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Editorial

Post-Restoration Forest Management Issues in East Asia under Climate Change: Based on the Special Issue "Economic and Societal Losses Due to Environmental Impacts on Forestry Productivity"

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Abstract: Forests provide diverse ecosystem services to people. Consequently, initiatives have been undertaken to restore deforested areas. In East Asian countries, particularly those within the Asian Monsoon region, deforestation has contributed to natural disasters such as sediment run-off, landslides, and flooding, which are exacerbated by torrential rainfall. Restoring forest cover is a critical aspect of national land conservation. To achieve this goal, state-led afforestation initiatives have been launched. Successful afforestation efforts have also been considered an indicator of economic development. However, Japan, which implemented afforestation projects successfully in the 1950s and 1970s, has experienced the under-utilization of its forests due to significant changes in economic and societal conditions since afforestation took place. During the 2010s, the Japanese government promoted the industrialization of forestry, encouraging final felling and reforestation. However, there have been issues with immature forest operation methods and low forestry productivity. Furthermore, in the context of intensifying climate change, heavy rainfall-induced disasters have become more intense, with an increased threat to human safety. Research efforts from the natural and social science fields in Japan have helped identify issues that need to be addressed concerning forests where plantation trees are now utilizable. There is a need to identify improved methods of forestry practice that reduce the risk of climate change-related disasters and establish related forest policies.

Keywords: afforestation; under-utilization; forestry operation; clearcutting; economic losses; societal losses; rural community; disaster-resilient forestry; East Asia

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1. Introduction

The Food and Agricultural Organization's (FAO's) Forest Resources Survey shows that global deforestation has continued but at a slower rate than that in the 1990s. Although deforestation has continued in Africa and South America, recent increases in forest cover in Asia have attracted increasing attention. Among Asian countries, China [1] and Vietnam [2] have experienced significant increases in forest cover since the 1990s. The change from deforestation to recovery efforts is correlated with economic development and an increase in gross domestic product (GDP). Both countries have initiated government-led efforts to promote natural forest conservation and plantation afforestation. Furthermore, although their political systems and timing of afforestation projects differ, Japan [3] and South Korea [4] have both implemented state-led afforestation projects during their economic growth periods to increase their forest cover. Afforestation projects were implemented in Japan between the 1950s and 1970s and in South Korea between the 1970s and 1990s.

East Asian countries have been successful in restoring forest cover as their economies have grown and are in a region where the Environmental Kuznets Curve (EKC) is applicable [5,6]. These countries fall into two groups: China and Vietnam, where forest cover is still

recovering, and Japan and South Korea, where forest cover is above 60% and planted forests have reached the utilization stage. Historically, the implementation of afforestation projects was triggered by severe forest degradation and consequent extensive human and material damage caused by heavy rainfall and extensive flooding, such as during Typhoon Kathleen (1947) in Japan [7] and the Yangtze River flooding in China (1998) [8]. The importance of forest restoration from a land conservation perspective has been widely recognized. In addition, the abundance of labor available for afforestation and forestry in rural villages during the early stages of economic development has been identified as a factor in the success of afforestation projects [9].

Despite these government-led afforestation projects and successful forest restoration in East Asian countries, various challenges in the context of climate change remain, and solutions are being sought to achieve sustainable forest management. With these considerations in mind, we wrote this article about the Special Issue titled "Economic and Societal Losses Due to Environmental Impacts on Forestry Productivity". This Special Issue comprised 13 noteworthy papers; four of which focused on China and nine on Japan, highlighting a striking contrast. Therefore, the purpose of this paper is to provide a summary of the post-reconstruction challenges in East Asia by reviewing the literature published in the Special Issue, along with some additional references.

2. Literature Review on Current Forestry Issues in China and Japan

Although forest cover is rapidly increasing in China (i.e., from 9% in 1990 to 23.3% in 2020) and the total area of plantation forests is expanding, there are areas where afforestation projects have failed. In addition, different regions of China are at different stages of economic development. For this reason, attempts have been made to apply the EKC theory, which has been used to make comparisons between countries and regions within China. For example, Zhang, Q. et al. [10] analyzed the relationship between regional GDP and forest cover in 41 cities in the Yangtze River Basin and showed that the EKC is valid within China. They concluded that economic development allows alternative income generation and forest cover recovery, which can reciprocally contribute to the economic development of the region. Forestry eco-efficiency (FECO) has been developed as an integrated indicator of resource, economic, and environmental strength. A literature review comparing China as a whole, by provinces and cities, found that there is a positive relationship between economic development and FECO in the economically developed eastern region; however, this relationship is not significant elsewhere [11].

In China, forests are owned by the