaches. First, it analyzes forest-related provisions in forest and non-forest legislation to explore how diverse laws may work together in forest management (e.g., Energy Act, Water Resource Management Act, and Environment Act, among others). Second, it classifies the contents of forest-related articles into three ecosystem services, namely provisioning, supporting and regulating, and cultural services. Using these two approaches, forest and non-forest laws are grouped into forest, agricultural, urban, environmental, and energy sectors and sectoral coordination was assessed using the main ecosystem services function. Through legal analysis, this study highlights three key findings on policy coordination between the forest and non-forest sectors: 1) the forest and agricultural sectors are coordinated by provisioning services, 2) the forest and urban sectors are coordinated by cultural services, and 3) the forest, environmental, and energy sectors are coordinated by supporting and regulating services. The findings present a better understanding of the sectoral coordination for forest management in the North Korean judicial system based on specific functions that each ecosystem service provides.

Keywords: Forest legislation, Ecosystem services, Legal analysis, Policy coordination, North Korea

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Chapter 1. Introduction

Integrating cross-sectoral demands on forestry has been a significant policy concern for a while now (De Montalembert, 1995; Schmithusen et al., 2001; World Bank Group, 2002). Harmonizing sectoral policies (environmental, economic, and social) is crucial to achieving sustainable development, according to the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. The international forest discourse in the 1990s highlighted the importance of non-forest policy while considering strategies to accomplish sustainable forest management (SFM) (Dubé & Schmithüsen, 2003a). Non-forestry sector policies have a substantial impact on poverty and forest degradation than do forestry sector policies (Kaimowitz & Angelsen, 1999). For example, agricultural policies could create incentives to expand agricultural areas by converting fertile forest land into farmlands. According to Schmithüsen (2003), cross-sectoral policy links between the forest and other sectors results from public policies that have an impact on how landowners, forest users, governmental agencies, and non-governmental organizations behave. Therefore, the need to integrate and coordinate forest policy along with non-forest sectors play a key role in SFM. The significance of a sectoral approach is emphasized throughout the study. The terms of sectoral approach, inter-sectoral approach, and cross-sectoral approach are all used interchangeably to address the interconnectedness between the various sectors since sectoral interdependencies is what enables effective management of the forest sector.

In North Korea[1], forests cover 80% of the land, making it a forest-rich nation. With abundant tree resources, forests play a key role in conserving land and supporting economic growth. However, since the 1990s, North Korea has faced serious forest degradation owing to the excessive use of forest resources. The North Korean government issued a directive to establish a 10 year-national plan for forest restoration. The importance of forests for social, governmental, and environmental

[1] The official name for North Korea is Democratic People's Republic of Korea (DPRK). In this article, North Korea is used to refer to DPRK, and South Korea to the Republic of Korea (ROK).

purposes has recently increased with the advancement of industrialization and urbanization (J. M. Yi et al., 2017). North Korea manages its forest through a variety of policies instruments (e.g., guidance of the Supreme Leader), laws (e.g., the Forest Act), ministerial authorities (e.g., the Ministry of Land and Environment Protection), and civilian action (mass tree-planting movements) (K. Park et al., 2013; M. S. Park et al., 2021; J. M. Yi et al., 2017).

Deforestation and forest degradation are caused by various factors (Geist & Lambin, 2002; M. S. Park & Youn, 2017). Controlling proximate causes and underlying driving forces of deforestation and forest degradation needs both forest and non-forest sector policies such as agricultural and energy sector policies. This study analyzes laws as policy instruments to assess policy coordination for SFM between the forest and non-forest sectors in North Korea. Sectoral policy coordination for forest management will be assessed with ecosystem services of forests.

Chapter 2. Literature Review

2.1. Policy Coordination in the Forest Sector

The term "public policy" refers to the contents and decisions made in particular fields or sectors in keeping with prevailing plans, goals, and practices that govern significant matters of public concern (Parsons, 1995). Public policy analysis describes policy provisions and clarifies how they relate to the prevailing institutional framework, the polity, and how they are affected by political processes, and/or politics (Dunn, 2015). Public policies are decided by laws, decrees, governmental regulations and rules, and judgments of public authorities. They are based on constitutionally established state competencies (Peters, 2015).

The debate around linking current policies and coordinating public sectoral institutions is one of the oldest and most prevalent challenges in the fields of public policy and administration, and political science (Peters, 2015). Cross-sectoral responses to complex issues, such as environmental protection (Jordan & Lenschow, 2010), climate change (Biesbroek et al., 2010), agriculture (Chinseu et al., 2018), and forestry (Kaimowitz & Angelsen, 1999; F. Schmithüsen, 2003), have received significant attention in recent years from public policy both in practice and in academia (Champion & Bonoli, 2011; Trein et al., 2021). Such policy dilemmas frequently crosscut traditional lines separating policy areas, administrative agencies, and nations, necessitating coordinated and coherent actions at all levels (Head & Alford, 2015; Peters, 2017, 2018b; Peters & Tarpey, 2019). Increasing policy regime complexity (Bolognesi & Nahrath, 2020) and the accumulation of policies over time (Adam et al., 2018) will probably make coordination and integration tougher. Thus, understanding the cross-sectoral nature of forest policy management is essential to addressing these policy issues (Peters, 2017, 2018)

Studies on public policies and cross-sector linkages that are crucial to sustainable forestry and forest conservation are readily available. For instance, a study on the policy context for forestry and the development of the forest industry in

Europe offers a significant amount of information on the connections between policy and the following four categories of forest policy objectives: (1) forest resources, forestry, and wood supply; (2) wood-processing industries; (3) international trade in forest products; and (4) the markets and demand for forest products (Peck & Descargues, 1997). The authors discuss the backdrop, objectives, and expected trajectories of relevant and significant external public policies. Policies that affect wood and processed forest product access to markets for intermediate and end uses are emphasized. Another study analyzed the causal relationships between policies affecting non-forest sectors and tropical deforestation processes (Kaimowitz & Angelsen, 1999). The authors present a thorough assessment of significant cross-sector relationships among several policy domains and offer recommendations for national and international policymakers on taking linkages into consideration. Thus, existing policies and relationships form the focus of the analysis.

Similarly, many of the precedent research draw from comparable references and professional experience that the field of forestry interacts with other public policies (Dubé & Schmithüsen, 2003b; Schmithusen et al., 2001; F. Schmithüsen, 2003). Table 1 presents a summary of several public policies that concern the forest sector, and emphasize the need to understand inter-sectoral significance in relation to the country context in the early 1990s. Such public policies that influence forestry is outlined as macroeconomic policies (fiscal, monetary, privatization, and public expenditure); population and social affairs; agriculture and livestock; land use and tenure; infrastructure; fisheries; trade; industry; energy; environment; and tourism (De Montalembert, 1995; Kaimowitz & Angelsen, 1999; Peck & Descargues, 1997; Schmithusen et al., 2001; F. J. Schmithüsen et al., 2000).

According to the matrix shown in Table 1, which takes into account the socio-economic, environmental, and political repercussions, there are a number of different policy areas that need to be addressed in order to achieve sustainable forestry growth. All eight authors identified economic, agriculture, land use/ tenure, and energy policy as the public policies that influence forestry (De Montalembert, 1995; De Montalembert & Schmithuesen, 1993; Kaimowitz & Angelsen, 1999; Peck & Descargues, 1997; F. J. Schmithüsen et al., 2000). Three out of four authors linked

social affairs (De Montalembert, 1995; De Montalembert & Schmithuesen, 1993; Kaimowitz & Angelsen, 1999; Peck & Descargues, 1997), and environment (De Montalembert, 1995; De Montalembert & Schmithuesen, 1993; Peck & Descargues, 1997; F. J. Schmithüsen et al., 2000) with forest sector. Further, rural and regional development (Peck & Descargues, 1997; F. J. Schmithüsen et al., 2000), fisheries (De Montalembert, 1995; De Montalembert & Schmithuesen, 1993; F. J. Schmithüsen et al., 2000), infrastructure (De Montalembert & Schmithuesen, 1993; F. J. Schmithüsen et al., 2000), tourism (De Montalembert & Schmithuesen, 1993; F. J. Schmithüsen et al., 2000) also highlighted by two authors.

Through this perspective, solving problems in forestry sector is not only understood as one sectoral problem, but linked concept that is affecting and affected by other sectoral goals and policies that are linked to forest sector. Therefore, in order to design forest policy with sustainability and longevity or to solve the problems in forest sector, there is a need to look closely into the other sectors. However, there are times when each sectoral goals and priorities are conflicting one another. There comes in the important of policy coordination to resolve such conflicts. Considering this, when properly managed with sectoral coordination, forest policy can be more effective and harmonizing with other sectoral goals, maybe even assisting in achieving bigger governmental goals.

Table 1 Public Policies Influencing Forestry as Identified by Authors

	De Montalembert	Kaimowitz &Angelsen	Peck & Descargues	Schmithüsen et al.
Sectoral policies	Macro-economic policies (fiscal, monetary, trade, privatization and public expenditure policies)	Macro-economic policies (fiscal, monetary, trade)	Economy (and trade)	Economic growth, employment, public finances
	Population and social affairs	Social affairs (indigenous rights, distribution of lands)	Demography and social affairs	
	Agriculture and livestock, fisheries	Agriculture	Agriculture	Agriculture, fisheries, game management
	Land use and tenure	Land tenure	Land use, rural and regional development	Rural and regional development, land-use planning, land tenure
	Infrastructure	Transportation		(Public) Infrastructure, communication, technology
	Industry, energy	Mining, energy	Construction, industry, energy	Energy, water resources
	Environment		Environment	Environmental protection, soil conservation, water resources management, nature- and landscape protection, national parks
	Tourism		The role of the public sector	Tourism, research, education
Scope	Sustainable development and environmental stability of all forests	Non-forest sector policies that affect tropical forests	Forestry in Europe	Separated for forestry / wood processing and sustainable forest resource utilization for all forests
Sources	de Montalembert (1994: 13-15) de Montalembert (1995: 29-31)	Kaimowitz and Angelsen (1999)	Peck and Descargues (1997)	Schmithüsen et al. (2000)

Adapted from Public Policies Influencing Forestry as Identified by Schmithusen et al., (2001)

2.2. North Korean Laws and Policies in the Forest Sector

Forest laws and policies in North Korea have been the subject of extensive interest in North Korean studies. Forestry cooperation was prioritized in inter-Korean exchange initiatives since it is possible to offer humanitarian assistance for forest pest management and seed and seedling support while North Korea is under UN sanctions (A. Y. Song & Hastings, 2020). The objective is to enhance the quality of life for North Koreans, who suffer mainly from floods brought on by deforestation and forest degradation and other natural calamities (S. Kim et al., 2020; M. Park, 2015). Even during the time of political complication, inter-Korean forestry cooperation has been the bridge that connects the divided nation through its established landscape (A. Y. Song & Hastings, 2020). In this regard, studies on North Korean forest sector have been actively pursued as an activity to sustain the landscape of the Korean peninsula and to support concrete peace-building (Oh et al., 2019; K. S. Park & Park, 2012; K.S. Park et al., 2013; M. S. Park & Lee, 2014; H. Yi, 2020).

Literature has been reviewed to better understand the overarching trends in forest studies and to determine which policy areas are connected to the North Korean forest sector. Although the discussion of forest policy and its interdependence on other policies is being pursued, a sectoral understanding of the forest sector in North Korea in respect to other sectors has not been taken. Instead, the literature can be divided into three major streams: Research on forest-related laws and policies in North Korea, comparative research between South and North Korea, and research on other North Korean laws related to forestry.

First, ample studies have outlined North Korea's forest policy, laws, and its governing organizations, which are authoritative bodies vested with duties of implementing the policy and law. These studies show forest laws and policies organized by period, looking through the eras of Kim Il-sung, Kim Jong-il, and Kim Jong-un (Oh et al., 2018; K. Park et al., 2013; K. S. Park, 2013; M. S. Park et al., 2021; J. M. Yi et al., 2017). The studies also highlight the challenges that North

Korea faced in every decade, and how these events have shaped its forest policy. Studies also present the background for the enactment of a Forest Act (1992), along with the policies and problems pertaining forest rehabilitation actions in North Korea such as heavy industry-oriented development (1960~70s), heavy timber production and forest degradation (1980s), and rapid land conversions due to economic downfall and food crisis (1990s) (Oh et al., 2018; K. Park et al., 2013).

Another study elaborated on the changing details of supplement and amendment of North Korean Forest Law (K. S. Park, 2013). The background for the enactment of the Forest law (1992) was caused by accelerating forest degradation due to the overuse of forest resource, and lack of government control in 1970~1990. At first, the national guidance and control of forest management by each mandated institution were emphasized. In 2000, first amendment was updated with emphasis on investment in the forest sector, thorough execution of forest construction plan, expansion of technical exchanges with the international community, and expansion of assigned reforestation area. Next supplement in 2001 was highlighted with establishment of a 10 year-national plan for forest restoration, emphasis on afforestation of effective tree species such as acacia trees, and stronger supervision on forest management (Oh et al., 2019; K. S. Park, 2013). Finally, the emphasis shifted toward strengthening the need for forestry policies for a pleasant national environment and protection of the land. Another change emerged in the emphasis on 'Wonlim-hwa' (making green space) and 'Soolim-hwa' (forestization) (Oh et al., 2018; M. S. Park et al., 2021; M. S. Park & Lee, 2014; M. Song et al., 2012). Thus, mentioning exotic tree species and wildfires reflects that the North's perception of forest management has diversified (M. Song et al., 2012). Park et al. (2021) mentioned how urban greening policies including forest and tree management began to include urban areas as spaces for greening. Using *Rodong Shinmun* as a medium, the study looked into North Korean urban forestry policy and showed how forests had been expanded to cities. It considered the green space policy (*wonlim*) an urban forest policy that provides better living conditions for urban dwellers. Making green space and afforestation were nationwide mass movements that the government emphasized.

Second, studies that compared the forest laws of North and South Korea were also referenced for a comprehensive understanding. Oh et al.'s (2019) comparative study of inter-Korean forest laws and policies clarified the commonalities and differences between South and North Korean forest laws, such as in terms of the years of adoption, resource ownership and use, protection and welfare system, and international relations. Another study compared the laws and policies governing forests in South and North Korea and recommended policies to support the sustainable development of the Korean Peninsula (M. S. Park & Lee, 2014). Further, Lee (2010) compared North and South Korean forest laws and suggested the ways for integrating of forest legislation and cooperation for green growth on the Korean Peninsula.

The third group consists of studies from the non-forest sector that demonstrate a connection to forest policy and laws. Notably, forest management seemed to be mentioned in numerous studies on the environmental sector. A study of North Korea's environmental law and its implications (Han, 2014) identified trends in North Korean environmental law, including the recent revision of the Environmental Protection Act. Act covers the National Land Planning Act (2002), Forest Act (1992), Agriculture Act (1998), and Water Resources Act (1997) as laws concerning soil protection. Forest resources are further mentioned concerning the protection of the ecosystem and natural environment, creation and conservation of the natural environment, and the reforestation of areas around railroad tracks. This shows strong relations between the Environmental Protection Act and forest resources. Another similar study of the Environmental Laws in North Korea (Kim, 2013) captured the changes in North Korea's environmental policy using various sectoral Acts. The author analyzed the National Land Planning Act (2002), Land Act (1997), Forest Act (1992), Construction Act (1993), Underground Resources Act (1993), and the Foreign Investment Act (1992) to comprehend the Environmental Protection Act (1986).

On top of literatures on environmental sector in relation to forest, a study on the agricultural laws and regulation in North Korea (KREI, 2011) shows the connection between agricultural laws and forest resource management. The author claims that

the Forest Act reveals aspects of North Korea's socialist agricultural policy. The water management study by Sa (2018) explains that sediment influx is a result of the destruction of the forests. Furthermore, due to the dryness of rivers and inefficient river management, North Korea suffers from water shortage and water pollution. In order to solve the problem, the article examines the way to achieve integrated water management system. In doing so, the research looks into the structure and characteristics of water management system in North Korea. In analysis of water use, the article states that the Environmental Protection Act (1986), Public Sanitation Act (1998), Taedong River Pollution Prevention Act (2008), Urban Management Act (1992), and Energy Act (1998) are related to water quality.

In conclusion, although several studies on the North Korean forest sector are ongoing, there is a research gap in thoroughly assessing the forest and non-forest sectors vis-à-vis the scope of forest management. This knowledge is crucial because the non-forest sectoral policy is likely to have an impact on the forest sector and vice versa given their close connection. Currently, there is no direct research on how various public policies influence forest sector at this point. Nevertheless, a fair amount of the literature in this chapter emphasizes how forest management is connected to other fields, including agriculture, the environment, and water resources, to mention a few. To further elaborate on this, this study aspires to identify which non-forest sectors are affecting North Korean forest sector, and to what extent. Therefore, forest and non-forest laws were analyzed in this study based on the policy coordination theory to supplement existing research on North Korean forests.

Chapter 3. Contextual Background

3.1. Forest Degradation as a Root of Multiple Problems in North Korea

North Korea considers nature a means to increase the living standards of its people (Nam, 2004). From the inception, North Korean regime has actively transformed the natural landscape for its benefit since 1945. The primary goal of North Korea's forestry policy was to secure a stable supply of forest products, such as timber, for constructing a stable economy and socialist society (Choi & Woo, 2007). Especially, North Korea has sought to exploit its available forest resources in favor of heavy industry development (K. Park et al., 2013). Moreover, the regime converted forests into farmland in order to make up for the shortage of cropland. (K. Park et al., 2013; K. S. Park & Park, 2012). The government used to believe that the forest can be exploited with little regard for natural consequences. Since 80 percent of the land in the North was covered with forests, economic development was highly dependent on utilizing forest resources. In its broader economic development policy, the forest policy was part of the centrally planned economy (S. Y. Park & Park, 2013). Therefore, forest policies were geared toward the use of land, including for economic development.

Whereas the government emphasized the importance of securing natural resources and wood products, it did not support the growth and maintenance of forest resources (K. Park et al., 2013). In contrast, the government encouraged terrace farming on mountains near residential areas to expand farmland to alleviate famines, a policy that resulted in the destruction of woodlands (Choi & Woo, 2007). Owing to the persisting economic crisis, people destroyed forests to acquire food and firewood (Park et al., 2013). The degradation of forests created disastrous floods and landslides that culminated in the food and energy crisis of the mid-1990s (Park et al., 2013). North Korea faced accumulated environmental issues.

At the same time, the North Korea encountered an ongoing economic crisis and the collapse of the Eastern European socialist regimes also impeded its economic recovery (K. Park et al., 2013). Deforestation weakened the forest's ability to control droughts and floods, leading to the loss of land, including that meant for agriculture. Landslides caused by deforestation damaged roads and factories. Deforestation, which was worsened by economic hardship, created a vicious cycle that aggravated economic hardship. Thus, the natural disasters of the 1990s severely impeded North Korea's economic recovery (Oh et al., 2018). At this point, North Korea began to change its forestry policies from heavy utilization to the rehabilitation of despoiled woodlands. The government passed the Forest Act in 1992 and established the Department of the Land and Environment Protection in 1996. In the 2000s, it took more conclusive actions to rehabilitate its forests, and sought the assistance of other nations (Oh et al., 2018; K. Park et al., 2013). In the 2010s, the North began emphasizing a management style geared toward the protection and improved management of its forests, to secure their ecological, economic, and social function and value. These changes show that North Korea expanded its understanding of the multiple benefits of forests (Oh et al., 2018; M. S. Park et al., 2021).

The will for forest restoration in the Kim Jong-un era was expressed in April 2012 when he announced the work "On bringing about a revolutionary transformation in the land management project in line with the demands of building a strong and prosperous socialist state." In his New Year address in 2014, Chairman Kim Jong-un proposed a nationwide tree-planting campaign ("Full text of North Korean leader Kim Jong-un's 2014 New Year's Address," 2014). In November 2014, while conducting a field trip at a nursery, Kim Jong-un presented a doctrine for reforestation and urban greening. He pointed out that the level of deforestation was serious at this site because of the arduous march in the mid-to-late 1990s, and appealed to the crowds for "restoring the forest as if the whole country rose from the ashes during the post-War restoration construction period" (S. Lee, 2014). In his New Year Address in 2015, he announced that he would transform the forest into a lush green Gold Mountain through a war on deforestation (Oh et al., 2018). To sum up, North Korea has been emphasizing the needs for afforestation and sustainable forest management. However, given this context, the cause of deforestation and the

motivation for reforestation in North Korea is linked to economic, agricultural, and environmental issues.

3.2. Characteristics and Impacts of North Korean Law

This subsection clarifies the reason for using North Korean legal documents to access the country's forest policies. The laws of a country generally reflect the values of its society, even if the lawful system in each county has different aspects. Laws can be understood by anyone and implemented without contradiction, and it is a continuous and stable norm in society (Hwang, 2019). In North Korea, where the access to verifiable social and political information is limited, officially published laws may be the most easily understood source of data for North Korean society.

The regime has used the law to secure its legitimacy and maintain power, and as a means for realizing the political goals and demands of the ruling class (Yoon, 2011). Since the establishment of the regime, North Korea has been controlling the country by prioritizing ideological education by the party rather than the law. Laws in North Korea were recognized as decorative because the teachings and instructions of the leader were supra-legal in nature, and the interaction between law and society was denied. Existing North Korean laws used to be one of the public relations strategies of political propaganda, there were a lot of contents that were out of sync with reality or contradictory.

However, after the collapse of the socialist bloc in the late 1980s and early 1990s, interest in the enactment of North Korean-style socialist legislation began. In the 2000s, the Kim Jong-il regime began to focus on the 'socialist legislation reform project', which initiated the official publication of a corpus juris for the general public in 2004 (Hwang, 2019). Since then, North Korea has been continuously publishing and disclosing new laws and regulations across different regimes, such as in 2006, 2012, and 2016.

Such legal reforms have been actively pursued with an emphasis on

strengthening socialist legislative projects and the ideology of the “socialist rule of law.” Efforts are being made to realistically achieve the socialist legal system, as claimed since the Kim Jong-il regime. This is recognized as North Korea moving toward the “rule of law” rather than the “rule of men” (Hwang, 2019). In 2005, the term “rule of law” appeared in legal journals during Kim Jong-il’s era. North Korea defined its “socialist constitutional state” as a state that was built under the leadership of the Party, to manage its social and national structure based on a socialist law in which the will and demands of the masses were expressed as a code of conduct (Hwang, 2019). Based on this, many researchers have concluded that North Korea is moving toward the rule of law. North Korea has been reforming its laws based on the socialist ideology of building a state governed by law (Hwang, 2019). Therefore, its legal system has been shaped and changed under the influence of the North Korean-style socialist development process (Hwang, 2019). Despite the distorted development of North Korean law, studies have focused on the interpretation that North Korea is moving toward 'rule by the law’ instead of cursory constitutionalism. This is the result of evaluating North Korea's active legislative reform in the 2000s (Hwang, 2019). More systematized legislation is set to appear, presenting a gradual shift in the attitude toward the law (Kang & Kwon, 2019).

Under Kim Jong-un, changes were made in the North Korean constitution that reflected changes in North Korean society (Hwang, 2019). The regime enacted the “Democratic People’s Republic of Korea Legislative Enactment Act” (the Legislative Enactment Act) in 2012, to define the legislative system and use the law as the institutional basis for policy implementation to build a strong socialist state governed by law (Kang & Kwon, 2019). With changes in meaning and status, the law became an important source of research data that is officially reflective of the regime's policies. The law is an important medium to grasp and understand North Korean society in situations where data are limited (Kang & Kwon, 2019).

Therefore, given the lack of information on North Korea’s forestry and the impossibility of field research, the law can help interpret the political context. It is meaningful to interpret North Korean laws in order to compensate for limitations. While it is meaningful to interpret the laws, the differences of North Korean laws

and other states should be considered. The North Korean laws do not specify the hierarchy levels within laws unlike South Korea. According to the study of North Korea's law-enactment Act, while matters are formally regulated by the North Korean constitution and laws, in reality, the instructions of Kim Il-sung and Kim Jong-il, and the Code and Rules of the Workers' Party of Korea to put them into practice works as a superordinate standard of law, including the constitution (S. Lee, 2021).

Chapter 4. Theoretical Framework

4.1. Policy Coordination

Society faces various environmental challenges such as climate change, deforestation, biodiversity loss, and so on. The causes are multiple and rooted in different policy arenas and are governed by different ministries with fragmented action. Fragmented government is referred to be caused by disaggregation and specialization of government action (Hood & Dixon, 2015). While one-dimensional problems can be solved by specialized government interventions, complex problems cannot be solved by a singular institutional approach (Verhoest, 2012). Complex issues demand collective action as they are multifactorial, meaning that their causes are multiple and rooted in different policy arenas. Complex problems need interventions through different programs, agencies, and levels of government (Cejudo & Michel, 2017). Environmental issues have been the main example of the need to solve government fragmentation (Meijers & Stead, 2004; van Bueren et al., 2003).

To solve this problem, different sectors must work together to meet new demands concerning the complexity of the aims for the environment, economy, and society such as sustainable development. To deal with the growing complexity of policy, it may be necessary to coordinate and move forward with an integrated understanding of relevant challenges. Though conceptually appealing, the concepts of policy coordination are notoriously challenging to put into practice (Zingerli et al., 2004). Tackling complex problems requires intervention by and cooperation among different ministries. Policy should be designed to enhance the possibility of solving complex problems. Several analytical concepts and frameworks may be used to define and evaluate policy coordination from a policy standpoint. This subsection offers a working definition and a few ideas to understand policy coordination.

Policy coordination involves a set of coordinated decisions where “adjustments have been made in it such that the adverse consequences of anyone decision for other

decisions in the set are to a degree and in some frequency avoided, reduced, counterbalanced, or outweighed" (Lindblom, 1965). Negative coordination involves avoiding conflict (Scharpf, 1994), whereas positive coordination involves searching for ways to cooperate on solutions that can profit all stakeholders (Scharpf, 1994).

Metcalfe (1994) had a continuum approach to policy coordination and developed a policy coordination scale comprising nine stages: 1) Independent Decision-Making, 2) Communication with others, 3) Consultation with others, 4) Avoiding divergence, 5) Search for agreement, 6) Arbitration of Policy Difference, 7) Setting limits on actions, 8) Establishing central priorities, and 9) Central strategy. Peters (2018) stated that coordination can be achieved through networks, collaboration, and hierarchy. Networks create coordination through interactions among civil servants. A network of social actors and governments provides coordination from the bottom up. Social actors interact while having information on different organizations and identify contradictions among them (Peters, 2018a).

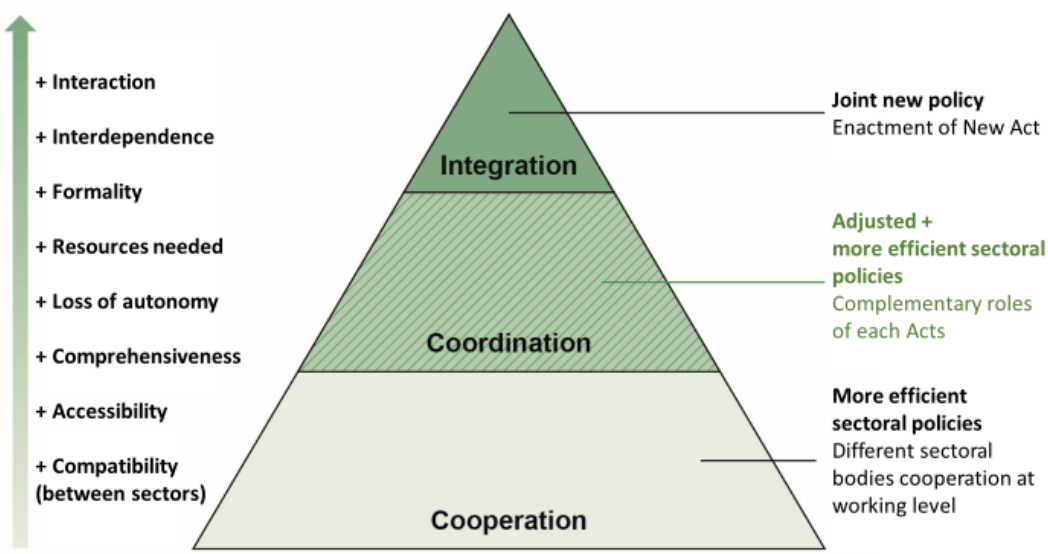
Coordination can be defined as "a process of creating the common understanding of the problem" (Bardach, 1998) and reaching an agreement on the nature of the problem among actors (Peters, 2018a). It requires defining rules and responsibilities for all actors, which can enable each organization to carry out their activities such as attending a committee and deciding specific instruments (Cejudo and Michel, 2017: 752). In other words, "setting and implementing priorities as well as about merely getting organizations to work together smoothly and effectively" (Peters, 2018a). Therefore, laws can support policy coordination by specifying actors' responsibilities.

The terms policy coordination, coherence, and integration are often used interchangeably to counter problems rising from government fragmentation. Policy integration is "a process of uniting and harmonizing separate policies to produce an integrated and coherent policy system" (Briassoulis, 2005: 50). It is a form of coordination (Cejudo and Michel, 2017: 752). Coordination and integration constitute the process and outcome of governance, respectively (Nordbeck and Steurer, 2015). Meijers and Stead (2004) explained policy coordination and

integration with different levels of hierarchy in policymaking. Policy coordination alters polices so that organizations may carry out their objectives successfully. In policy integration, organizations share policy objectives and work together to create a comprehensive policy. It involves the highest level of collaboration among organizations.

The concept of policy coordination, which is the superordinate concept of cooperation and the subordinate concept of integration, is the subject of this study (Figure 1). When applying this idea to North Korea, it is necessary to look at how the Ministry of Forestry, the Ministry of Agriculture, the Ministry of Urban Management, the Ministry of Land and Environmental Protection interact in order to gauge the level of cooperation. However, considering the limited information on North Korea, it is difficult to determine how each governmental body genuinely interacts with the others. The concept of policy integration is further advanced from the concept of policy coordination. A new law that unifies the objectives of the forest sector and other sectors must be developed or established in order to see the integration of policy. This part, however, is outside the scope of this study.

Figure 1 Conceptual Outline of Policy Cooperation, Coordination, and Integration



Adapted from Meijers & Stead (2004)

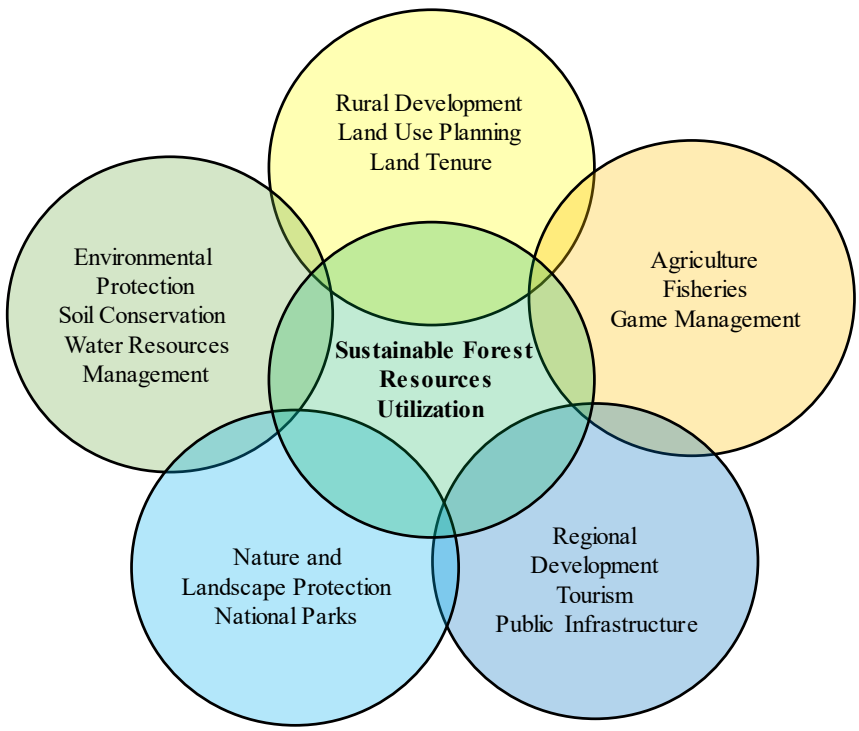
In terms of modes of coordination, this study elaborates the horizontal coordination defined by Lafferty & Hovden (2003). According to Lafferty and Hovden (2003), vertical coordination refers to intra-sectoral approaches, and horizontal coordination refers to inter-sectoral approaches. Vertical coordination demonstrates the degree to which a particular government sector has adopted and attempted to achieve the fundamental goals that the government body persistently pursues. Meanwhile, horizontal coordination represents the extent to which a central authority of different sectoral bodies has devised a harmonious cross-sectoral strategy. This study focuses on horizontal coordination as it navigates between forest and non-forest sectors at equal level, not in hierarchical order. Further, the considered policy landscape is a nation. In other words, a national government and its composite sectors are main targets of policy coordination through legal instruments to sustainably manage forest sector. The focus is on incorporating policy-making as a component of governmental steering in accordance with distinct sectoral responsibilities. This study primarily focuses on procedure and policy, not the actual effects and outcomes of governmental policy initiatives (products or outcomes).

Certain policy sectors such as the forest and environment should work toward enabling greater cooperation and integration (Zingerli et al., 2004). Zingerli et al. (2004) stated the need for coordination between international and national forest policy. They analyzed the Swiss National Forest Programme against the theoretical background of positive and negative coordination to make high-level decisions for integrated policy strategies in the environmental sector and for the sake of sustainable development, which are often multisectoral domains. Nordbeck & Steurer (2016) focused on ways to integrate policies across sectors and levels of government and argued how national sustainable development strategies have failed. Russel et al. (2020) found that long-term conflicts and synergies across sectoral policies are related climate change adaptation.

Most nations have developed an increasingly intricate network of laws and policies over the past 30 years that have an indirect but significant impact on forest protection and SFM. This includes sectors like environmental preservation,

landscape and nature preservation, land-use planning, and urban and rural development (F. J. Schmithüsen et al., 2000). There are pertinent sector policies and their enabling laws, such as rules and policy goals relating to agricultural growth, water preservation and usage, fisheries, hunting, and wildlife conservation, and national parks (Figure 2).

Figure 2 Public Policies with Important Impacts on Sustainable Forest Resource Utilization



Adapted from Schmithüsen et al., (2000)

4.2. Ecosystem Services

Ecosystems provide society with a range of goods (e.g., food and construction materials) and services (e.g., regulation of water flow), which support human survival and well-being. Humans have long been aware of such "ecosystem services" (Daily, 1997; MA, 2005). However, they were not formally recognized until the late 1960s and 1970s when scientists began to consider the importance of nature's functions for society (Bormann & Likens, 1979; Hermann et al., 2011; Portman,

2013). The term “ecosystem services” was first used in 1983 (Ehrlich & Mooney, 1983), and after significant contributions from individuals like Daily (1997) and Costanza et al., (1997), the Millennium Ecosystem Assessment (MA, 2005) highlighted the significance of the term for the world at large. The term “ecosystem services” is now recognized in policy, and represents a substantial research area with various modeling and mapping techniques supporting studies at various geographical and temporal dimensions (Burkhard et al., 2013). Research on ecosystem services has been conducted from various analytical perspectives owing to the growing recognition of the significance and interdependence of ecosystem services and human activities (Malinga et al., 2015). There are several approaches to categorizing ecosystem services, in order to evaluate and reflect the ecosystem (Boyd & Banzhaf, 2007).

According to the Millennium Ecosystem Assessment’s conceptual framework, ecosystem services are valued ecological benefits that directly and indirectly contribute toward human well-being through provisioning, regulating, cultural, and supporting services (MA, 2005). Provisioning services refer to economic activities that depend on tangible items that an ecosystem provides, such as food, raw materials, and drinking water. Regulating services refer to the indirect advantages offered by an ecosystem, such as climate regulation, preventing soil erosion, and purifying the air. Cultural services are non-material benefits that come from experiences and support for personal and cultural growth. Support services refer to additional tasks that enable ecosystems to deliver all the aforementioned advantages. Support services offer habitats, and are important for maintaining ecological biodiversity. These services are connected in various ways, from harmonious to antagonistic to mutually exclusive. Ecosystem services are naturally interdisciplinary (Costanza et al., 2014; MA, 2005; Malinga et al., 2015; TEEB, 2010). The theoretical foundation of ecosystem services has the capacity to assist in the advancement of knowledge backed by evidence. Forests are widely recognized as fundamental ecosystem service providers (Pohjanmies et al., 2017). Forests are linked to human livelihood as they provide food and support the energy industry and economy. The multiple benefits of forests have been recognized and communicated through the ecosystem services approach (Binder et al., 2017; Pohjanmies et al., 2017; Vizzarri et al., 2015).

Forest ecosystem services have fostered decision-making processes concerning forest policies (Aznar-Sánchez et al., 2018).

Several beneficial services that forest provides to society and the country can be more specifically categorized through ecosystem services. In the social sciences, ecosystem services analyze and assess the effects of various goods and services derived from the ecosystem on human society (Aznar-Sánchez et al., 2018; H. Yi, 2020). This study draws the concept and categories of ecosystem services from the most widely recognized studies namely Costanza et al., (1997; 2014), Millennium Ecosystem Assessment (2005), and TEEB (2010) (Table 2).

Table 2 Typology of ecosystem services

Service type	Costanza et al., (1997, 2014)	MA (2005)	TEEB (2010)
Provisioning	Food production Water supply Raw material Genetic resources	Food and fiber Water Fuel Genetic resources Natural medicine	Food Water Fuel Genetic resources Medical resources
Regulation/ environment regulation	Climate regulation Water control Waste control Erosion control Sediment retention Soil formation Plant pollination Biological control	Air quality control Climate regulation Storm protection Water control Water purification Waste control Erosion control Human disease control Plant pollination Biological control	Air quality control Climate regulation Mitigation of extreme Natural phenomena Water flow control Water purification Waste control Erosion prevention Soil fertility Maintenance Plant pollination Biological control

Support/ habitat	Nutrient cycle Habitat Shelter	Nutrient cycle Habitat Soil cycle Oxygen production (photosynthesis) Water cycle	Maintenance of the life cycle of migratory species Maintenance of genetic diversity
Cultural/ convenience	Recreation Cultural value Aesthetics	Recreation Ecotourism Aesthetic value Inspiration Cultural heritage value Spiritual/religious value Educational value Social value Knowledge Place Cultural diversity	Recreation Tourism Aesthetic value Cultural value Artistic inspiration Spiritual experience Cognitive development

Chapter 5. Research Design and Methodology

5.1. Methodology

This study was designed to look at the policy coordination between the forest and non-forest sectors in North Korea through the law. Accordingly, laws governing the forest and non-forest sectors were examined through content analysis methodology. Content analysis methodology makes inferences by objectively and systematically identifying the characteristics of a specifically designed message that evaluates trends across time (Song et al., 2012; Lacy et al., 2001). This study analyzes all obtainable North Korean legal documents and identifies how forest sector is coordinated with other policy sectors using forest-related articles indicating forest ecosystem services. Based on the constructed coding category of legal section and ecosystem services framework, all Acts and Articles were objectively distinguished and coded in a systematic manner. The final outcome of forest-related and forest- ecosystem services containing articles were regrouped by forest and other related sectors for the final analysis of sectoral policy coordination.

Law is one of the many policy instruments such as National strategy or plan. Law in policy is considered as a regulatory instrument. Regulatory instruments are all those political regulatory actions that formally affect social and economic behavior through legally binding regulations (Krott, 2005). The reason for analyzing policy coordination by means of law is that the Korean Workers' Party uses law as a tool to implement its policies, and responsible citizens are expected to follow them (Goedde, 2004). North Korea's laws are open and accessible unlike other policy instruments in the country. The state is mandated to oversee forest management as specified by law. Therefore, laws are important policy instrument that proves North Korea’s existing forest-related policies. For an instance, with other political instruments, it is hard to verify whether a media-stated forest policy actually exists, while the legislation can clearly show existing policy direction through provisions. Through the forestry-related articles, legislation serve as an official policy tool that illustrates how the forest and non-forest sectors are interrelated. Thereby the legal documents

can be used to identify the sectors of North Korean law that are relevant to forests. Using such characteristics, this study identifies forest-related Acts and Articles, and draw sectoral coordination within North Korean forest management through legal analysis.

5.2. Materials

The laws of North Korea were drawn from the *Database on a Unified Korea's Legal System*, an open website co-supervised by the Ministries of Justice, Unification, and Government Legislation of the Republic of Korea[2]. It offers open access to North Korean laws for the general public. From the database, a total of 239 North Korean laws, which are divided into 18 sections, were drawn (Table 3).

North Korea published 'The Code of the Democratic People's Republic of Korea' in 2004 to publicize laws internally and externally for the first time. The second edition was published in 2012, followed by newly adopted and supplementary laws, which were published thrice. In 2012, laws were classified into 18 sections except for the Socialist Constitution, Sovereignty, Administration, Criminal and Civil Affairs, Judicial Judgment, Planning· Labor· Property Management, Energy· Metal· Underground Resources, Transportation, Agriculture· Fisheries, Measurement· Standards· Quality Supervision, People's Service· Construction· Urban Management, National Land· Environmental Protection, Finance· Banking· Insurance, Science and Technology· Intellectual Property Rights· Postal Service, Education· Culture· Sports, Health, Social Welfare, North-South Economic Cooperation, Diplomacy· Foreign Economic Affairs (Database on a Unified Korea's Legal System, 2022; Kang & Kwon, 2019).

[2] Database on a Unified Korea's Legal System, https://www.unilaw.go.kr/en/Index.do?lang=en_US

Table 3. North Korean Laws by Section

Section	Number of Laws	Section	Number of Laws
Sovereignty	5	People's Service, Construction, and Urban Management**	13
Administration	12	National Land and Environmental Protection*	20
Criminal and Civil Affairs	11	Finance, Banking, and Insurance	12
Judicial Judgment	16	Science and Technology, Intellectual Property Rights, and Postal Service	20
Planning, Labor, and Property Management	14	Education; Culture, and Sports	11
Energy, Metal, and Underground Resources	15	Health	9
Transportation	17	Social Welfare	6
Agriculture and Fisheries	13	North-South Economic Cooperation	2
Measurement, Standards, and Quality Supervision	11	Diplomacy and Foreign Economic Affairs	31

* The National Land and Environmental Protection sector includes the Forest Act
** The People's Service, Construction, and Urban Management sector includes the Urban Greening Act

Within North Korean law, the Forest Law belongs to 'National Land; Environmental Protection'. The Green Space Act belongs to 'People's Services; Construction; and Urban Management'.

5.3. Research Design

5.3.1. Analysis units

To assess policy coordination of forest management in North Korean Law, it is necessary to classify the laws governing the forest and non-forest sectors. For filtering forest laws and forest relates articles, five search words that refer directly to forest and forestry were selected, namely tree (*namu*), forest (*sanlim*), green space (*wonlim*), woodland (*soolim)*, and forest industry (*rimup*)'. Using five forest-related search words, all non-forest laws and articles can be considered consistently based

on clear requirements. The forest-related articles serve as a medium to navigate forest and non-forest laws to be analyzed at the same level and scope. Based on five search words, forest-related articles were pulled from 239 Acts in 18 sections of North Korean laws.

- Tree (*namu*) is an official word for a woody perennial plant. Tree is a key element of the most basic forest composition. Tree was chosen as a key search word for drawing Acts and Articles connected to forests since the Forest Act makes reference to the management of trees.
- Forests (*sanlim*) is a word for a large area of land covered by trees. In the Forest Act, a forest is defined as a place that includes forest land and the animal and plant resources in it (Forest Act, Article 2, Forests and their ownership).
- Green space (*wonlim*) is a term used to refer to bushes in the yard or park within cities and villages in North Korea. The Green Space Act is considered urban forest law. Green space refers to the provision of a sanitary and cultural living environment by beautifully planted parks and amusement parks in cities and villages (Green Space Act, Article 2, definition of Wonlim). Green Space is also considered because it is a term frequently used to refer to North Korea's urban forest policy.
- Woodland (*soolim*) in North Korea signifies wooded forests. Forestization (*soolim-hwa*) refers to the creation of dense forests to protect land. Nationally declared policies have repeatedly emphasized on forestization and the creation of green space (*wonlim-hwa*; Song et al., 2012). Since then, these words have gained more recognition in forest policy in recent years.
- The forest industry (*rimup*) involves the management of forests for the sake of economic gain from various forest products.

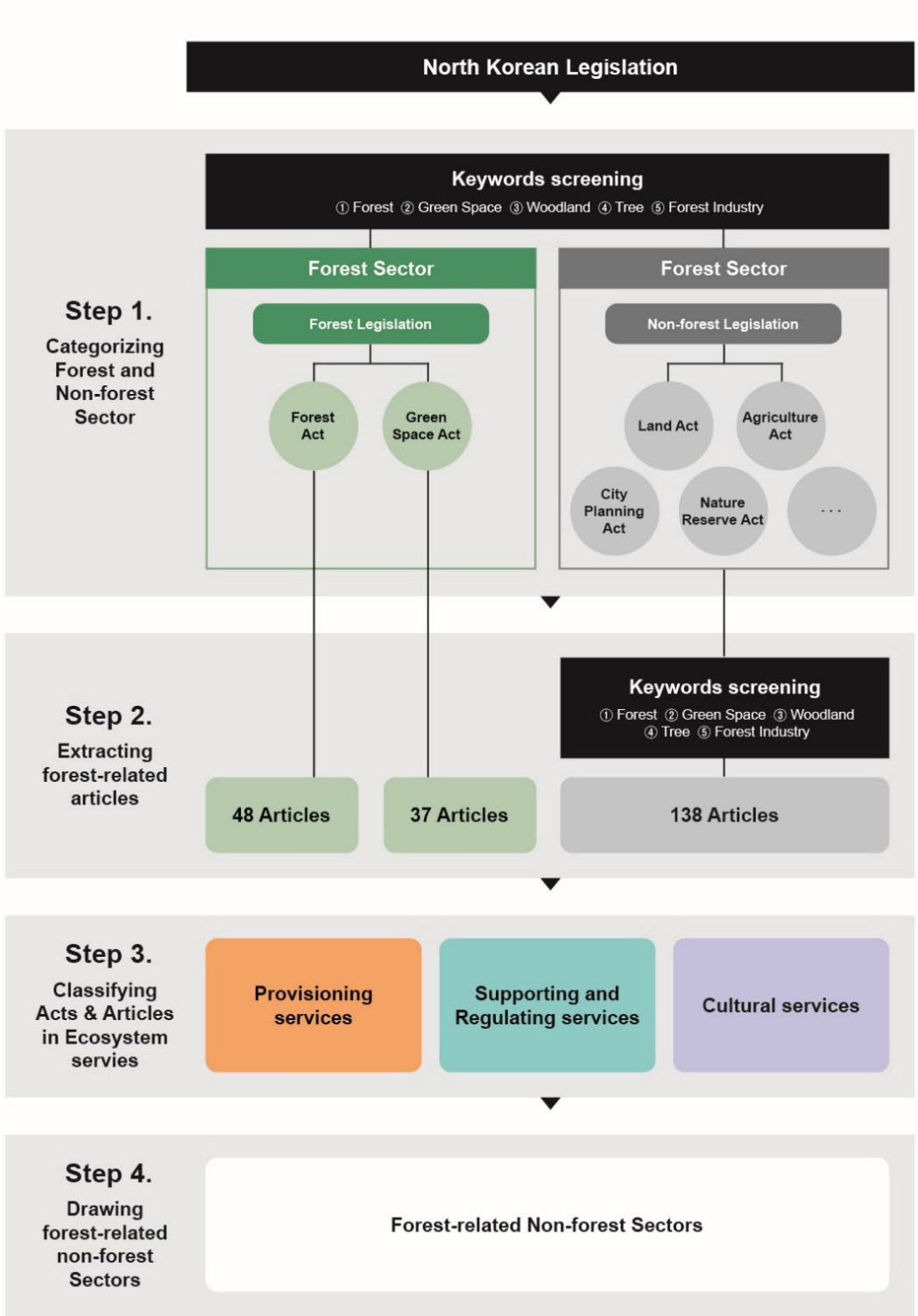
Using these five words, the first step involved categorizing forest and non-forest laws by title. If the title of the Act included five search words, it was defined as forest legislation, whereas others were considered non-forest legislation. Forest-related titles were extracted. This step was important as coordination in policy was arranged across various sectors. To see the policy coordination between the forest and non-

forest sectors, it is important to distinguish the laws that count as forest-related laws.

Next, forest-related articles were extracted. They were defined based on forest and non-forest laws. First, articles from forest laws were considered forest-related articles. Therefore, legal provisions were examined. Second, articles from non-forest laws were extracted with the five search words, which, in turn, were used with "OR," meaning that the search words were pulled out individually from each article. The purpose of search-word extraction in legal articles was to pull out only forest-related articles from the article contents in a systematic and regulated manner. Doing so enabled a deeper analysis of the forest and non-forest legislation and their provisions. The distribution of search words across North Korean laws shows the direct connection of forest-including, forest-related articles.

In Step 3, the forest-related articles from forest and non-forest sectors were categorized into forest ecosystem services of provisioning, supporting and regulating, and cultural services based on a structured coding system. This step explicates forest-related articles with specific ecosystem services functions. The results links Acts that have forest-related articles with specific forest ecosystem services and functions. Finally, in Step 4, the Acts with ecosystem services are regrouped as forest sector and forest-related non-forest sectors using inductive inference. The result first presents forest-related non-forest sectors. Next, based on the ecosystem services coding results, forest and forest-related non-forest sectors can be coordinated using ecosystem services functions.

Figure 3 Four steps to categorization



5.3.2. Categorization System

The legal articles were coded using a coding category system. The study first categorized the Acts based on Section, Year of Enactment, and Title (Table 4). Next, the content was categorized into ecosystem service type, namely provisioning; supporting and regulating; and cultural services, and according to examples based on the given definitions (Table 5). Whereas the information on Acts is obtainable from the North Korean legislation, the wording ecosystem services are not directly mentioned or distinguished in legal content. Therefore, the classification criteria of ecosystem services based on the theoretical framework in previous papers was adopted (Costanza et al., 2014; MA, 2005; TEEB, 2010; H. Yi, 2020; Costanza et al., 1997; Shin et al., 2020; M. S. Park et al., 2021) (Table 5).

Ecosystem services were coded into three categories, namely provisioning, supporting and regulating, and cultural services. While these services are generally divided into four categories, 'regulating or environmental regulating services' and 'support and habitat services' are hard to distinguish under the context of North Korean articles. They appear in a similar context under the broad framework of environmental protection. Therefore, to avoid duplication, regulation and environmental regulation and support and habitat services were integrated into one category of 'supporting and regulating services.' Other studies have also adapted the combination of these two services (M. S. Park et al., 2021; Shin et al., 2020).

There are two main reasons for classifying the extracted legal articles into ecosystem services. First, the ecosystem services framework conceptualizes the functions and types of forests revealed in each article from forest and non-forest legislations. Second, the categorized articles make it plausible to look into the legal coordination of forest and non-forest sectors using the forest ecosystem services in North Korean law. Articles with forest ecosystem services help us track relevant forest policy trends.

Table 4 Coding category system for laws

Unit of Analysis	*Category*	*Sub-Category*
Act	Legal Section	Sovereignty
		Administration
		Criminal and Civil Affairs
		Judicial Judgment
		Planning, Labor, and Property Management
		Energy, Metal, and Underground Resources
		Transportation
		Agriculture and Fisheries
		Measurement, Standards, and Quality Supervision
		People's Service, Construction, and Urban Management
		National Land and Environmental Protection
		Finance, Banking, and Insurance
		Science and Technology, Intellectual Property Rights, and Postal Service

Unit of Analysis	*Category*	*Sub-Category*
		Education, Culture, and Sports
		Health
		Social Welfare
		North-South Economic Cooperation
		Diplomacy and Foreign Economic Affairs
	Year of enactment	1977~2015
	Title	e.g., Forest Act, Green Space Act, Land Act, etc.

Table 5 Coding category system for Articles

Unit of Analysis	*Category*	*Sub-Category*	*Example*	*Definition*
Article	Ecosystem service type[3]	Provisioning	Food	Edible plants and animals
			Fiber	Species or abiotic components with potential for application in timber or textiles
			Water	Presence of water or water reservoirs
			Pharmaceuticals	Species or abiotic components with potential application for medicinal use
			Materials	Species or abiotic components with potential application as raw material
			Energy	Species or abiotic components with potential application as fuel or energy resources
		Support and regulation	Air quality regulation	The ability of ecosystems to remove aerosols and chemicals from the atmosphere.
			Disease and biological pest regulation	Pest population control using trophic relations
			Climate regulation	Regulating the atmosphere by sequestering and storing greenhouse gases

[3] Typology developed by modifying Costanza et al., (1997, 2014); MA (2005); M. S. Park et al., (2021); Shin et al., (2020); TEEB, (2010)

Unit of Analysis	*Category*	*Sub-Category*	*Example*	*Definition*
			Soil and erosion regulation/nutrient cycling	Natural soil formation, regeneration, and composition processes
			Natural hazard regulation	Influence of land cover and biologically mediated processes on regional and global climate, and the significance of forests in reducing the frequency of severe events
			Pollination	Contribution toward the efficacy and number of pollinators
			Water regulation	Water infiltration and release of water, and in biotic and abiotic processes of breaking down organic matter, xenic nutrients, and chemicals.
			Primary production	A process whereby organisms assimilate or accumulate nutrients and energy
			Habitat	Provision of breeding, feeding, or resting habitat for species to maintain ecological balance
			Supporting biodiversity	Provision of a variety of plants, wildlife, and habitats to maintain a given ecological balance and evolutionary processes
		Cultural	Aesthetics and inspiration	Aesthetic value of the landscape based on structural characteristics, verdancy, and tranquility
			Cultural values and diversity	Culturally significant landscape features or species

Unit of Analysis	*Category*	*Sub-Category*	*Example*	*Definition*
			Education and research	Attributes of educational and scientific significance
			Recreation and tourism	Recreational value of the landscape based on structural characteristics, verdancy, and tranquility
			Religion and spirituality	Landscape features or species with spiritual and inspirational significance to humans
			Social relations	Influence of nature on the kinds of social relationships that are created in different cultures and traditional knowledge

Chapter 6. Results

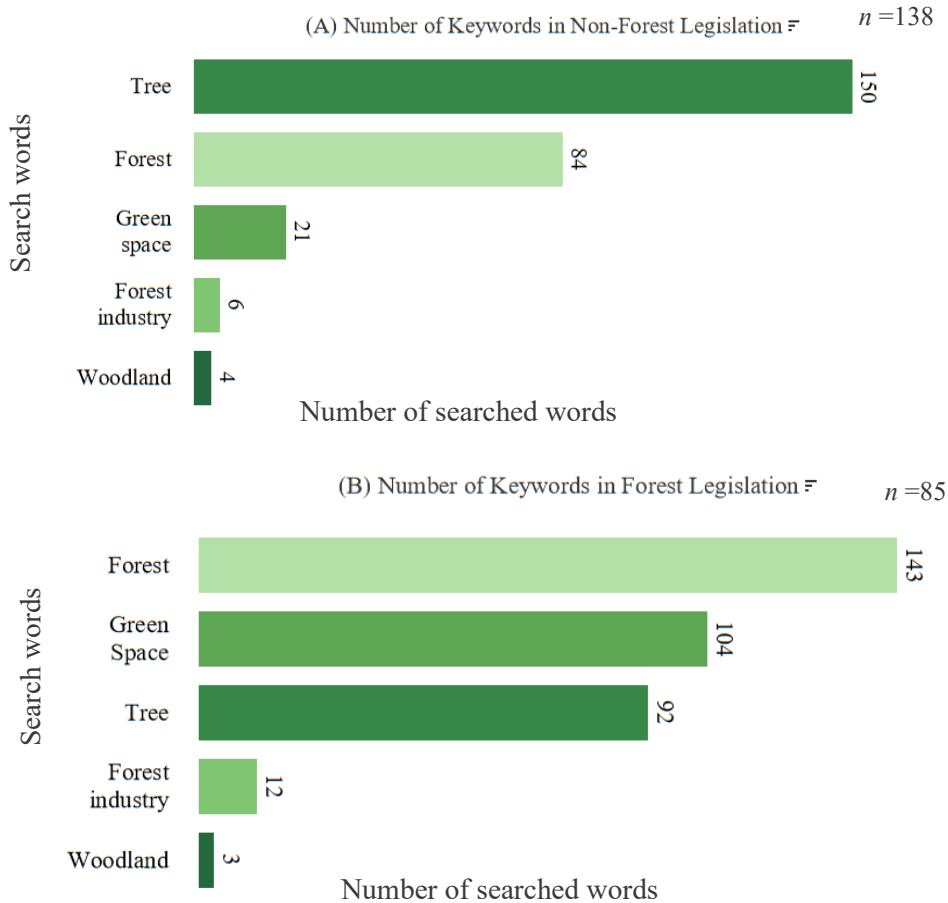
6.1. Forest-related Article Extraction

Five tree-related search words[4] were extracted from the North Korean laws reviewed. First, a search-word based screening process distinguished the laws governing the forest and non-forest sectors (Step 1). Given the use of the words *forest* and *green space*, the Forest Act and Green Space Act were categorized as constituting laws in the forest sector. The remaining 237 Acts were considered constituting laws in the non-forest sector. Second, forest-related provisions within the laws of both forest and non-forest sectors were extracted (Step 2). All 48 articles under the Forest Act and 37 articles under the Green Space Act were counted as forest-related articles. A total of 85 Articles were selected from forest sector laws. The non-forest sector laws comprised 237 Acts. From these, articles were extracted using the same 5 search words and 54 Acts and 138 forest-related articles were drawn.

Search words were drawn and counted individually, meaning that if an article contained several search words, all of them were counted but the number of articles remained one. This made it possible to identify the tree-related search terms that are often used in the non-forest sector. In effect, the search words 'tree', 'forest', 'green space', 'forest industry', and 'woodland' were found 150, 84, 21, 6, and 4 times, respectively in the non-forest sector (Figure 4A). All articles in the Forest Act and Green Space Act were reviewed. However, a similar result emerged in terms of the number of keywords. Yet, more 'forest' and 'green space' words were searched as two Acts mainly concerns the related terms. The search words 'forest', 'green space', 'tree', 'forest industry', and 'woodland' occurred 143, 104, 92, 12, and 3 times, respectively (Figure 4B).

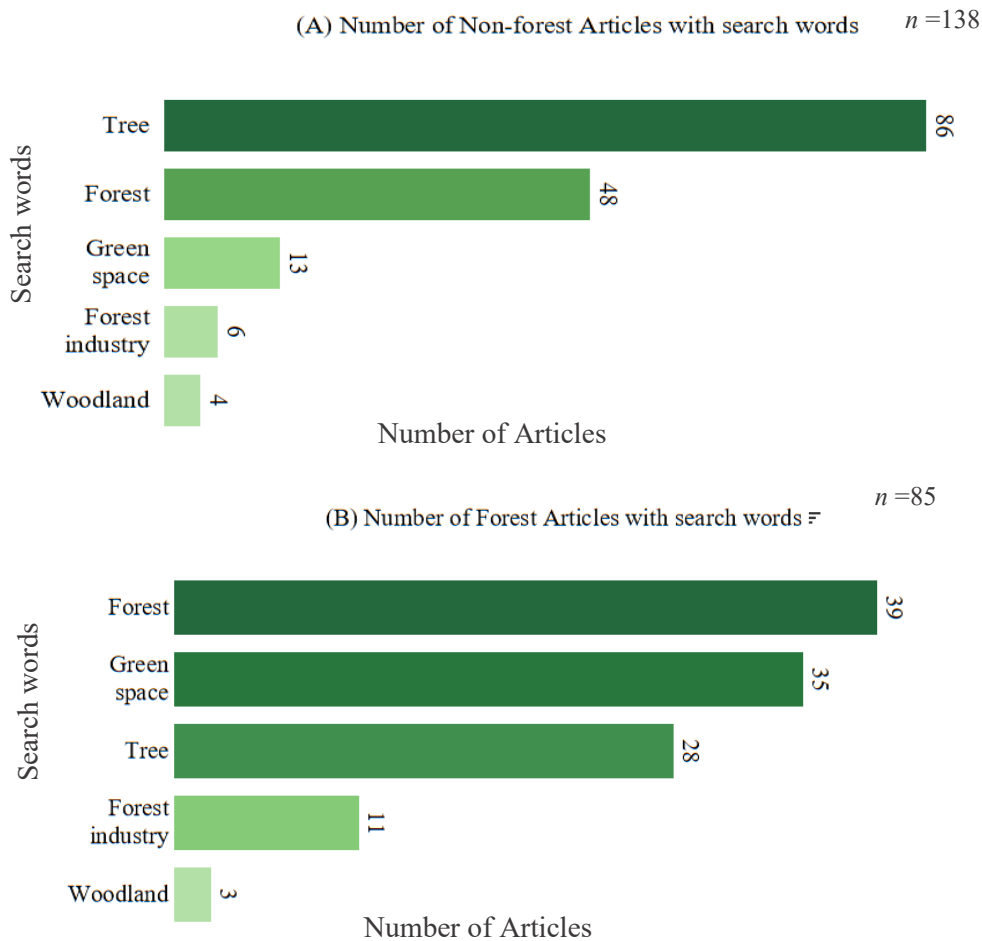
[4] Tree (*namu*), forest (*sanlim*), green space (*wonlim*), woodland (*soolim)*, and forest industry (*rimup*)

Figure 4 Number of keywords searched in non-forest (A) and forest (B) legislation



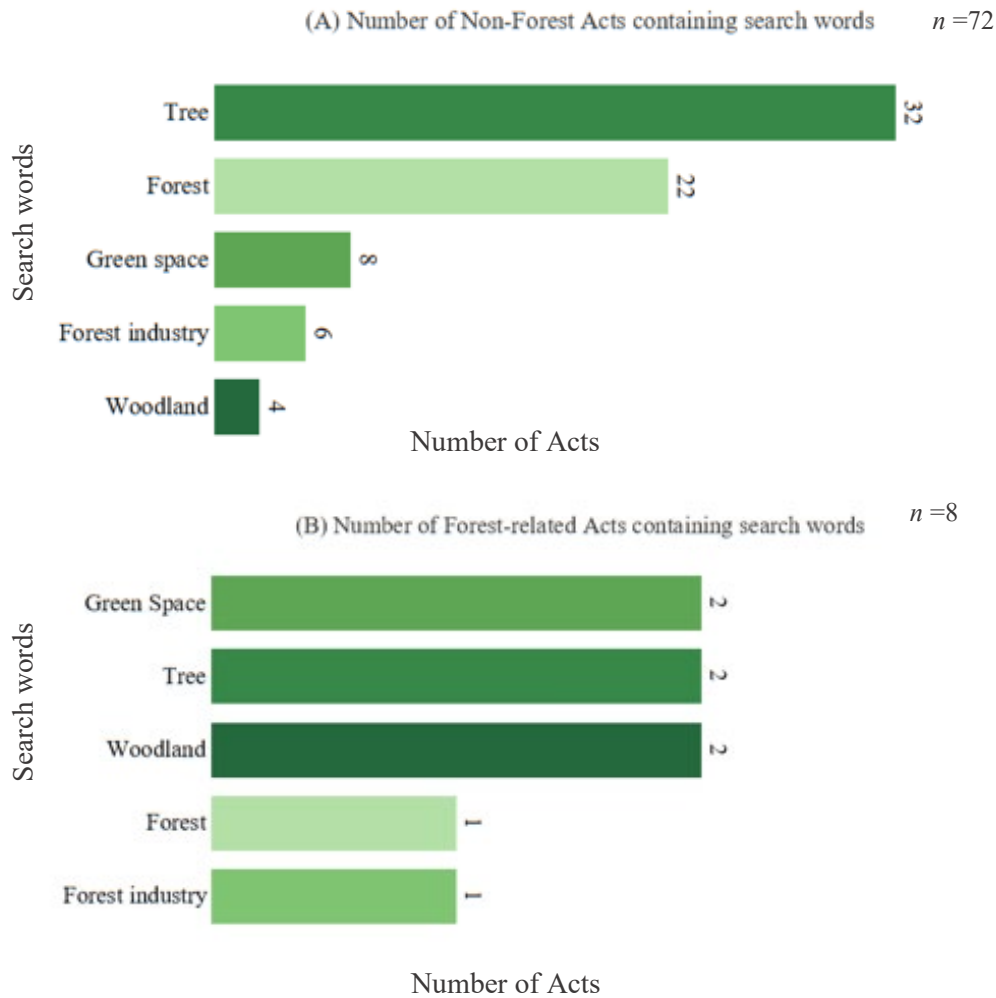
Within the 138 articles, after discounting the duplication of words, 86 articles mentioned 'tree.' Similarly, 'forest' was mentioned in 48 articles, 'green space' in 13 articles, 'forest industry' in 6 articles, and 'woodland' in 4 articles (Figure 5A). For 85 articles in forest legislation, forest and green space were mentioned more times in articles, compared to non-forest legislation. However, this can be seen as natural as each forest legislation are Forest Act and Green Space Act, emphasizing words forest and green space within its contents. The rest of the result showed a similar pattern. In sum, 39, 35, 28, 11, and 3 articles mentioned 'forest', 'green space', 'tree', 'forest industry', and 'woodland', respectively (Figure 5B).

Figure 5 Number of keywords searched for in non-forest (A) and forest (B) legislation



Out of the 54 non-forest Acts, 32, 22, 8, 6, and 4 contained the words 'tree', 'forest', 'green space', 'forest industry', and 'woodland', respectively (Figure 6A). The search words 'green space', 'tree', and 'woodland' were found in both the Forest Act and Green Space Act. The words 'forest' and 'forest industry' were found only in the Forest Act (Figure 6B). Thus, the subject of analysis was narrowed down to 138 Articles from 54 Acts in the non-forest sector. The full sample comprised 223 Articles from 56 Acts in the forest and non-forest sectors.

Figure 6 Number of Acts using keywords in non-forest (A) and forest (B) legislation



6.2. Acts and Articles Categorized by Ecosystem Services

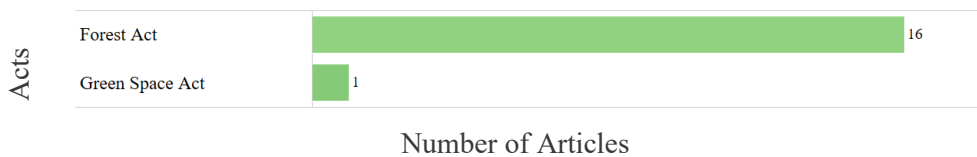
The 223 Articles in 56 Acts were categorized into 3 ecosystem services, namely provisioning, supporting and regulating, and cultural services. A total of 68 (17 Acts), 26 (13 Acts), and 31 (15 Acts) Articles were categorized under provisioning, supporting and regulating services, and cultural services, respectively. Out of 56 Acts, 20 Acts did not align with any ecosystem service. Therefore, after exclusion, 36 Acts remained. The details of the extracted Acts, Articles, and forest service contents are explained based on ecosystem service categories in the following segments.

6.2.1. Provisioning services

A total of 68 Articles from 17 Acts were categorized under provisioning services. Both the Forest Act (16 Articles) and Green Space (1 Article) Act mentioned provisioning services (Figure 7). Table 7 summarizes the coding results based on service types and contents of each article. The provisioning services mentioned in the Forest Act pertain to food, fiber, pharmaceuticals, material, and energy. The Green Space Act highlights the pharmaceutical value of forest provisioning services by mentioning the planting of medicinal herbs with various flower trees under Article 16. The Forest Act is more strongly aligned with provisioning services than is the Green Space Act (Table 7).

Figure 7 Number of articles including provisioning services in forest legislation

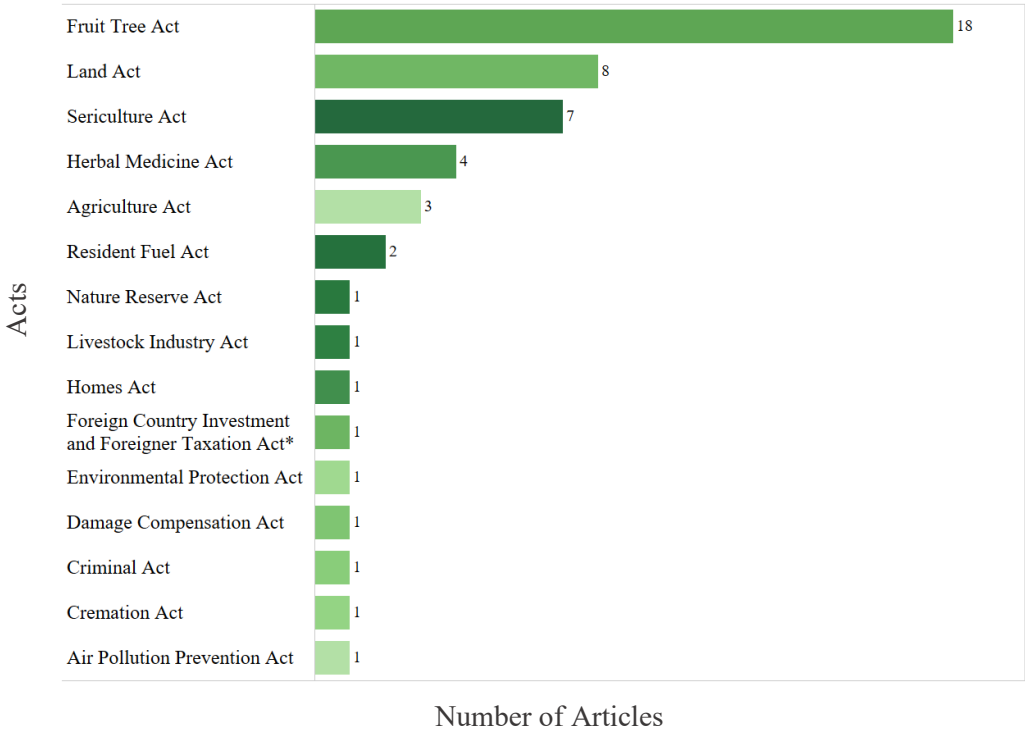
n= 17



Among the non-forest legislation, provisioning services are mentioned under the Fruit Tree Act (18 Articles), Land Act (8 Articles), Sericulture Act (7 Articles), Herbal Medicine Act (4 Articles), Agriculture Act (3 Articles), and Resident Fuel Act (2 Articles). The Nature Reserve Act, Livestock Industry Act, Homes Act, Foreign Country Investment Enterprises and Foreigner Taxation Act, Environmental Protection Act, Damage Compensation Act, Criminal Act, Cremation Act, and Air Pollution Prevention Act all mentioned provisioning services in 1 Article each (Figure 8).

Figure 8 Number of articles including provisioning services in non-forest legislation

n= 51



The Fruit Act supports the supply and production of fruits and fruit trees, which provide both food and economic value to people. The Land Act mentions materials (Increase the country's material wealth and forests for national economy, Articles 19, 20, and 36), fiber (paper and textile raw material forests, Article 31), food (fruit forests, forests for cooperative farms, Articles 31, 34, and 53), and energy (firewood forests, Article 34). The Sericulture Act mentions fiber and materials such as the mulberry tree, silkworms, silkworm feed, and the economic gains from the sericulture industry in seven Articles. The Herbal Medicine Act mentions pharmaceuticals described by herbal medicine or medicinal herbs in four Articles. The Agriculture Act mentions food (fruit farms, orchards, and chestnut forests, Articles 19 and 36) and fiber (sericulture farm, Articles 19 and 54). The Resident Fuel Act addressed energy through firewood forests for fuel production for residents (Articles 2 and 11). The Nature Reserve Act mentions food and pharmaceutical values in the form of hunting animals, gathering plants, and medicinal herbs (Article

32). The Livestock Industry Act mentions livestock and animal feed (Article 29). The Homes Act mentions food through planting fruit trees (Article 40). The Foreign Country Investment Enterprises and Foreigner Taxation Act mentions materials in terms of forest resources tax (Article 48). The Damage Compensation Act (Article 21) and Criminal Act indicate materials mentioning the economic value of forest resources (Article 168). The Cremation Act indicates coffin materials (casket) production (Article 22), and the Air Pollution Prevention Act mentions raw material for making manure with tree leaves (Article 33; Table 8).

Table 6 Details of provisioning services in forest legislation

Act	Article	Category	Content	Number of Articles
Forest Act	Article 3	Fiber, Materials, and Energy	Timber, economic, and firewood forests	16
	Article 4	Materials	National economic development	
	Article 10	Materials	The economic effectiveness of forests	
	Article 13	Food, Fiber, Materials, and Energy	Creation of timber, textile raw material, oil trees, fruit, and firewood forests, grasslands, and agroforestry management	
	Article 14	Materials	Specializing in the production of tree seedlings and purchase of tree seeds	
	Article 17	Food, Pharmaceuticals, and Materials	Increasing the number of forest incomes by planting and cultivating medicinal herbs and wild vegetables in the forest area in charge	
	Article 18	Food, Fiber, and Materials	Agroforestry can be actively accepted and other vegetation can be planted together with trees.	
	Article 21	Materials	Forest area for the sake of using forest land or collecting forest resources for income	
	Article 25	Food, Pharmaceuticals, and Materials	Cultivating mountains or using forestlands as graves, harvesting forest resources such as medicinal herbs and mountain fruits, and poaching forest animals	
	Article 29	Materials	Forest resources are important for accelerating socialist economic construction and improving people's living standards	
	Article 31	Fiber and Materials	Timber production must be continuously increased	
	Article 32	Materials and Energy	There is no need for permission to cut down trees to ensure convenience for residents, such as firewood.	

Act	Article	Category	Content	Number of Articles
	Article 35	Food, Fiber, Pharmaceuticals, and Materials	Harvesting forest resources such as trees, grass, medicinal herbs, and wild fruits	
	Article 37	Food and Materials	Hunting wild animals and birds	
	Article 44	Fiber, Materials	Supervision and control to keep the order of forest resources use such as forest land use, tree cutting, and log consumption.	
	Article 46	Food, Pharmaceuticals, Materials	Collection of medicinal herbs or wild fruits, or hunting of wild animals or birds.	
Green Space Act	Article 16	Pharmaceuticals	Planting medicinal herbs.	1

Table 7 Details of provisioning services in non-forest legislation

Act	Article	Category	Content	Number of Articles
Fruit Act	Article 2	Food	Production and supply of fruit varieties that can reap high yields	18
	Article 3	Food	Establishment of orchards and dense planting of fruit trees on land favorable for fruit production	
	Article 8	Food	Establishment of orchards and planned production of fruit tree seedlings	
	Article 9	Food	Producing breeders' seed fruit tree seedlings suitable for the situation in North Korea	
	Article 10	Food	Producing native fruit tree seedlings with high yields by acclimatizing to the local climate	
	Article 11	Food	Producing fruit tree seedlings	
	Article 12	Food	Producing fruit tree seedlings	
	Article 13	Food	The fruit seedling production plan is carried out without fail.	
	Article 14	Food	Accurately inspect the thickness, size, nutritional status, and disease and pest infection status of produced fruit tree seedlings	
	Article 15	Food	Supplying fruit tree seedlings	
	Article 16	Food	Packaging of fruit trees to be supplied	
	Article 21	Food	Fruit trees should be planted with empty trees replenished in time.	
	Article 23	Food	Replanting and replenishing fruit tress	
	Article 28	Food	Research on branch pruning and fruit thinning methods suitable for the characteristics and nutritional status of fruit trees	
	Article 32	Food	Young fruit tree, domestic animal feed, and manure crops	
	Article 33	Food	Protect orchards from natural damage	
	Article 35	Food	Scientific measurement of average yield of fruit trees	
	Article 49	Food	Compensation for fruit trees	

Act	Article	Category	Content	Number of Articles
Land Act	Article 19	Materials	Increase the country's material wealth	8
	Article 30	Materials	The “Forest Construction Project” is a great natural transformation project for the prosperity of the descendants and the development of the country's wealth	
	Article 31	Food, Fiber, Materials, and Energy	Creating paper forests, oil forests, textile raw material forests, mountain fruit forests, firewood forests, etc.	
	Article 33	Fiber and Materials	Establishing industrial forests and private forests for institutions and enterprises to meet the demand of institutions and enterprises for timber	
	Article 34	Fiber, Materials, and Energy	Establishing forests for cooperative farm and firewood forests	
	Article 36	Materials	Forests must be used in a planned manner in accordance with the development of the national economy and people’s needs	
	Article 53	Food and Materials	Agricultural extension institutions and cooperative farms should make the village beautiful by planting fruit and oil trees in and around the village.	
	Article 58	Food	The road management agency will plant fast-growing and useful fruit trees by the road	
Sericulture Act	Article 2	Fiber and Materials	Sericulture is a branch of agriculture that cultivates silkworm feed crops and produces cocoons by beating silkworms. Mulberry fields are sites where mulberry trees and other crops for silkworm feed are planted.	7
	Article 13	Fiber and Materials	Silkworm feed crops based on mulberry trees should be planted and nurtured.	
	Article 17	Fiber and Materials	An advanced mulberry cultivation method according to the country's situation must be introduced.	
	Article 18	Fiber and Materials	Set up a mulberry tree nursery, increase its production, and supply mulberry seedlings that have passed the inspection to planned institutions, enterprises and organizations.	

Act	Article	Category	Content	Number of Articles
	Article 19	Fiber and Materials	Establish measures to prevent pests and control pests on mulberry trees.	
	Article 21	Fiber and Materials	Not plant crops that harm mulberry trees or silkworms around mulberry fields and a silkworm-raising[rearing] room	
	Article 42	Fiber and Materials	Compensating for mulberry tree damage	
Herbal Medicine Act	Article 24	Pharmaceuticals	Initiating herbal medicine resource creation plan	4
	Article 25	Pharmaceuticals	Preparing herbal medicinal resource composition design	
	Article 26	Pharmaceuticals	Intensive planting of medicinal herbs in forest land at the right time	
	Article 36	Pharmaceuticals	Herbs must be collected in a timely manner in order not to interfere with the preservation and proliferation of medicinal herb resources	
Agriculture Act	Article 19	Food, Fiber, Material	Constructing and making orchards and mulberry tree fields convenient for irrigation, mechanization, and chemicalization	3
	Article 36	Food	Chestnut forest	
	Article 54	Fiber, Material	Preventing pests and diseases of mulberry trees	
Resident Fuel Act	Article 2	Energy	Firewood forest for fuel production, fuel for residents	2
	Article 11	Energy	Resident fuel is coal, oil, gas, firewood, and other substitute fuels used to ensure the livelihood of residents by resident households, institutions, enterprises and organizations, and firewood forests	
Nature Reserve Act	Article 32	Food, Pharmaceuticals, and Materials	Hunting animals and gathering medicinal herbs	1
Livestock Industry Act	Article 29	Food	Tree and leaves for livestock and animal feed	1
Homes Act	Article 40	Food	Planting fruit tree	1

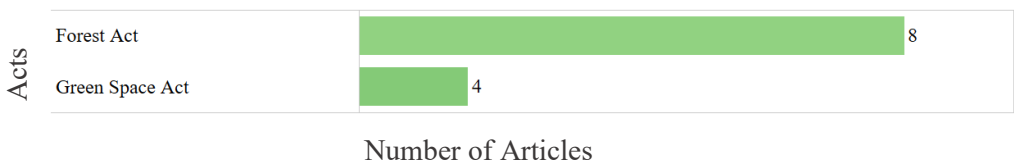
Act	Article	Category	Content	Number of Articles
Foreign Country Investment Enterprises and Foreigner Taxation Act	Article 48	Materials	Resource tax on forest resources	1
Environmental Protection Act	Article 13	Food	Orchard	1
Damage Compensation Act	Article 21	Materials	Compensation for forest resources	1
Criminal Act	Article 168	Materials	Punishment for massive forest property loss	1
Cremation Act	Article 22	Materials	Relevant agencies must first secure tree for coffin (casket) production	1
Air Pollution Prevention Act	Article 33	Materials	Tree leaves or waste must be carried out to a certain area or used to make manure	1

6.2.2. Supporting and Regulating Services

A total of 26 Articles from 13 Acts mentioned supporting and regulating services. The Forest Act and Green Space Act had the highest number of mentions of supporting and regulating services (Figure 9). In the Forest Act, mentions were made of four categories under eight articles, namely habitat, biodiversity, natural hazard regulation, and soil regulation/nutrient cycling. Supporting biodiversity, air quality, natural hazards, and soil regulation and nutrient cycling were drawn from four articles in the Green Space Act (Table 11). Though broadly similar, only the Forest Act addresses habitat function whereas the Green Space Act addresses air quality regulation. This can be understood as a spatial difference between both Acts. The Forest Act generally targets rural and mountainous areas that have more animals. Green Space is generally made for the urban population, thus, its air quality regulation function has been emphasized.

Figure 9 Number of articles including supporting and regulating services in forest legislation

n= 12



The Land Act and Air Pollution Prevention Act have three and two Articles addressing supporting and regulating services, respectively. The Waste Disposal Act, Tideland Act, Small and Medium Power Plant Act, Scenic Places and Natural Monument Protection Act, River Act, Renewable Energy Act, Environmental Protection Act, Electric Power Act, and City Planning Act each had 1 Article mentioning supporting and regulating services (Figure 10). The Land Act highlights the protection of beneficial animals and plants (Article 17), and prevention of land loss (Articles 19 and 30). The Air Pollution Prevention Act mentions guaranteeing the cleanliness of the air in Pyongyang City (Article 30), and natural purification abilities of trees and forests (Article 39), which can be considered addressing air quality, soil, climate, pest, and water regulation. The Waste Disposal Act mentions the natural purification ability of soil (Article 24), which aligns with soil and erosion

regulation and nutrient cycling. The Tideland Act mentions the function of air quality regulation, natural hazard regulation from windbreak forests, and other benefits of trees (Article 26). The Small and Medium Power Plant Act mentions supporting and regulating services of trees, which handles natural hazard regulation (Article 26). The Scenic Places and Natural Monument Protection Act mentions habitat and supporting biodiversity quality by encouraging the process of planting trees and greens to suit the characteristics of scenic spots and natural monuments (Article 29). River Act contained water regulation quality of supporting and regulating services by mentioning creation of reservoir forest (Article 20). Renewable Energy Act mentioned soil and erosion regulation, nutrient cycling quality by stating improving the fertility of farming field, and recycling of biomaterials (Article 31). The Environmental Protection Act addresses biodiversity through environmental protection (Article 17). The Electric Power Act highlights water and natural hazard regulation by mentioning the protective quality of trees though soil, water, and natural hazard regulation (Article 24). The City Planning Act encloses air quality and natural hazard regulations by mentioning the prevention of natural disaster and pollution (Article 12). While the 9 Acts contained only 1 article with supporting and regulating services, the highlighted function of the services appear to be diverse (Table 9).

Figure 10 Number of articles including supporting and regulating services in non-forest legislation

n= 14

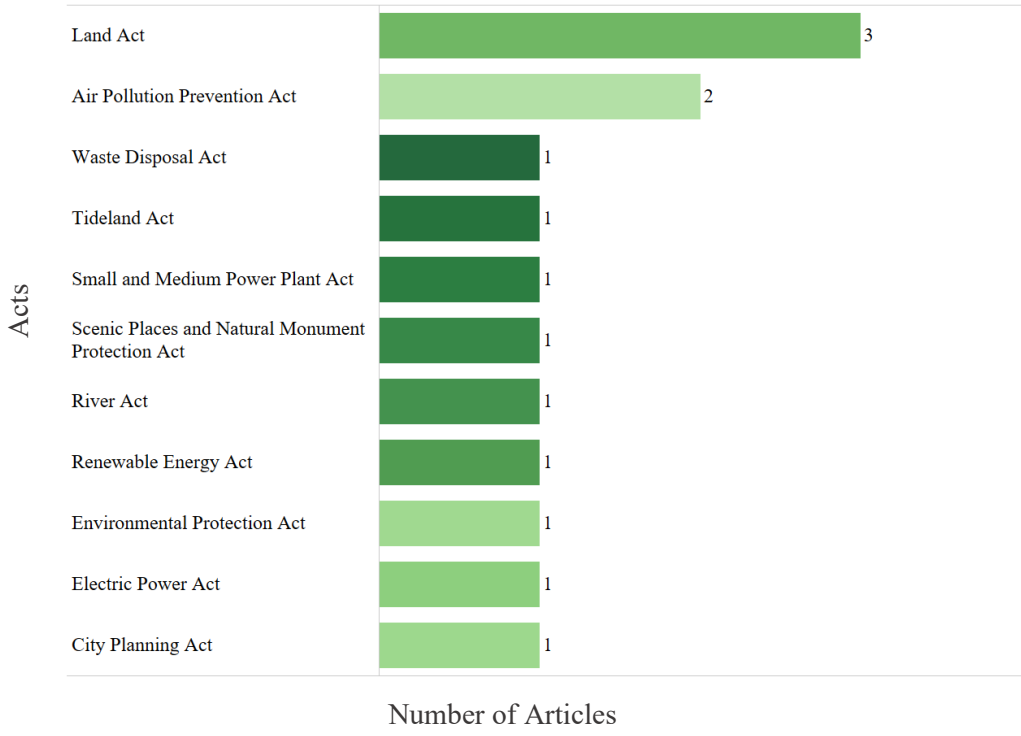


Table 8 Details of supporting and regulating services in forest legislation

Act	Article	Category	Content	Number of Articles
Forest Act	Article 2	Habitat and Supporting biodiversity	Forests include forest land and the plant and animal resources within it.	8
	Article 3	Natural hazard regulation	General protection of forests	
	Article 18	Soil and erosion regulation/nutrient cycling	Agroforestry to ensure productivity while preserving the ecological environment	
	Article 25	Habitat	Providing habitat for animals	
	Article 27	Habitat and Supporting biodiversity	Forest Ecoregion Preservation, Animal and Plant Resources Protection	
	Article 28	Habitat	Protection and breeding of beneficial animals and plants	
	Article 37	Habitat	Managing the habitats of wild animals and mountain birds	
	Article 46	Habitat	Prohibiting the hunting of wild animals and mountain birds	
Green Space Act	Article 2	Supporting biodiversity	Environmental protection forests	4
	Article 12	Supporting biodiversity	Green space/urban forests to meet the requirements of urban environmental protection	
	Article 15	Air quality regulation and Supporting biodiversity	Environmental protection forests are barriers for harmful gas, dust, and noise	
	Article 17	Soil and erosion regulation/ nutrient cycling, Natural hazard regulation	Windbreak forest to protect the environment and prevent disasters, cover plants for prevention of soil erosion on steep slopes	

Table 9 Details of supporting and regulating services in non-forest legislation

Act	Article	Category	Content	Number of Articles
Land Act	Article 17	Habitat	Protection of beneficial animals and plants	3
	Article 19	Soil and erosion regulation/nutrient cycling	Prevention of land loss	
	Article 30	Soil and erosion regulation/nutrient cycling	Prevention of land loss	
Air Pollution Prevention Act	Article 30	Air quality regulation	Guaranteeing air cleanliness (of Pyongyang City)	2
	Article 39	Air quality, Soil and erosion, Climate, Disease and biological pest, and Water regulation	Natural purification ability	
Waste Disposal Act	Article 24	Soil and erosion regulation/nutrient cycling	Natural purification ability of soil	1
Tideland Act	Article 26	Natural hazard regulation	A windbreak forest should be created on the reclaimed tideland. Trees should be planted around roads, villages and production bases such as fish farms and salt fields	1
Small and Medium Power Plant Act	Article 26	Natural hazard regulation	Plant a lot of trees to protect power facilities from damage owing to drought, floods, and landslides	1
Scenic Places and Natural Monument Protection Act	Article 29	Habitat and supporting biodiversity	Planting trees and greens according to the characteristics of scenic spots and natural monuments	1

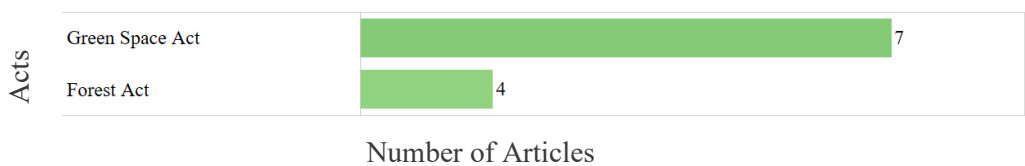
River Act	Article 20	Water regulation	Creation of reservoir forests to protect rivers	1
Renewable Energy Act	Article 31	Soil and erosion regulation/nutrient cycling	Improving the fertility of farming fields and recycling biomaterials	1
Environmental Protection Act	Article 17	Supporting biodiversity	Necessary to plant good species of trees, flowers, grass, and plants that can perform various environmental protection functions	1
Electric Power Act	Article 24	Water regulation and natural hazard regulation	Protection of facilities through soil, water, and natural hazard regulation	1
City Planning Act	Article 12	Air quality regulation and natural hazard regulation	Prevention of natural disasters and pollution	1

6.2.3. Cultural Services

A total of 31 Articles from 15 Acts embodies cultural services. The Green Space Act has the highest number, with 7 Articles, followed by the Forest Act with 4 Articles (Figure 13). The Green Space Act and Forest Act mentioned cultural services the most. Seven Articles in the Green Space Act included diverse categories such as aesthetics and inspiration; cultural values and diversity; recreation and tourism; social relations; religion and spirituality; and education and research. Four Articles in the Forest Act mentioned cultural values and diversity; aesthetics and inspiration; social relations; and education and research. The Green Space Act emphasized contributing toward beautifying cities and making hygienic and cultural living environments though green spaces (Articles 1 and 23). The definition of green space presented in Article 2 highlights the various functions of cultural services that green spaces encompass. Most Articles in the Green Space Act tend to align cultural functions with city facilities (Articles 2, 14, 16, 22, and 23). The Forest Act mentions cultural services obtained from mountainous areas with the forest landscape at a large scale (Table 10).

Figure 11 Number of articles including cultural services in forest legislation

n= 11



In non-forest legislation, the Urban Beautification Act and Land Act each had three Articles on cultural services. The Pyongyang City Management Act, Kumsusan Palace of the Sun Act, and Environmental Protection Act each had two Articles. The Urban Management Act, Road Act, Residents Administrative Act, Railway Act, Park and Amusement Park Management Act, National Heritage Protection Act, Mineral Spring Act, and Cultural Heritage Protection Act each had one article on cultural services (Figure 14). Table 11 shows how each Article under the non-forest laws address cultural services with various functions. The Urban Beautification Act addresses cultural services of aesthetics and inspiration (Articles 14, 39, and 41). The Land Act addresses more diverse functions (Articles 19, 37, and 53). Article 37

speaks of education and research function, and Article 53 addresses the aesthetics and inspiration value of cultural services. The Pyongyang City Management Act addresses cultural values and diversity, recreation and tourism, and aesthetics and inspiration (Articles 10 and 20). Kumsusan Palace of the Sun Act mentions aesthetics and inspiration quality (Articles 28 and 29). The Environmental Protection Act addresses aesthetics and inspiration, cultural values and diversity, and recreation and tourism value (Articles 13 and 17). The Road Act and Park and Amusement Park Management Act address aesthetics and inspiration quality. The Railway Act, Mineral Spring Act, National Heritage Protection Act, and Cultural Heritage Protection Act address cultural values and the quality of diversity in their articles. The Urban Management Act mentions aesthetics and inspiration, cultural value and diversity, and recreation and tourism (Article 38). The Resident Administrative Act addresses the quality of aesthetics and inspiration and cultural values and diversity (Article 20).

Figure 12 Number of articles including cultural services in non-forest legislation

n= 20

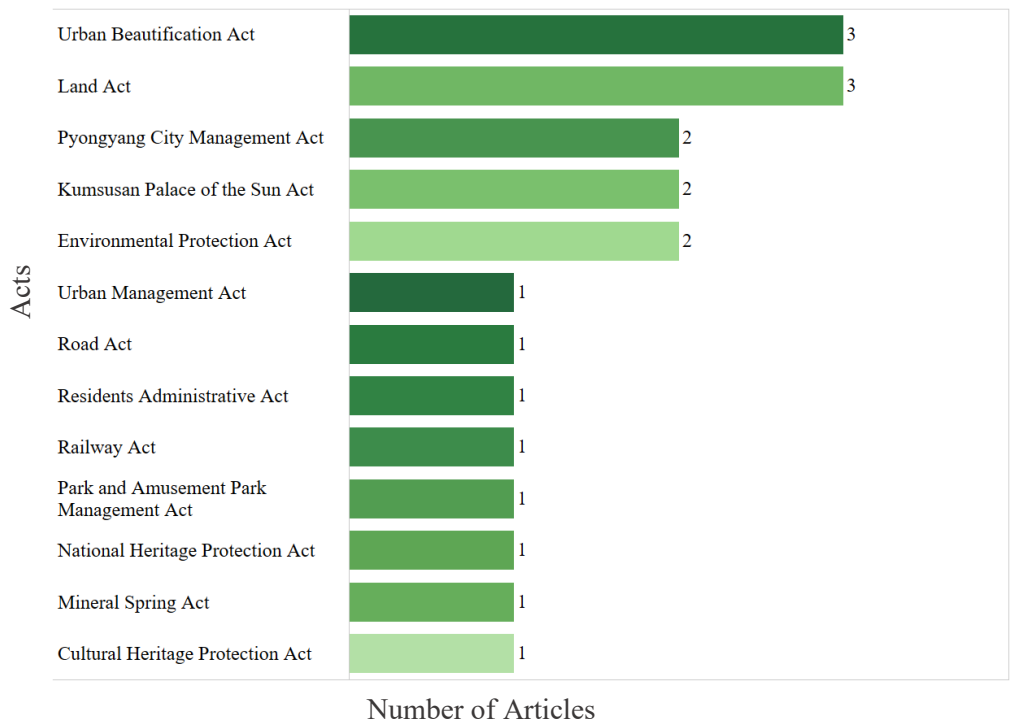


Table 10 Details of cultural services in forest legislation

Act	Article	Category	Content	Number of Articles
Green Space Act	Article 1	Aesthetics and inspiration, and cultural values and diversity	Contributing to beautifying cities and villages, and providing a hygienic and cultural living environment	7
	Article 2	Aesthetics and inspiration, cultural values and diversity, recreation and tourism, and social relations	The green space is beautifully and hygienically decorated with plants to meet people's cultural and emotional needs and environmental protection. Green space includes parks, amusement parks, green areas around roads and buildings, urban landscape and environmental protection forests, zoos and botanical gardens, greenhouses, and tree nurseries	
	Article 12	Cultural values and diversity, recreation and tourism, religious and spiritual, and social relations	Meet the demands of residents for their cultural and emotional lives.	
	Article 14	Cultural values and diversity, recreation and tourism, and social relations	Various sports, cultural, and entertainment, and public service facilities should be provided in parks and amusement parks	
	Article 16	Cultural values and diversity, and education and research	Trees that are good for education, cultural rest, and health promotion of children and workers	
	Article 22	Recreation and tourism, and education and research	Zoos and botanical gardens as educational bases and cultural resting places that broaden knowledge about animal and plant resources.	
	Article 23	Aesthetics and inspiration, and cultural values and diversity	Green space management is an important project to decorate and protect the landscape of places such as roadsides, living quarters, and public spaces. Make cities and villages more beautiful and hygienic and cultural.	

Act	Article	Category	Content	Number of Articles
Forest Act	Article 4	Cultural values and diversity	Manage forests in line with the development of the national economy and the promotion of people's welfare.	4
	Article 10	Aesthetics and inspiration	Improve the forest landscape	
	Article 25	Cultural values and diversity, and social relations	Forest site for graves	
	Article 32	Education and research	Forest science research	

Table 11 Details of cultural services in non-forest legislation

Act	Article	Category	Contents	Number of Articles
Urban Beautification Act	Article 14	Aesthetics and inspiration	Plant a variety of good species of trees and create a beautiful flower garden	3
	Article 39	Aesthetics and inspiration	Cutting or destroying trees and flowers will hinder urban beautification	
	Article 41	Aesthetics and inspiration	Ineffective management of green space will hinder urban beautification	
Land Act	Article 19	Cultural values and diversity	Land protection projects such as river clearing and forest development to prevent land loss, increase the country's material wealth, and promote people's welfare.	3
	Article 37	Cultural values and diversity, and education and research	The State establishes special forests to protect the forests in areas where revolutionary battlegrounds and historic sites are located. Nature conservation forests may be established for academic research on forests.	

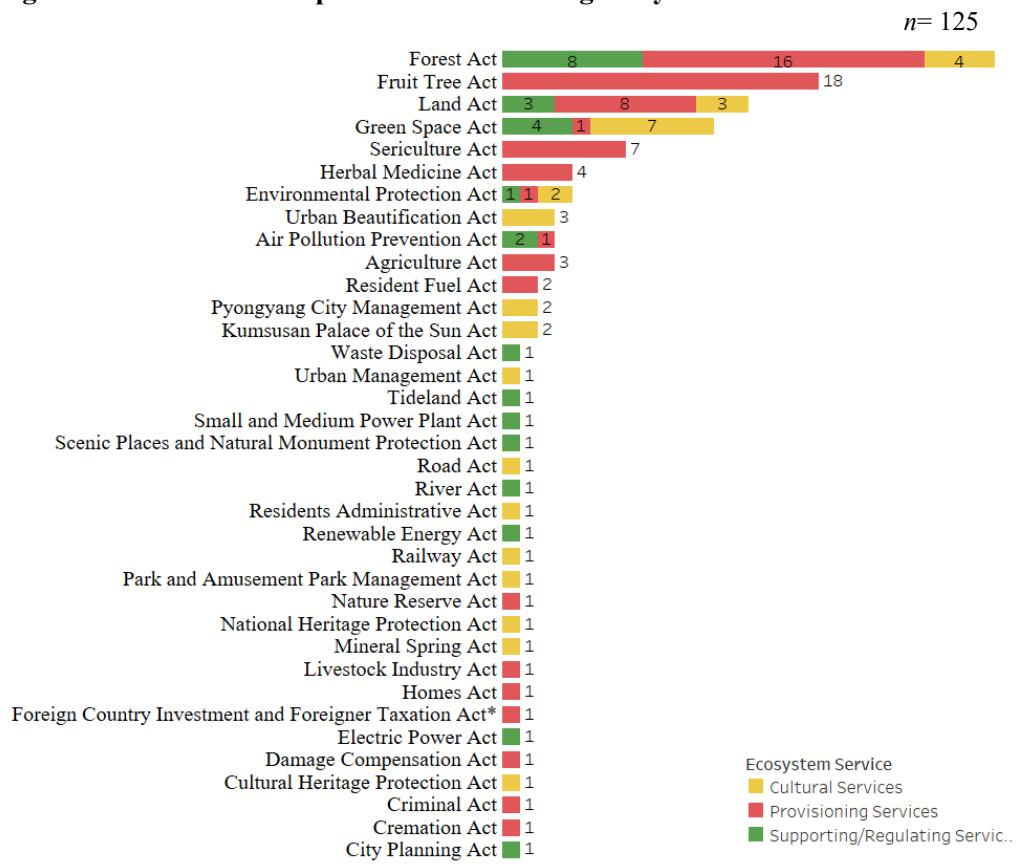
Act	Article	Category	Contents	Number of Articles
	Article 53	Aesthetics and inspiration, cultural values and diversity, and recreation and tourism	Organize cultural resting places for workers, including parks and amusement parks in the city and its surroundings, and plant many flowers and trees to create a good living environment for residents.	
Pyongyang City Management Act	Article 10	Cultural values and diversity, and recreation and tourism	A protected area is established to protect the environment of the central and local region and to ensure a cultural resting place for residents. A protected green area is based on forests and amusement parks.	2
	Article 20	Aesthetics and inspiration	Must plant various trees that look good and have good species in the management divisions in charge, make flower beds beautiful, plant ground-cover plants such as grass so that the raw land is not visible, and manage them normally.	
Kumsusan Palace of the Sun Act	Article 28	Aesthetics and inspiration	Planting and cultivating more tree species, rare and beautiful flowers, and good varieties of ground-cover plants should make the park bloom in full.	2
	Article 29	Aesthetics and inspiration	Trees of good species should be planted in a planned manner and nurtured well to create a beautiful scenery.	
Environmental Protection Act	Article 13	Aesthetics and inspiration, and cultural values and diversity	Do not damage or destroy the natural scenery around the river, including scenic forests, rocky cliffs, graceful and bizarre mountains, and scenic islands.	2
	Article 17	Cultural values and diversity, and recreation and tourism	Cultural and resting areas such as parks and amusement parks are modernized and operated normally.	
Urban Management Act	Article 38	Aesthetics and inspiration, and cultural values and diversity	Proper green space management and increasing its area to improve the living environment of the people and ensuring sufficient conditions for their cultural resting areas. Green	1

Act	Article	Category	Contents	Number of Articles
			space design in accordance with the needs and aspirations of the people, regional characteristics, and environmental protection requirements to make cities and villages more beautiful.	
Road Act	Article 23	Aesthetics and inspiration	Plant good tree species that match the nature of the road and surrounding environment.	1
Residents Administrative Act	Article 20	Aesthetics and inspiration, and cultural values and diversity	Plant good species of roadside, fruit, and flower trees in streets and villages to ensure a natural environment conducive to the health and life of residents.	1
Railway Act	Article 56	Cultural diversity and diversity	Manage surroundings in a sanitary and culturally appropriate manner. Install railroad signs in a culturally appropriate manner. Make woodlands for the basic railroad connected to mountains.	1
Park and Amusement Park Management Act	Article 22	Aesthetics and inspiration	Parks and amusement park management organizations and enterprises should plant more trees, flowers, and ground-cover plants to make parks and amusement parks more beautiful.	1
National Heritage Protection Act	Article 32	Cultural values and diversity	Cutting trees is prohibited in Historic Site Preservation Areas.	1
Mineral Spring Act	Article 14	Cultural values and diversity	Projects such as creating green space should be conducted appropriately to make the mineral spring protection area healthy and cultural.	1
Cultural Heritage Protection Act	Article 28	Cultural values and diversity	Cutting trees is prohibited in Historic Site Preservation Areas	1

6.2.4. All Three Ecosystem Services

Figure 15 shows that the Forest Act and Green Space Act contain all three ecosystem services presented in the articles. This is significant as it shows that both Acts represent all ecosystem services that a forest offers. Among the non-forest legislation, the Land Act and Environmental Protection Act mention all three ecosystem services, implying their close relations to the forest sector.

Figure 13 Distribution of provisions mentioning ecosystem services



*Full name of the law: Foreign Country Investment Enterprise and Foreigner Taxation Act

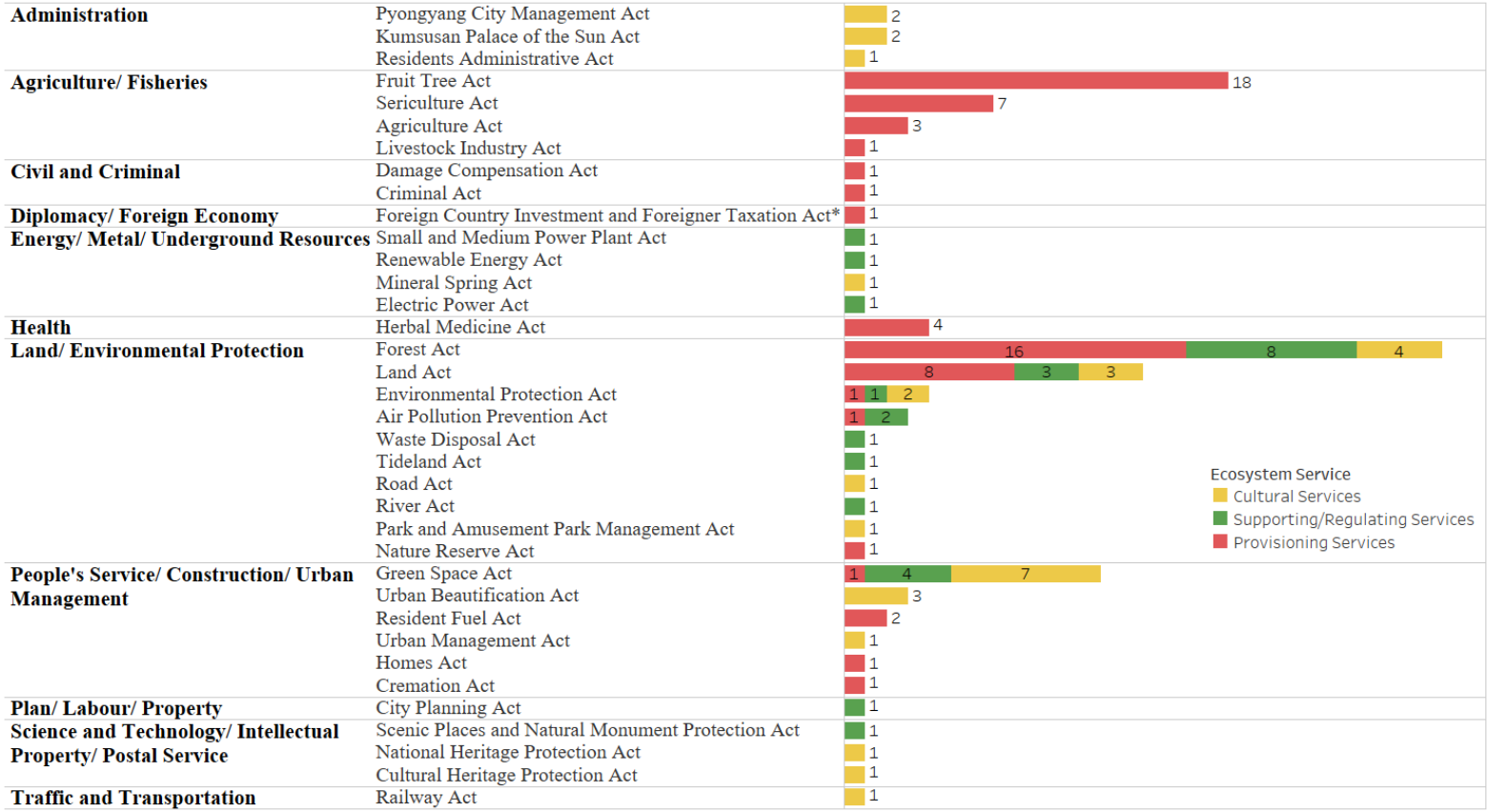
Looking in terms of legislation sections based on the Socialist Constitution classified into 18 sections, 11 sections have forest-related articles and mention matching ecosystem services. Figure 16 shows the sections, articles, and legislations that concern forest-related issues and ecosystem services.

The Land and Environmental Protection section comprises three Acts that

mention all three ecosystem services (the Forest Act, Land Act, and Environmental Protection Act). The Agriculture and Fisheries section comprises four Acts that mention provisioning services alone. The Fruit Act, Sericulture Act, Agriculture Act, and Livestock Industry Act all mention provisioning services alone. The Administration, People's Service, Construction, Urban Management, Science and Technology, Intellectual Property, Postal Service, and Traffic and Transportation sections, which are close to urban areas and functions, mention cultural services more. Looking into sections, this figure mildly represent how various sections are aligning with forest ecosystem services based on their role. This shows that the result of this study is plausible and within the reach of common sense.

Figure 14 Distribution of articles mentioning ecosystem services by legal section

n= 125

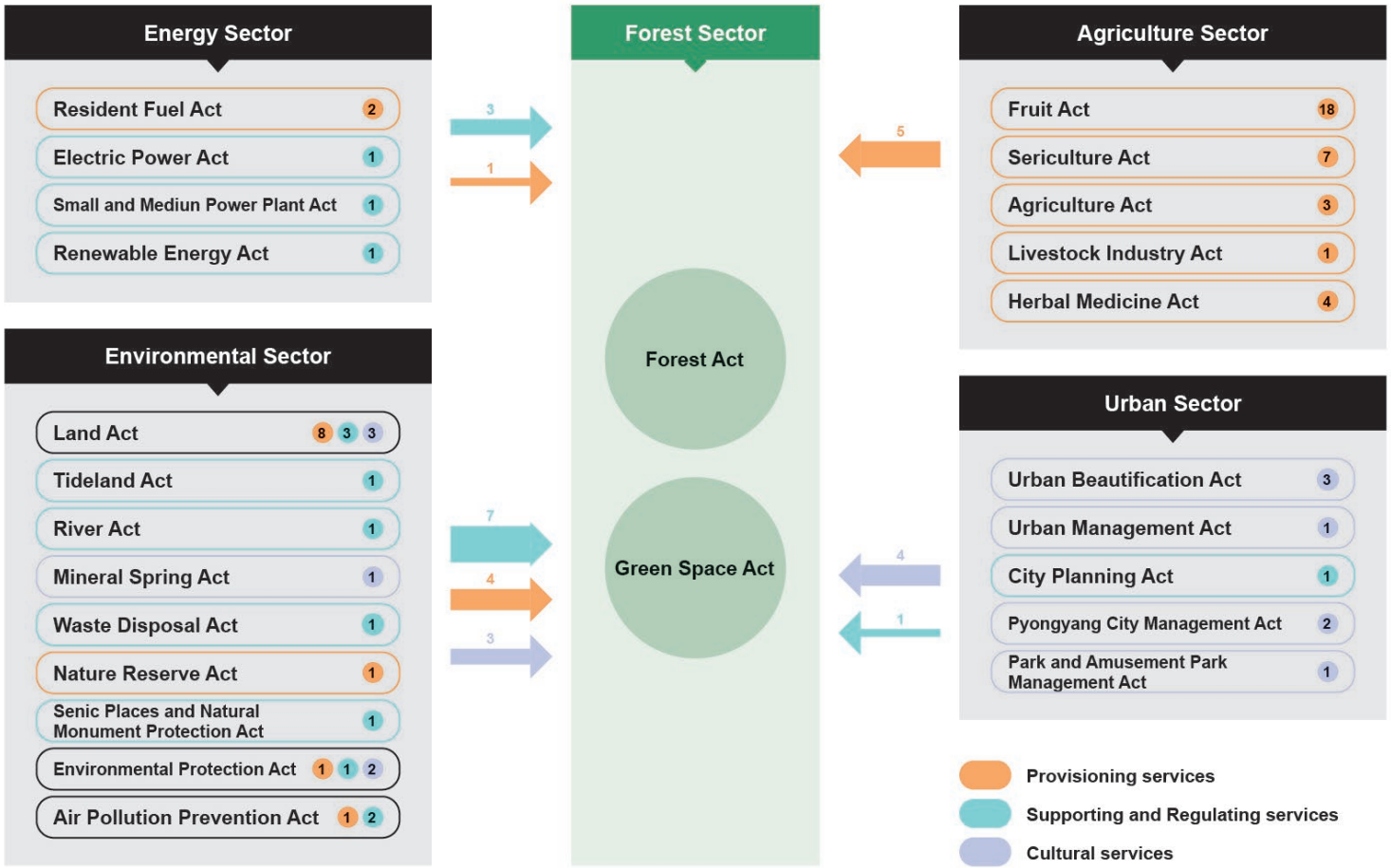


Chapter 7. Discussion

Over the course of the 20th century, forest policymaking became more and more entwined with other policy sectors, such as agriculture, energy, regional and rural development, water, and climate change (Hogl et al., 2016). In discussion, the articles classified according to forest ecosystem services are grouped into several sectors to show the relationship between the forest sector and the non-forest sectors. It is crucial to identify the non-forest sectors that have a relationship with the functions of the forest ecosystem services in order to demonstrate the policy coordination focused on the forest sector. Drawing from the results, this section provides four sectoral coordination insights using the ecosystem services function. The articles classified according to forest ecosystem services are grouped into sectors to show the relationship between the forest sector and the non-forest sectors. The results indicate forest sector is strongly coordinated with agriculture, urban, energy, and environmental sectors.

The legislative sections based on the Socialist Constitution do not define the forest sector. The constitution links various sectors together, such as Agriculture, Fisheries, People's Service, Construction, Urban Management, Land, and Environmental Protection. These sections blur the lines between the individual sector and makes the sectoral distinction difficult to understand. To draw policy implications from various sectors that align with the forest sector, some Acts are grouped together as constituting a particular sector based on its title and main functions. In this study, the Forest Act and Green Space Act were reviewed as base documents and combined as the "forest sector." Along with this, the agriculture, urban, environmental, and energy sectors are presented to show how they relate to the forest sector (Figure 15).

Figure 15 Sectoral coordination based on ecosystem services



7.1. Policy Coordination Between the Forest and Agriculture Sectors with a Focus on Provisioning Services

Among the 34 non-forest legislative Acts, 5 Acts represent agricultural values and are grouped together under the heading "agriculture sector." These are the Fruit Act, Sericulture Act, Agriculture Act, Livestock Industry Act, and Herbal Medicine Act. The grouping is valid as the term "agriculture" describes all the diverse ways in which domesticated animals and crop plants support the world's population by producing food and other goods (Harris & Fuller, 2014). All Acts in the agriculture sector only mention provisioning services, implying strong coordination between the forest and agricultural sectors on this area.

In the Fruit Act, 18 Articles mention provisioning services. They address the proper construction and management of fruit tree farms and orchards to increase the quality and quantity of fruit production. This aligns with the forest sector as the Forest Act mentions the creation of fruit forests (Article 13) and recognizes the presence of wild and mountain fruits (Article 25, 35, 46). The Sericulture Act is linked to forest sector through provisioning services concerning fiber and material. As sericulture refers to a branch of agriculture that cultivates silkworm feed crops and produces cocoons through silkworms (Article 2), it produces fiber and materials. Mulberry fields mean fields where mulberry trees and other crops for silkworm feed are planted (Article 2). Using these definitions, a total of 7 forest-related articles were marked with fiber and materials production using mulberry fields and trees. The Forest Act mentions the creation of forests for textile raw materials (Article 13). While textile raw material forests do not specify mulberry trees or sericulture, both Acts recognizes the forest as a source of fiber and material production.

Under the Agriculture Act, 3 Articles mention provisioning services concerning food, fiber, and materials. Food from tree resources is presented through orchards and chestnut forest (Article 19, 36). The management of mulberry trees is mentioned as a provisioning service concerning fiber and material (Article 19, 54). The

Agriculture Act emphasizes the proper construction of orchards and mulberry tree fields as necessary for irrigation, mechanization, and chemicalization (Article 19) and the prevention of pests and diseases (Article 54). The Forest Act does not mention the management of tree resources for the cultivation of food, fiber, and materials, but mentions agroforestry (Article 18). It states that agroforestry can be actively accepted, and that other vegetation can be planted with trees, highlighting the complementary quality of tree and crop cultivation in forest.

The Livestock Industry Act mentions provisioning services concerning food, that is, using trees and leaves for livestock or animal feed. In the Forest and Green Space Act, there is no mention of using trees and leaves for livestock feeds. In the Forest Act, multiple Articles bring up the forest as a shelter for wild animals (Articles 25, 37, and 46). This implies that forests and trees offer food resources for animals to sustain their lives, showing how food from forests benefit humans and animals.

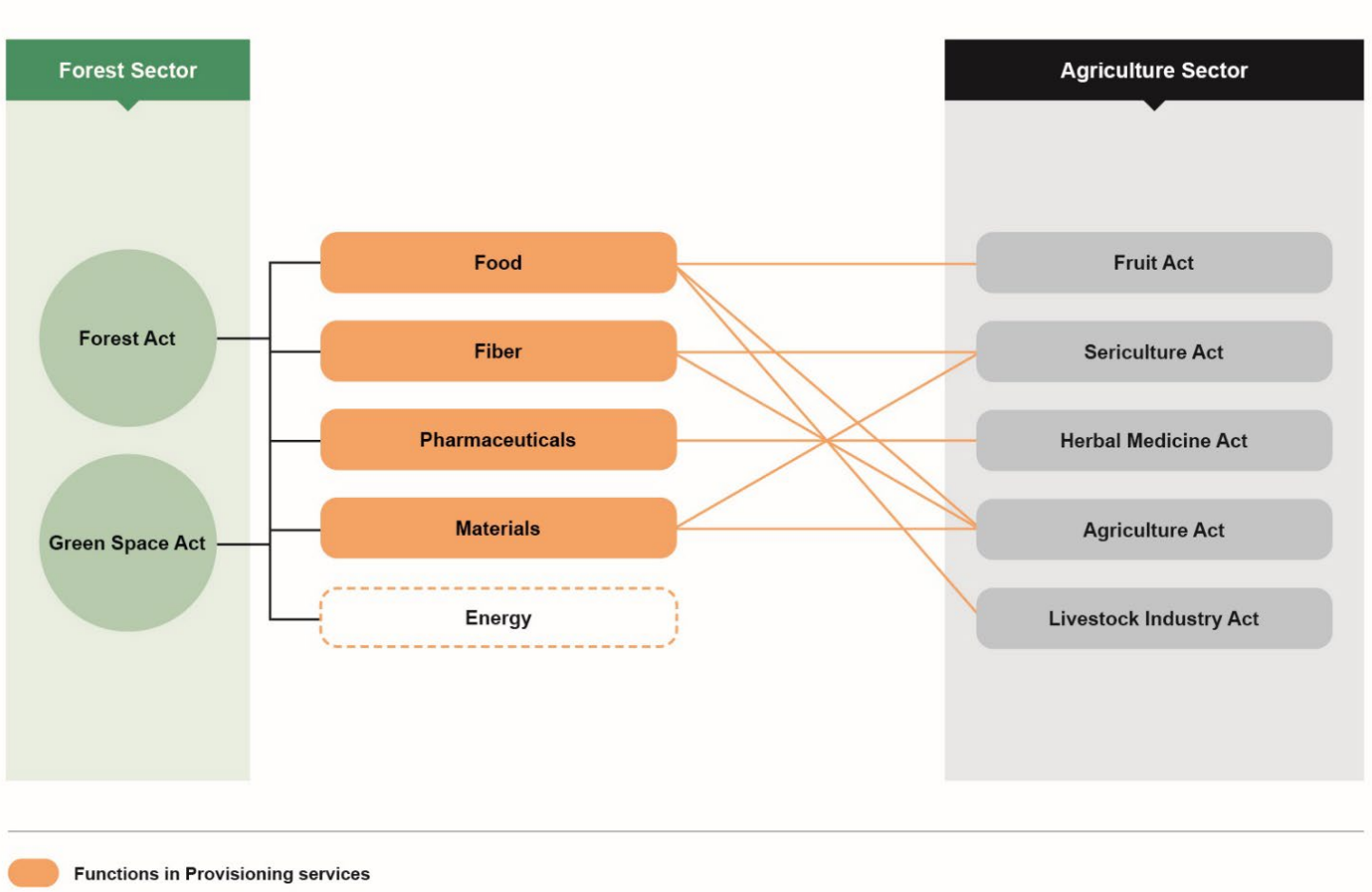
The Herbal Medicine Act contains four articles concerning the provisioning services vis-à-vis pharmaceuticals. All four articles highlight cultivation and the proper management of medicinal plants and herb resources. The Green Space Act mentions the planting of medicinal herbs (Article 16). The two Acts coordinate provisioning services concerning pharmaceutical quality and the management of medicinal plants.

Coding results showed a strong, horizontal coordination between the agriculture and forest sectors through provisioning services concerning food, fiber, material, and pharmaceuticals. As the agriculture sector provides and offers goods from tree resources and can function as a source of income, the result aligns with the literature, which has shown that the forest has been recognized as a natural resource for economic, materialistic, and subsistence values for a long time in North Korea (K. Park et al., 2013; K. S. Park, 2013; K. S. Park & Park, 2012). Oh et al., (2019) divided North Korea's forest laws and policy into three parts, namely the creation and use of forest resources, and forest protection and recreation and welfare. They concluded that North Korea focuses on a production-oriented forest management system, emphasizing the economic function of forests. The provisioning quality of forests is

mentioned in the Forest Act, as well. The Act seeks to create “economic forests with fast-growing and useful tree types, including oil trees, wild raw material bases such as mountain fruits, wild vegetables, and medicinal herbs, orchards and mulberry fields.” In other words, North Korea “creates forests such as timber forests, oil forests, mountain fruit forests, chestnut forests, and forests for raw materials for paper to actively serve economy and people’s lives.”

Forests support the agricultural sector in the production of food, fiber, material, and pharmaceuticals. This aligns with the national goal of building strong infrastructure, and achieving economic wealth and food security. Therefore, the coordination and relations of the agriculture and forest sectors should be considered complementary and not confrontational like in the early development stage. Studies have shown how the forest sector is connected with agriculture (Aggestam & Pülzl, 2018). The expansion of agriculture, which is the main land use rival for forests, is a good justification for deforestation (Dubé & Schmithüsen, 2003a). Forest cultivation for agriculture is a challenging topic as it involves two policy sectors, and emphasizes the importance of intersectoral coordination. By recognizing how the law governing the agricultural sector coordinates with the law that deals with the forest and related provisioning services, more effective and non-conflicting management between the agriculture and forest sectors can be achieved.

Figure 16 Coordination between Forest and Agriculture Sectors



7.2. Policy Coordination Between the Forest and Urban Sectors with a Focus on Cultural Services

The "Urban Sector" category comprises the Urban Beautification Act, Urban Management Act, City Planning Act, Pyongyang City Management Act, and Park and Amusement Park Management Act. These laws address, function in, and target the urban areas. The Park and Amusement Park Management Act concerns the urban sector as it addresses a component of city management. This is supported by the long-standing definition of urban management as a collection of activities that shape and guide the social, physical, and economic development of urban areas. The primary concerns of urban management are to intervene in these areas to foster economic growth and general well-being and to guarantee the necessary provision of basic services (Sharma, 1989, p. 48) including cultural services that green space provides. Cho (2019) mentioned that the Green Space Act is a construction and urban management law, which implies a close relationship between the urban sector and green space.

These five Acts governing the urban sector are strongly coordinated with the forest sector through the provision of cultural services. Four of five Acts in the urban sector only indicate cultural services. This demonstrates cultural service-based coordination between the forest and urban sectors. The Urban Beautification Act contains three Articles addressing cultural services of aesthetics and the inspirational quality of forest scenery. They mention planting a variety of good tree species (Article 14) and that cutting trees in green spaces and the city hinders beautification (Articles 39 and 41). The Pyongyang City Management Act highlights the aesthetic quality in cultural services. Article 20 mandates planting trees that look good so that raw ground is not visible, thus emphasizing the value of green space in Pyongyang City Management. The Park and Amusement Park Management Act echoes the same values as these articles. Article 22 states that "Parks and amusement park management organizations and enterprises should plant more trees, flowers, and ground-cover plants to make parks and amusement parks more beautiful." This is found in both the Green Space Act and Forest Act. The Green Space Act defines

green space under Article 2 as "a green area that is beautifully and hygienically decorated with various plants to meet the needs of people's cultural and emotional life and environmental protection." Article 1 highlights the aesthetic and inspirational function of green space as "Contributing to beautifying cities and villages and providing a hygienic and cultural living environment."

Article 38 of the Urban Management Act mentions several cultural services concerning aesthetics, cultural values, and recreation. It mentions green space, and states that "proper green space management and increasing its area to improve the living environment of the people ensures sufficient conditions for citizen's cultural resting area." Green space design, in keeping with the needs and aspirations of the people, regional characteristics, and environmental protection requirements can beautify cities and villages. This article coordinates and supports the Forest Sector, and the Green Space Act, by mentioning how green space affects living conditions by providing cultural, restful, and inspiring spaces. The article states that proper management helps a green space capture the needs of people, geographical character, and environmental protection. Mentioning the functions, benefits, and needs of green space in Urban Management Act represents the strong connection and coordination between Urban and Forest sectors through the cultural services of green space.

The Pyongyang City Management Act defines a protected area as "an area established to protect the environment of the central and local region and to ensure a cultural resting place for residents. A protected green area is based on forests and amusement parks" (Article 10). This indicates the recognition that securing green spaces through forests and amusement parks in Pyongyang city ensures a place for rest and cultural inspiration for local people in urban areas. This aligns with multiple articles in the Green Space Act but mainly with Article 12, which states "ensure the demand of residents for cultural and emotional life." Article 2 of the Green Space Act states that "Green space include parks, amusement parks, green areas around roads and buildings, urban landscape forests, environmental protection forests, zoos and botanical gardens, greenhouses, tree nurseries." This quality of green space can

be considered cultural, recreational, and educational (Article 14, 16, 22, 23). By considering parks and amusement parks green space, the Park and Amusement Park Management Act coordinates with the forest sector through cultural, recreational, educational, and social values outlined by the cultural services of trees and forests.

The agricultural sector and provisioning services in forests have been long-term agenda. The recent emphasis on green spaces and the urban sector express the expansion of forest policy toward urban forestry. Jang (2011) claimed that North Korea has placed a strong emphasis on "green space" in order to maintain a balance between urban and rural regions (Jang, 2011). Securing sufficient green space is one of the important characteristics of socialist urban planning (Green Space Act, Articles 1, 3, and 4). Earlier, Kim Il-sung and Kim Jong-il encouraged the creation and management of green spaces. The Kim Jong-un regime also emphasizes green space-making policies (Oh et al., 2018). Thus, strengthening the creation and management of green spaces is a typical characteristic of North Korean cities as a socialist country and one of the political projects that has been carried forward from the era of Kim Il-sung to that of Kim Jong-un (Kang & Kwon, 2019). However, the Kim Jong-un regime places greater emphasis on green space than did the previous regimes, and values green space as an important aesthetic component (M. S. Park et al., 2021). In his New Year's address in 2015 and 2019, Kim Jong-un called on his country to "consistently push ahead with the project to achieve afforestation, green space, and orchardization in all sectors" (Anh, 2019; "Full text of North Korean leader Kim Jong-un's 2014 New Year's Address," 2014).

Kang & Kwon, (2019) stated that the mentions of green space in the Urban Beautification Act, Urban Management Act, Green Space Act, and Parks and Amusement Park Management Act, shows the relevance of these laws. The study thus states that these parts were revised in the Kim Jong-un regime, indicating that it considers green space an important policy project. Thus, the study's findings, which are based on a sectoral approach to the forest and urban sectors, adds to the literature by showing how green space in the urban and forest sectors are coordinated through various cultural services of aesthetics and inspiration, cultural values and diversity, education and research, recreation and tourism, and social relations,

enriching the political goals of the North Korean regime.

To broaden the perspective, even in global aspect, cultural ecosystem services in particular has become more significant recently among the many uses that forests provide (Harshaw et al., 2007). Outdoor leisure and activities are a significant part of everyday life for urban and rural communities alike (Mann & Absher, 2008). Intensifying and diversifying social demands on forest ecosystems are the result of the increased need for forests for recreational, social, and cultural purposes (Wilkes-Allemann et al., 2015). North Korea is not necessarily adapting a green space policy to diversify cultural services. However, the Articles concerning green space highlight the multiple benefits they can bring to the urban sector. Thus, strong emphasis and promotion of green space coordinates the urban and forest sectors to enrich its benefits in terms of cultural services for people, especially in the urban sector.

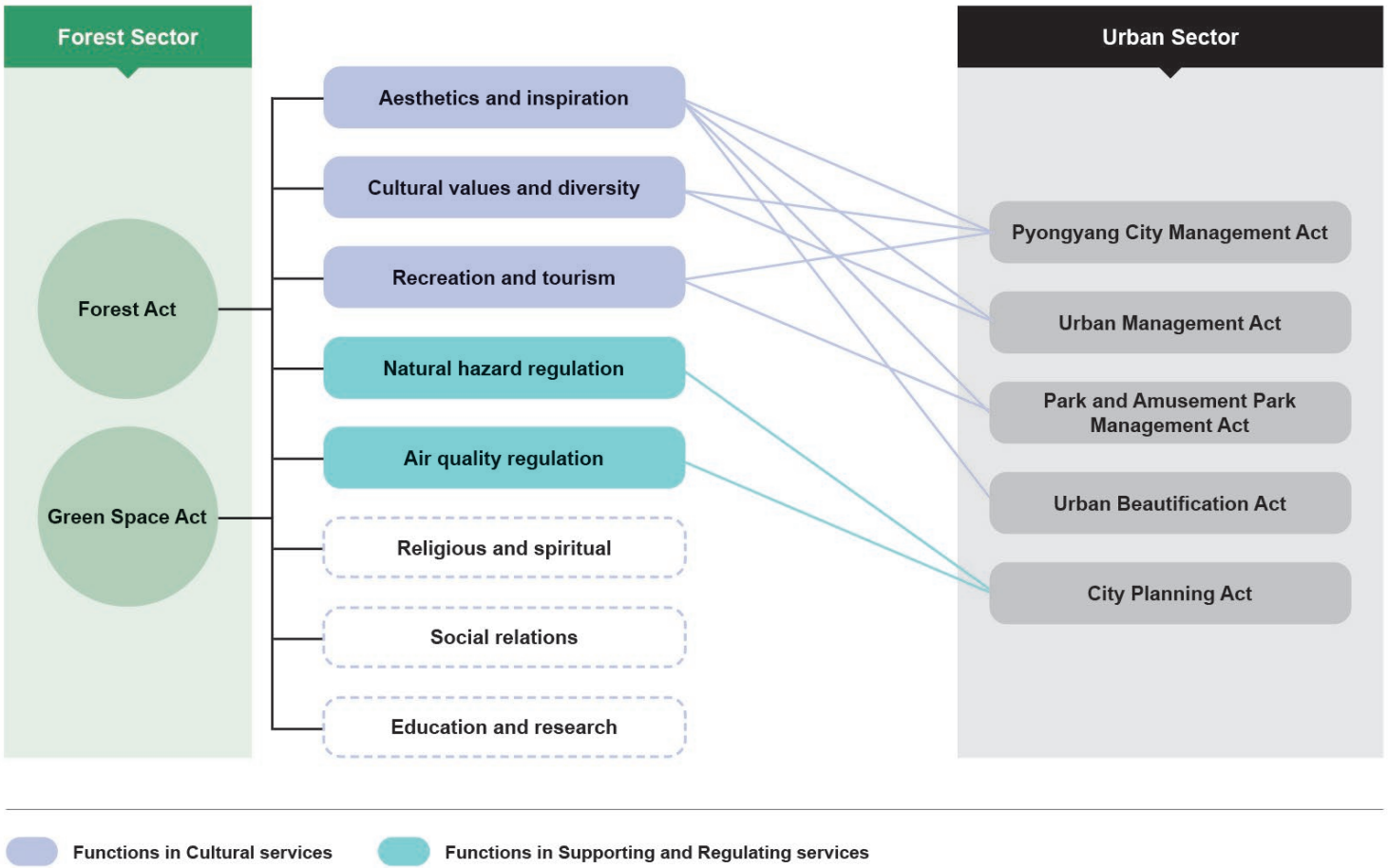
International trends have highlighted the benefits of urban green space, similar to how this research results connect forests and urban space. The article from Nature (Endreny, 2018), specifies the roles of urban forest that impacts sustainability of human wellbeing and biodiversity. The article also links various functions of ecosystem services to urban forest. Furthermore, urban forest support nine UN Sustainable Development Goals (SDGs): no poverty, zero hunger, good health and well-being, clean water and sanitation, affordable and clean energy, decent work and economic growth, climate action, life on land, and sustainable cities and communities, according to the Food and Agriculture Organization (Salbitano et al., 2016). Despite its importance, developing countries have not fully established the concepts of green space legislation and urban forestry. Only a few developing nations have the urban forest or green space laws. There are studies on urban forest in developing nations, yet they have not fully formulated the legal bounds and regulation on urban forest. Given this, North Korea's approach to forest management is apart from other developing countries. North Korea enacted Green Space Act in 2010, and continues to emphasize green spacing making in urban policy. As highlighted from this study, multiple Acts on urban sector show connection with forest sector through cultural ecosystem services. The emphasis on green space of

North Korea is likely to be influenced by China, which has been enforcing green space system planning in China (Zhou et al., 2021). Similar to North Korea's City Planning Act (2003) and Green Space Act (2010), China also has Urban Planning Law (1990), and Urban Greening Act (1991).

It is important to remark that as a developing country, North Korea emphasizes the management of urban green space within their laws by specifically assigning a legal Act, while other developing nations do not have urban forest laws. Other than laws, the Forest Law of Laos (2021)[5] contained one article on urban area as a newly enacted Article 40 that is "Management of Trees in Urban Areas and on Land of Individuals, Legal Entities and Organizations". Vietnam Forestry Law (2017)[6] mentions the trees and forest in urban areas from three Articles. Article 5 of forest classification of special-use forest, "forest for environmental protection in urban areas" is mentioned along with forests for conservation of historical or cultural relics, scenic places, sacred forest, industrial parks, export processing zones, economic zones, and high-tech parks (Article 5:2:d). Article 16 of forest allocation, forests for environmental protection in urban areas is remarked as the special-use forest (Article 16:1:a) echoing the Article 5. Lastly, Article 50, Planting of scattered trees, states "central and local agencies and organizations shall advocate, mobilize the entire people to plant scattered trees; and shall organize the planting, management, and protection of scattered trees in urban centers, rural areas and industrial parks (Article 50:2). As seen from three articles within Vietnam Forestry Law, urban areas are addressed with trees. However, there are no specific Article titles assigned with green space or urban forest. Given this, it seems noteworthy that North Korea, a developing nation, emphasizes urban space by enacting Green Space Act. Furthermore, the study's finding shows how five non-forest Acts in the urban sector coordinates with forest sector through cultural service functions of aesthetics and inspiration, cultural values and diversity, recreation and tourism, natural hazard regulation, and air quality regulation (Figure 17).

[5] Lao People's Democratic Republic. LAW ON FORESTRY (Revised), Pub. L. No. 08/NA, 1 (2021).
[6] Socialist Republic of Vietnam. Forestry Law, Pub. L. No. 16/2017/QH14, 1 (2017).

Figure 17 Coordination between Forest and Urban Sectors



7.3. Policy Coordination Between the Forest and Energy Sectors with a Focus on Supporting and Regulating Services

The Energy sector is also relevant. According to Øvergaard (2008), energy can be primary, which implies energy that has been extracted or captured by humans from natural sources and may involve cleaning, grading, or separation from surrounding material so that it can be traded, used, or transformed; or secondary, which implies energy that results from energy transformation caused by humans. Based on this, the Resident Fuel Act, Electric Power Act, Small and Medium Power Plant Act, and Renewable Energy Act can be classified under the energy sector. The energy sector mentions provisioning, and supporting and regulating services. The Electric Power Act, Small and Medium Power Plant Act, and Renewable Energy Act each mention one supporting and regulating service. The Resident Fuel Act is the only one that mentions provisioning services, that is, it mentions firewood as a source of fuel for production and residents (Article 2, 11). This is an important feature that is also captured in the Forest Act (Articles 3, 13, and 32) and Land Act (Articles 31 and 34). Wood for energy has been recognized as an important feature in the energy sector in the global North and South (Felix & Gheewala, 2011; Gamula et al., 2013; Jåstad et al., 2021; Müller et al., 2004; M. S. Park & Youn, 2017; Sawe, 2012).

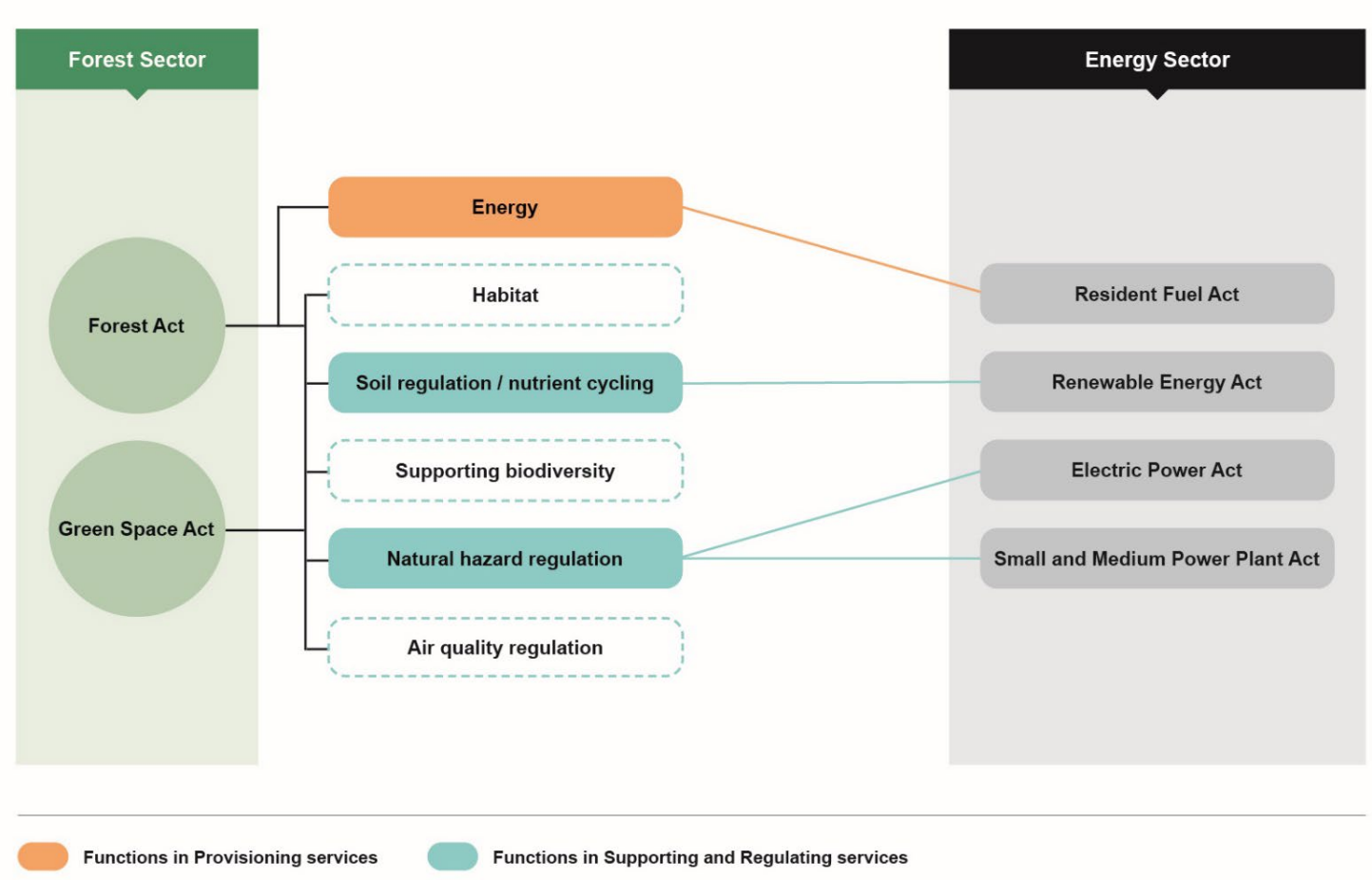
One reason for environmental degradation in North Korea is the heavy use of wood as a fuel without proper management (K. Park et al., 2013; K. S. Park, 2013). Similar situations are seen across the African continent, which has abundant but underutilized energy resources. The energy sector in Africa is distinguished by low per capita modern energy consumption (Felix & Gheewala, 2011). Owing to the lack of access to or the high cost of contemporary energy sources like LPG, kerosene, and electricity, the bulk of the population relies on wood-fuels like charcoal and firewood (Gamula et al., 2013; Sawe, 2012), like in the case of North Korea. The current patterns of energy consumption in Africa are a significant contributor to deforestation and forest degradation (Sawe, 2012), which North Korea already

experienced, recognized, and has tried to fix. This has been addressed in forest-related articles, which mention the importance of creating fuel and firewood forests.

This study also showed how Acts in the energy sector support and regulate a part of the forest. In the Small and Medium Power Plant Act, the forest was mentioned as a source for natural disaster mitigation against droughts, floods, and landslides (Article 26). In the Renewable Energy Act, soil regulation and nutrient cycling were mentioned as a means of improving the fertility of farming fields and recycling of biomaterials (Article 31). The Electric Power Act mentions how wood helps with water and natural hazard regulation by addressing the protection of the facility through soil, water, and natural hazard regulations (Article 24). These protective and environmental regulating functions are mentioned in the Forest Act and Green Space Act, through the regulation of natural hazards by setting up general protection and windbreak forests (Forest Act, Article 3; Green Space Act, Article 17).

Providing energy through firewood forests is important and aligns the forest and energy sectors. However, more significant factor in this study came to be a natural hazard regulation that prevent and mitigate damages either directly to facility protection or land and water management. Therefore, similar to environmental sector, energy sector shows strong coordination with forest sector using supporting and regulating services though natural hazard regulation, nutrient cycling, and water regulation (Figure 18).

Figure 18 Coordination between Forest and Energy Sectors



7.4. Policy Coordination Between the Forest and Environmental Sectors with a Focus on Supporting and Regulating Services

The "environmental sector" is defined as including the Land Act, Tideland Act, River Act, Mineral Spring Act, Waste Disposal Act, Nature Reserve Act, Scenic Places and Natural Monument Protection Act, Environmental Protection Act, and Air Pollution Prevention Act. The term "environmental sector" concerns the two main categories of environmental activity, namely environmental protection and resource management. The former include activities whose main goal is to prevent, reduce, and eliminate pollution and other forms of environmental deterioration, whereas the latter includes activities whose major objective is the maintenance and preservation of the stock of natural resources, thus protecting against depletion (ILO, 2013). The Land Act, Tideland Act, River Act, and Mineral Spring Act concern resource management. The Waste Disposal Act, Nature Reserve Act, Scenic Places and Natural Monument Protection Act, Environmental Protection Act, and Air Pollution Prevention Act aim to prevent and reduce environmental damages.

Of the nine Acts concerning the environmental sector, seven address the supporting and regulating functions of forests. The Land Act mentions forest protection as beneficial for animals and plants (Article 17), and highlights the habitat function of supporting and regulating services. The same is mentioned in the Scenic Places and Natural Monument Protection Act by emphasizing the plantation of trees and greens to support and complement with scenic spots and natural monuments (Article 29). This habitat function is indicated in several places in the Forest Act. The definition of forest "includes forest land and the plant and animal resources within it" (Article 2). The Forest Act states that forests serve as a habitat for animals (Article 25), and protect and breed beneficial animals and plants (Article 28) and wildlife (Article 37). It also prohibits the hunting of wildlife (Article 46). These functions highlight the connection between the forest and environmental sectors through supporting and regulating services.

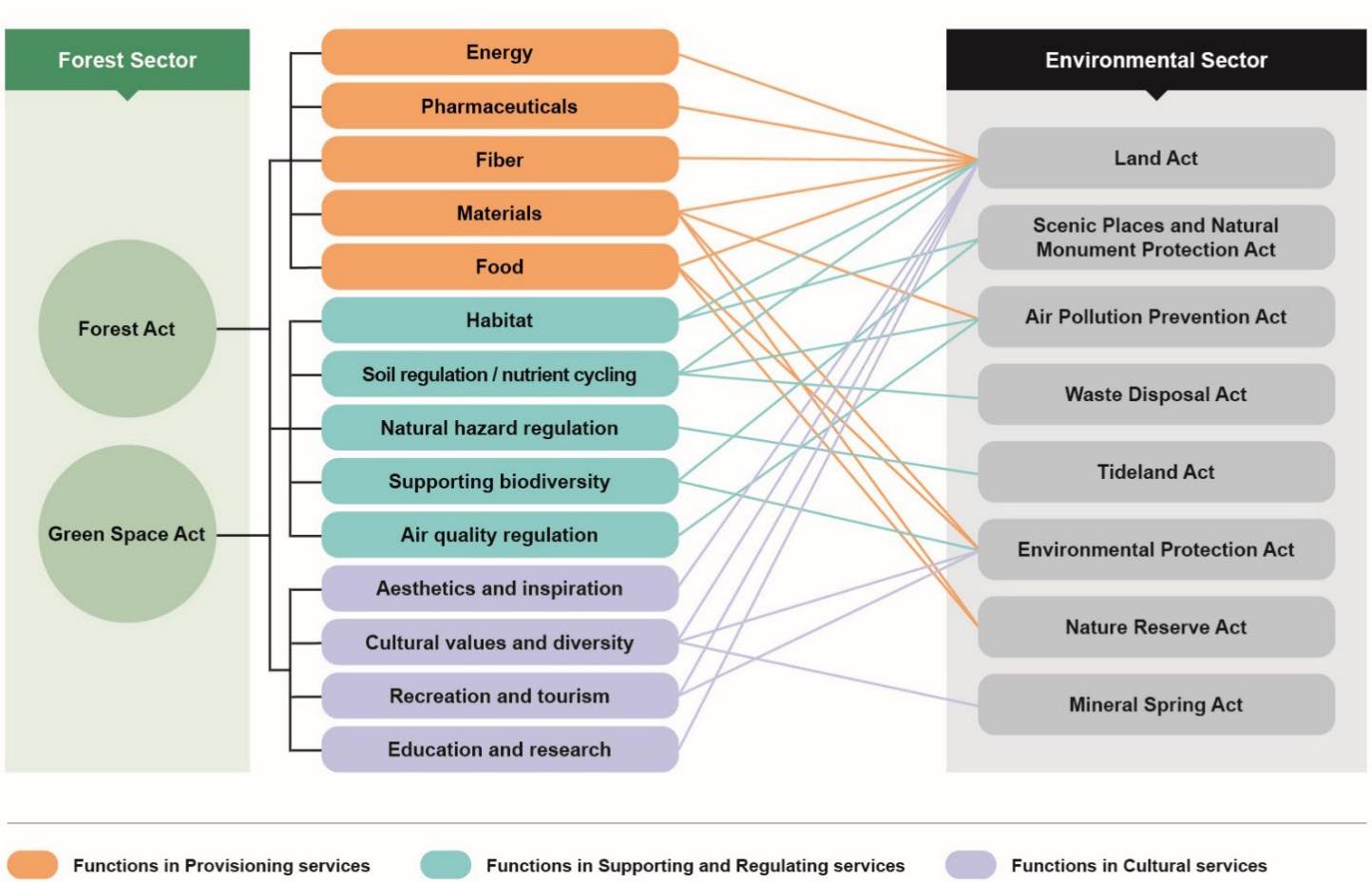
Another supporting and regulating function, namely soil and erosion regulation is mentioned in the Land Act as a means of preventing land loss (Articles 19 and 30). This is also mentioned in the Green Space Act: "To protect the environment and prevent disasters, cover plants for prevention of soil erosion on steep slopes" (Article 17). This shows how the forest is important protective measures for soil erosion prevention. It enables nutrient cycling and supports and regulates services for the forest and urban sectors. The Air Pollution Prevention Act (Article 39) and Waste Disposal Act (Article 24) mention the soil's natural purification ability. This aligns with the Forest Act, which also mentions nutrient cycling in agroforestry as a means to ensure productivity while preserving the ecological environment (Article 18). These aspects are also related to natural hazard regulation functions. The Tideland Act mentions natural hazard regulation through windbreak forests (Article 26). The Green Space Act mentions the windbreak forest function of protecting the environment and preventing disasters (Article 17). The Air Pollution Prevention Act and River Act mention the supporting and regulating services of air quality and water regulation. In the former, trees are identified as a source of air cleanliness in cities (Article 30). In the latter, the importance of forests in environmental protection is mentioned as they create barriers for noise, harmful gas, and dust (Article 15). The River Act mentions the creation of reservoir forests for river protection (Article 20). No article matches the supporting and regulating function of forests and water regulation in the forest sector. The purification ability of forest can be aligned with water regulation.

The laws governing the environmental sector is the only one to mention all three ecosystem services. The Land Act, Environmental Protection Act, Forest Act and Green Space Act mention all three ecosystem services. Cho (2019) highlighted the strong relations between the forest and environmental sectors in North Korean law. In Cho's study, the author grouped the Forest Act and Land Act under the category of national land related laws, within the umbrella of environmental law. Along with the finding of this study, the research shows the close sectoral relations between Land Act and Forest Act within the environmental sector. Similarly in another study by Kim (2013), he examined legislations related to national land development, which can have an impact on environment. In his study, he grouped Forest Act as one of

the laws that belongs to national land development along with National Land Planning Act, Land Act, Construction Act and Underground Resources Act, and Foreign Investment Act.

North Korean Environmental Law does not limit the environment to the natural and living environments alone, but also includes the social and cultural environments (Han, 2014). This is evident in the categorization of ecosystem services and the mention of all three categories, namely provisioning, supporting and regulating, and cultural quality, in the environmental sector. Studies have identified the close relations between forests and the environmental sector. However, most of them have treated forests as a sub-category of environmental division. The current study analyzes the level of coordination between the forest and environmental sectors. Supporting and regulating services are dominant and connect the forest and environmental sectors. They are coordinated through soil and erosion, nutrient cycling, natural hazard, habitat, air quality, and water regulation (Figure 19).

Figure 19 Coordination between Forest and Environmental Sectors



Chapter 8. Conclusion

In an era of multifunctional forests, the contentious use of forests, and increased interest in the processes and interactions that result in the sustainable management of forests, the proper management and utilization of forests has become crucial. It is a major concern world over, to integrate forestry management and planning within the larger context of rural development, agriculture, landscape management, and nature conservation. This study sought to understand routes for effective forest management by analyzing sectoral coordination between the forest and non-forest sectors through provisioning, supporting and regulating, and cultural ecosystem services. North Korean laws were examined as policy instruments that enable such intersectoral coordination.

The study first categorized forest and non-forest laws and extracted forest-related provisions using five forest-related search words of “forest,” “green space,” “woodland,” “tree,” and “forest industry.” All forest-related articles were categorized under provisioning, supporting and regulating, or cultural services. The Forest Act and Green Space Act were coordinated with other sectors of urban, environmental, and energy within articles that each categorized Acts entailed. Each sector was found to be strongly coordinated with the forest sector. The forest and agriculture sectors were strongly coordinated vis-à-vis provisioning services, namely the production of food, fiber, material, and pharmaceuticals. These functions can achieve the national goals of building strong infrastructure, achieving economic wealth, and ensuring food security. The agriculture and forest sectors provide goods and services that support human lives. Instead of making the agriculture and forest sector conflict over land use, complementary resource management should be considered in line with close sectoral relations. One way to coordinate both sectors strongly could be by adapting agroforestry in laws and policies, as mentioned in the Forest Act.

The forest and urban sectors are coordinated through cultural services. Within the city boundary, these services are strongly coordinated with green space-making

policies. The Urban Management Act, Urban Beautification Act, Pyongyang City Management Act, and Park and Amusement Park Act have one article each on the creation and management of green spaces, which shows a compelling sectoral coordination between the forest and urban sector with a strong emphasis on green space promotion. Thus, green space and other forest including cultural services include aesthetics and inspiration, cultural values and diversity, and recreation and tourism. Therefore, by showing strong coordination of forest and urban sectors, articles related to forest highlight benefits of multiple cultural services.

Finally, the environmental and energy sectors are strongly coordinated with the forest sector through supporting and regulating services. The environmental sector addresses all three ecosystem services, and the energy sector addresses provisioning and supporting, and regulating services. Therefore, there are other aspects of coordination in how environmental and energy sectors could work with. The most significant observation demonstrated supporting and regulating service coordination between the environmental and energy sectors and the forest sector. In the environmental sector, the coordination of supporting and regulating services were more palpable through habitat, natural hazard regulation, supporting biodiversity, soil and erosion regulation and nutrient cycling, and air quality regulation. These functions show how various natural benefits are encoded in the forest sector. In the energy sector, supporting and regulating services such as natural hazard, soil, and erosion regulation, and nutrient cycling are coordinated with the forest sector by highlighting the functions of natural disaster mitigation and prevention of damages.

This study echoes many previous studies that have emphasized the comprehensive management of forest resources in various sectors. The forest is an important resource in the agricultural, urban, environmental, and energy sectors though their coordination of multiple ecosystem services. Non-forest sectors are connected and engaged with the forest sector. This makes it all the more necessary to approach forest sectoral management with a holistic approach, by connecting its benefits and functions actively with all other relevant sectors.

One might wonder whether it is important to see policy coordination in socialist

nations. It has been confirmed through several previous studies that even in socialist countries, efforts are being made to enforce forest laws and sustainably manage forest resources (Oh et al., 2018; K. S. Park, 2013; M. S. Park et al., 2021). Regardless of the political system, this study offers a strategy for improving the effectiveness of forest management by demonstrating how non-forest sectors can work in tandem with the forest sector to achieve shared objectives identified through ecosystem services. On the same note, this research design could be replicated to analyze sectoral cooperation in other nations with legal systems.

This study has a limitation in that it relied solely on the law to grasp the sectoral coordination of forest policy and management in North Korea. The lack of information on the supplementation and amendment of each Act prevented a detailed analysis of changes in sectoral coordination. North Korea newly enacted the Forest Industry Act (2019) and Urban Space Greening Act (2022), which concern the forest sector. Owing to political complications, the legal texts of both Acts are not available. Future research must examine these Acts to deepen the understanding of forest management. In addition, nuance and weight of terms relating to forests in articles could not be analyzed. If interviews had been a part of this study, it could have been possible to offer a more in-depth interpretation based on the realistic context. However, this study has the limitation that interviews cannot be conducted.

North Korea is a unique country with limited access and information. The multifunctionality of forests, however, is universal. The scope and diversity of the objectives of national forest policies have increased world over, including in North Korea. Countries take all production, conservation, and cultural benefits into account. They highlight the importance of forests as multipurpose resources, and emphasize their economic potential and importance to the environment, urban areas, and the energy sector. The significance of this study lies in capturing sectoral coordination of four non-forest sectors with the forest sector based on ecosystem services in North Korea.

References

Adam, C., Steinebach, Y., & Knill, C. (2018). Neglected challenges to evidence-based policy-making: The problem of policy accumulation. *Policy Sciences*, *51*(3), 269–290. https://doi.org/10.1007/s11077-018-9318-4

Aggestam, F., & Pülzl, H. (2018). Coordinating the Uncoordinated: The EU Forest Strategy. *Forests*, *9*(3), 125. https://doi.org/10.3390/f9030125

Anh, Y. (2019, January 1). <Full text> North Korean leader Kim Jong-un's 2019 New Year's Address. *SPN Seoul Pyongyang News*. http://www.spnews.co.kr/news/articleView.html?idxno=16014

Aznar-Sánchez, J., Belmonte-Ureña, L., López-Serrano, M., & Velasco-Muñoz, J. (2018). Forest Ecosystem Services: An Analysis of Worldwide Research. *Forests*, *9*(8), 453. https://doi.org/10.3390/f9080453

Bardach, E. (1998). *Getting agencies to work together: The practice and theory of managerial craftsmanship*. Brookings Institution Press.

Biesbroek, G. R., Swart, R. J., Carter, T. R., Cowan, C., Henrichs, T., Mela, H., Morecroft, M. D., & Rey, D. (2010). Europe adapts to climate change: Comparing National Adaptation Strategies. *Global Environmental Change*, *20*(3), 440–450. https://doi.org/10.1016/j.gloenvcha.2010.03.005

Binder, S., Haight, R. G., Polasky, S., Warziniack, T., Mockrin, M. H., Deal, R. L., & Arthaud, G. (2017). *Assessment and valuation of forest ecosystem services: State of the science review* (NRS-GTR-170; p. NRS-GTR-170). U.S. Department of Agriculture, Forest Service, Northern Research Station. https://doi.org/10.2737/NRS-GTR-170

Bolognesi, T., & Nahrath, S. (2020). Environmental Governance Dynamics: Some Micro Foundations of Macro Failures. *Ecological Economics*, *170*, 106555. https://doi.org/10.1016/j.ecolecon.2019.106555

Bormann, F. H., & Likens, G. E. (1979). Catastrophic Disturbance and the Steady State in Northern Hardwood Forests: A new look at the role of

disturbance in the development of forest ecosystems suggests important implications for land-use policies. *American Scientist*, *67*(6), 660–669. JSTOR.

Boyd, J., & Banzhaf, S. (2007). What are ecosystem services? The need for standardized environmental accounting units. *Ecological Economics*, *63*(2), 616–626. https://doi.org/10.1016/j.ecolecon.2007.01.002

Burkhard, B., Crossman, N., Nedkov, S., Petz, K., & Alkemade, R. (2013). Mapping and modelling ecosystem services for science, policy and practice. *Ecosystem Services*, *4*, 1–3. https://doi.org/10.1016/j.ecoser.2013.04.005

Cejudo, G. M., & Michel, C. L. (2017). Addressing fragmented government action: Coordination, coherence, and integration. *Policy Sciences*, *50*(4), 745–767. https://doi.org/10.1007/s11077-017-9281-5

Champion, C., & Bonoli, G. (2011). Institutional fragmentation and coordination initiatives in western European welfare states. *Journal of European Social Policy*, *21*(4), 323–334. https://doi.org/10.1177/0958928711412220

Chinseu, E., Stringer, L., & Dougill, A. (2018). Policy Integration and Coherence for Conservation Agriculture Initiatives in Malawi. *Sustainable Agriculture Research*, *7*(4), Article 4.

Cho, K.-H. (2019). Analysis of Legal System Related to Management of Natural Environments and Ecological Engineering in North Korea. *Ecology and Resilient Infrastructure*, *6*(1), 49–57. https://doi.org/10.17820/eri.2019.6.1.049

Choi, I.-H., & Woo, J.-C. (2007). Developmental Process of Forest Policy Direction in Korea and Present Status of Forest Desolation in North Korea. *Journal of Forest Science*, *23*(1), 35~49.

Costanza, R., de Groot, R., Sutton, P., van der Ploeg, S., Anderson, S. J., Kubiszewski, I., Farber, S., & Turner, R. K. (2014). Changes in the global value of ecosystem services. *Global Environmental Change*, *26*, 152–158. https://doi.org/10.1016/j.gloenvcha.2014.04.002

Costanza, R., Limburg, K., Naeem, S., O'Neill, R. V., Paruelo, J., Raskin, R.

G., & Sutton, P. (1997). *The value of the world's ecosystem services and natural capital*. *387*, 8.

Daily, G. C. (1997). *Nature's services: Societal dependence on natural ecosystems.*

De Montalembert, M. R. (1995). Cross-sectoral linkages and the influence of external policies on forest development. *Unasylva*, *46*, 25–37.

De Montalembert, M. R., & Schmithuesen, F. (1993). Policy and legal aspects of sustainable forest management. *Unasylva (FAO)*. https://scholar.google.com/scholar_lookup?title=%5BPolicy+and+legal+aspects+of+sustainable+forest+management%5D&author=De+Montalembert%2C+M.R.&publication_year=1993

LAW ON FORESTRY (Revised), Pub. L. No. 08/NA, 1 (2021).

Dubé, Y. C., & Schmithüsen, F. (2003a). *Cross-sectoral policy impacts between forestry and other sectors* (Vol. 142). Food and Agriculture Organization of the United Nations FAO, Communication ….

Dunn, W. N. (2015). *Public Policy Analysis*. Routledge.

Ehrlich, P. R., & Mooney, H. A. (1983). Extinction, Substitution, and Ecosystem Services. *BioScience*, *33*(4), 248–254. https://doi.org/10.2307/1309037

Endreny, T. A. (2018). Strategically growing the urban forest will improve our world. *Nature Communications*, *9*(1), Article 1. https://doi.org/10.1038/s41467-018-03622-0

Felix, M., & Gheewala, S. H. (2011). A Review of Biomass Energy Dependency in Tanzania. *Energy Procedia*, *9*, 338–343. https://doi.org/10.1016/j.egypro.2011.09.036

Full text of North Korean leader Kim Jong-un's 2014 New Year's Address. (2014, January 2). *YTN*. https://www.ytn.co.kr/_ln/0101_201401021100345870

Gamula, G. E. T., Hui, L., & Peng, W. (2013). An Overview of the Energy Sector in Malawi. *Energy and Power Engineering*, *05*(01), 8–17. https://doi.org/10.4236/epe.2013.51002

Geist, H. J., & Lambin, E. F. (2002). Proximate Causes and Underlying Driving Forces of Tropical Deforestation. *BioScience*, *52*(2), 143. https://doi.org/10.1641/0006-3568(2002)052[0143:PCAUDF]2.0.CO;2

Goedde, P. (2004). LAW "OF OUR OWN STYLE": THE EVOLUTION AND CHALLENGES OF THE NORTH KOREAN LEGAL SYSTEM. *Fordham International Law Journal*, *27*(4), 1265–1288.

Han, S. (2014). Latest Trends in North Korea's environmental law and Implications. *Environmental Law Review*, *36*(3), 237–271.

Harris, D. R., & Fuller, D. Q. (2014). Agriculture: Definition and Overview. In C. Smith (Ed.), *Encyclopedia of Global Archaeology* (pp. 104–113). Springer New York. https://doi.org/10.1007/978-1-4419-0465-2_64

Harshaw, H. W., Sheppard, S. R. J., & Kozak, R. A. (2007). Outdoor recreation and forest management: A plea for empirical data. *The Forestry Chronicle*, *83*(2), 231–238. https://doi.org/10.5558/tfc83231-2

Head, B. W., & Alford, J. (2015). Wicked Problems: Implications for Public Policy and Management. *Administration & Society*, *47*(6), 711–739. https://doi.org/10.1177/0095399713481601

Hermann, A., Schleifer, S., & Wrbka, T. (2011). The Concept of Ecosystem Services Regarding Landscape Research: A Review. *Living Reviews in Landscape Research*, *5*. https://doi.org/10.12942/lrlr-2011-1

Hogl, K., Kleinschmit, D., & Rayner, J. (2016). Achieving policy integration across fragmented policy domains: Forests, agriculture, climate and energy. *Environment and Planning C: Government and Policy*, *34*(3), 399–414. https://doi.org/10.1177/0263774X16644815

Hood, C., & Dixon, R. (2015). *A government that worked better and cost less? Evaluating three decades of reform and change in UK central government* (First Edition). Oxford University Press.

Hwang, E.-J. (2019). The Meaning and Limits of the Rule by North Korean Socialist Law in the Kim Jong-un Era—Focused on the General View of the Rule of Law -. *Northeast Asian law journal*, *12*(3), 109–139.

https://doi.org/10.19035/nal.2019.12.3.5

ILO. (2013, November 27). *Guidelines concerning a statistical definition of employment in the environmental sector* [Guidelines]. http://www.ilo.org/global/statistics-and-databases/standards-and-guidelines/guidelines-adopted-by-international-conferences-of-labour-statisticians/WCMS_230736/lang--en/index.htm

Jang, S. (2011). Close and Distant Pyongyang, Revisited: Lim Dong-woo, 『Pyongyang and After Pyongyang—Another Perspective on Pyongyang's Urban Space: 1953-2011』. *Korean Journal of Urban History*, *5*, 179–188. https://doi.org/10.22345/kjuh.2011.6.5.179

Jåstad, E. O., Bolkesjø, T. F., Trømborg, E., & Rørstad, P. K. (2021). Integration of forest and energy sector models – New insights in the bioenergy markets. *Energy Conversion and Management*, *227*, 113626. https://doi.org/10.1016/j.enconman.2020.113626

Jordan, A., & Lenschow, A. (2010). Environmental policy integration: A state of the art review. *Environmental Policy and Governance*, *20*(3), 147–158. https://doi.org/10.1002/eet.539

Kaimowitz, D., & Angelsen, A. (1999). The World Bank and non-forest sector policies that affect forests: Background paper for the World Bank's Forest Policy and Strategy. *Bogor, Center for International Forest Research*.

Kang, Y.-J., & Kwon, Y.-S. (2019). The Changes of Urban Spatial Policy under the Urban Beautification Act in the Regime of Kim Jong-un. *Journal of the Urban Design Institute of Korea Urban Design*, *20*(6), 119–136. https://doi.org/10.38195/judik.2019.12.20.6.119

Kim, S., Jeong, Y., & Park, S. (2020). Why Is Inter-Korean Forestry Cooperation Hard to Accomplish? *Asian Journal of Peacebuilding*, *8*(2), 309–331. https://doi.org/10.18588/202011.00a098

Kim, S.-M. (2013). A Study of the Environmental Laws in North Korea. *International Law Review*, *5*(2), 49–82.

Krott, M. (2005). *Forest Policy Analysis*. Springer Science & Business Media.

Lafferty, W., & Hovden, E. (2003). Environmental policy integration: Towards an analytical framework. *Environmental Politics*, *12*(3), 1–22. https://doi.org/10.1080/09644010412331308254

Lee, K. (2010). *Preliminary Study on Improving Laws on Forestry Cooperation between South and North Korea for Green Growth on the Korean Peninsula*. 105 p.

Lee, S. (2014, November 11). North Korean Kim Jong-un, on-site guidance at the Central Nursery... Presenting the task of reforestation and greening. *Tongil News*. http://www.tongilnews.com/news/articleView.html?idxno=109696

Lee, S. (2021). *A Study on the Legislation Act of North Korea* (No. 21-18–2; Groundwork research on North Korean legislation, pp. 1–164). https://www.klri.re.kr/kor/publication/2006/view.do

Lindblom, C. E. (1965). *The intelligence of democracy: Decision making through mutual adjustment*. New York: Free Press.

MA (Ed.). (2005). *Ecosystems and human well-being: Wetlands and water synthesis: a report of the Millennium Ecosystem Assessment*. World Resources Institute.

Malinga, R., Gordon, L. J., Jewitt, G., & Lindborg, R. (2015). Mapping ecosystem services across scales and continents – A review. *Ecosystem Services*, *13*, 57–63. https://doi.org/10.1016/j.ecoser.2015.01.006

Mann, C., & Absher, J. D. (2008). Recreation conflict potential and management implications in the northern/central Black Forest Nature Park. *Journal of Environmental Planning and Management*, *51*(3), 363–380. https://doi.org/10.1080/09640560801979527

McGill, R. (1998). Urban management in developing countries. *Cities*, *15*(6), 463–471. https://doi.org/10.1016/S0264-2751(98)00041-9

Meijers, E., & Stead, D. (2004). *Policy integration: What does it mean and how can it be achieved? A multi-disciplinary review*. 15.

Müller, D. B., Bader, H.-P., & Baccini, P. (2004). Long-term Coordination of

Timber Production and Consumption Using a Dynamic Material and Energy Flow Analysis. *Journal of Industrial Ecology*, *8*(3), 65–88. https://doi.org/10.1162/1088198042442342

Nam, S. (2004). The Legal Development of the Environmental Policy in the Democratic People's Republic of Korea. *Fordham International Law Journal*, *27*(4), 1322–1342.

Nordbeck, R., & Steurer, R. (2016). Multi-sectoral strategies as dead ends of policy integration: Lessons to be learned from sustainable development. *Environment and Planning C: Government and Policy*, *34*(4), 737–755. https://doi.org/10.1177/0263774X15614696

Oh, S. U., Kim, E., & Kim, K. (2018). Characteristics of forest policy in the Kim Jong-Un era. *North Korean Studies*, *14*(2), 33. https://doi.org/10.23040/kcidoi.2018.14.2.004

Oh, S. U., Kim, E., Kim, K., & Park, S. Y. (2019). *A Comparative Study on Forest Laws and Policies in North and South Korea*. *28*(1), 159–182.

Øvergaard, S. (2008). *Issue paper: Definition of primary and secondary energy*. 7.

Park, K., Lee, S., & Park, S. (2013). Changes in North Korea's Forestry Policy. *North Korean Review*, *9*(1), 20–29. https://doi.org/10.3172/NKR.9.1.20

Park, K. S. (2013). *North Korea's Forest Status and Forest Policy* (No. 15, vol 3; KREI Quarterly Agricultural Trends in North Korea, pp. 3–23). Korea Rural Economic Institute.

Park, K. S., & Park, S. Y. (2012). The Rehabilitation of North Korea's Devastated Forest—With focus on the Case of South Korea. *North Korean Study*, *8*(1), 133–159. https://doi.org/10.23040/kcidoi.2012.8.1.005

Park, M. (2015). Inter-Korean Forest Cooperation 1998–2012: A Policy Arrangement Approach. *Sustainability*, *7*(5), 5241–5259. https://doi.org/10.3390/su7055241

Park, M. S., & Lee, H. (2014). Forest Policy and Law for Sustainability within

the Korean Peninsula. *Sustainability*, *6*(8), 5162–5186. https://doi.org/10.3390/su6085162

Park, M. S., Shin, S., & Lee, H. (2021). Media frames on urban greening in the Democratic People's Republic of Korea. *Forest Policy and Economics*, *124*, 102394. https://doi.org/10.1016/j.forpol.2020.102394

Park, M. S., & Youn, Y.-C. (2017). Reforestation policy integration by the multiple sectors toward forest transition in the Republic of Korea. *Forest Policy and Economics*, *76*, 45–55. https://doi.org/10.1016/j.forpol.2016.05.019

Park, S. Y., & Park, K. S. (2013). Research on Operation of Forest Policy under the Planned Economy System in North Korea. *Korean Journal of Forest Economics*, *20*(1), 1–11.

Parsons, W. (1995). An introduction to the theory and practice of policy analysis. *UK: Edward Elgar Publishing Limited*.

Peck, T. J., & Descargues, J. (1997). The policy context for the development of the forest and forest industries sector in Europe. ETTS V working paper. *Geneva Timber and Forest Discussion Papers (ECE/FAO)*. https://scholar.google.com/scholar_lookup?title=The+policy+context+for+the+development+of+the+forest+and+forest+industries+sector+in+Europe.+ETTS+V+working+paper&author=Peck%2C+T.J.&publication_year=1997

Peters, B. G. (2015). *Pursuing Horizontal Management: The Politics of Public Sector Coordination*. University Press of Kansas. https://www.jstor.org/stable/j.ctt1b7x61g

Peters, B. G. (2017). What is so wicked about wicked problems? A conceptual analysis and a research program. *Policy and Society*, *36*(3), 385–396. https://doi.org/10.1080/14494035.2017.1361633

Peters, B. G. (2018a). The challenge of policy coordination. *Policy Design and Practice*, *1*(1), 1–11. https://doi.org/10.1080/25741292.2018.1437946

Peters, B. G., & Tarpey, M. (2019). Are wicked problems really so wicked?

Perceptions of policy problems. *Policy and Society*, *38*(2), 218–236. https://doi.org/10.1080/14494035.2019.1626595

Pohjanmies, T., Triviño, M., Le Tortorec, E., Mazziotta, A., Snäll, T., & Mönkkönen, M. (2017). Impacts of forestry on boreal forests: An ecosystem services perspective. *Ambio*, *46*(7), 743–755. https://doi.org/10.1007/s13280-017-0919-5

Portman, M. E. (2013). Ecosystem services in practice: Challenges to real world implementation of ecosystem services across multiple landscapes – A critical review. *Applied Geography*, *45*, 185–192. https://doi.org/10.1016/j.apgeog.2013.09.011

Regulatory Instruments. (2005). In M. Krott, *Forest Policy Analysis* (pp. 219–245). Springer Science & Business Media.

Russel, D., Castellari, S., Capriolo, A., Dessai, S., Hildén, M., Jensen, A., Karali, E., Mäkinen, K., Ørsted Nielsen, H., Weiland, S., den Uyl, R., & Tröltzsch, J. (2020). Policy Coordination for National Climate Change Adaptation in Europe: All Process, but Little Power. *Sustainability*, *12*(13), 5393. https://doi.org/10.3390/su12135393

Salbitano, F., Borelli, S., Conigliaro, M., & YuJuan, C. (2016). Guidelines on urban and peri-urban forestry. *FAO Forestry Paper*, *No.178*. https://www.cabdirect.org/cabdirect/abstract/20173003651

Sawe, E. N. (2012). Sustainable Charcoal and Firewood Production and Use in Africa. In R. Janssen & D. Rutz (Eds.), *Bioenergy for Sustainable Development in Africa* (pp. 75–80). Springer Netherlands. https://doi.org/10.1007/978-94-007-2181-4_7

Scharpf, F. W. (1994). Games real actors could play: Positive and negative coordination in embedded negotiations. *Journal of Theoretical Politics*, *6*(1), 27–53.

Schmithüsen, F. (2003). Understanding cross-sectoral policy impacts – policy and legal aspects. *Forestry Paper*, *142*, 5–44.

Schmithusen, F., Bisang, K., & Zimmermann, W. (2001). Cross-sectoral linkages in forestry. Review on available information and consideration on future research. *FAO. Rome*.

Schmithüsen, F. J., Herbst, P., & Le Master, D. C. (2000). *Forging a new framework for sustainable forestry: Recent developments in European forest law* (Vol. 10). ETH Zurich.

Sharma, S. (1989). Municipal management. *Urban Affairs Quarterly–India*, *21*(4), 47–53.

Shin, S., Soe, K. T., Lee, H., Kim, T. H., Lee, S., & Park, M. S. (2020). A Systematic Map of Agroforestry Research Focusing on Ecosystem Services in the Asia-Pacific Region. *Forests*, *11*(4), 368. https://doi.org/10.3390/f11040368

Forestry Law, Pub. L. No. 16/2017/QH14, 1 (2017).

Song, A. Y., & Hastings, J. V. (2020). Engaging North Korea: Environmental cooperation in peacebuilding. *Third World Quarterly*, *41*(11), 1809–1827. https://doi.org/10.1080/01436597.2020.1787826

Song, M., Park, M. S., & Yoon, Y.-C. (2012). Forest Policy of Democratic People's Republic of Korea Represented in RodongShinmun. *Journal of Environmental Policy*, *11*(3), 123–148. https://doi.org/10.17330/JOEP.11.3.201209.123

TEEB (Ed.). (2010). *The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB*. UNEP.

Trein, P., Biesbroek, R., Bolognesi, T., Cejudo, G. M., Duffy, R., Hustedt, T., & Meyer, I. (2021). Policy Coordination and Integration: A Research Agenda. *Public Administration Review*, *81*(5), 973–977. https://doi.org/10.1111/puar.13180

Verhoest, K. (Ed.). (2012). *Government agencies: Practices and lessons from 30 countries*. Palgrave Macmillan.

Vizzarri, M., Tognetti, R., & Marchetti, M. (2015). Forest Ecosystem Services: Issues and Challenges for Biodiversity, Conservation, and Management in Italy. *Forests*, *6*(12), 1810–1838. https://doi.org/10.3390/f6061810

Wilkes-Allemann, J., Pütz, M., & Hirschi, C. (2015). Governance of Forest

Recreation in Urban Areas: Analysing the role of stakeholders and institutions using the institutional analysis and development framework. *Environmental Policy and Governance*, *25*(2), 139–156. https://doi.org/10.1002/eet.1668

World Bank Group. (2002). *A revised forest strategy for the World Bank Group*. World Bank Group.

Yi, H. (2020). Impacts of Land Change on Ecosystem Service Values and Environmental Sustainability in North Korea (Democratic People's Republic of Korea) through the 2030s. *Journal of the Korean Geographical Society*, *55*(2), 97–121. https://doi.org/10.22776/KGS.2020.55.2.97

Yi, J. M., Song, M. K., & Park, K. S. (2017). An Analysis on North Korean Forest-related Articles in Kim Jong Un Era(2012-2016): Focusing on Forest Restoration Status and Problems. *Unification Policy Research*, *29*(2), 49–81.

Yoon, D. (2011). *65 Years of Division—Changes in the Character and Function of North Korean Law*. *13*, 269–286.

Zhou, Q., Konijnendijk van den Bosch, C. C., Chen, Z., Wang, X., Zhu, L., Chen, J., Lin, Y., & Dong, J. (2021). China's Green space system planning: Development, experiences, and characteristics. *Urban Forestry & Urban Greening*, *60*, 127017. https://doi.org/10.1016/j.ufug.2021.127017

Zingerli, C., Bisang, K., & Zimmermann, W. (2004). *Towards Policy Integration: Experiences with intersectoral coordination in international and national forest policy*. 16.

Abstract (Korean)

국 문 초 록

산림 관리를 위한 정책조정: 북한 법제를 중심으로

민수연
국제농업개발협력전공
서울대학교 국제농업기술대학원

산림이 사회에 제공하는 다양한 기능은 생태계서비스 개념의 등장과 맞물려 그 기능과 역할이 세분화되고 있으며, 이에 산림서비스를 고려한 산림관리는 중요한 의제로 떠오른다. 또한 산림은 농촌 개발, 농업, 경관 관리와 환경보호 등 타 분야와 긴밀하게 연결되어 있다는 점에서 보다 통합적이고 효과적인 산림관리를 위해 산림과 비산림 섹터 간의 조정에 대한 중요성이 강조된다. 이러한 맥락에서 본 연구는 북한 법제 전반의 산림 및 비산림 부문의 산림 정책 조정의 양상 살펴보았다.

본 연구는 통일법제 데이터베이스에서 북한법령 전문 239건을 수집하여, 총 223개의 산림 관련 조항과 이를 담고 있는 56개의 법령을 선정해 분석하였다. 본 연구는 산림관리에서의 섹터간 정책 조정의 현황을 파악하기 위해 크게 두 가지 접근방식에 초점을 맞추고 있다. 첫째, 산림법과 비산림법 내의 산림 연관 조항을 추출하고 분석하여 다양한 법령(에너지법, 수자원관리법, 환경법 등)들이 산림 관리에 어떠한 방식으로 함께 작용하는지 탐색하였다. 둘째, 산림관련 조항의 내용을 생태계서비스의 기능에 따라 공급, 지지 및 조절, 문화서비스의 3가지 서비스로 분류하였다. 이와 같은 두 가지 접근 방식을 사용하

여 추출된 법령들을 그 기능에 따라 산림 섹터와 농업, 도시, 환경, 에너지의 비산림섹터로 분류하고, 비산림 법제와 산림법제가 어떠한 생태계 서비스를 통해 법령 간 정책 조정을 보여주고 있는지 제시하였다.

본 연구는 법률 분석을 통해 1) 산림과 농업 부문 간 공급 서비스에 의한 정책 조정을 시사하고, 2) 산림과 도시 부문 간에는 문화 서비스에 의해 정책 조정을 제시하며, 마지막으로 3) 산림 부문이 환경과 에너지 부문과는 지지 및 조절 서비스를 통해 연관성을 가지며 조정된다는 세 가지 핵심 결과를 제시한다. 본 연구의 결과는 농업, 도시, 환경, 에너지의 비산림 부문이 산림부문과 생태계 서비스의 구체적인 기능을 바탕으로 어떠한 부문별 조정을 이루는지에 대해 보다 나은 이해를 제공한다.

주요어: 산림법, 생태계서비스, 산림정책, 법률분석, 정책조정, 북한법
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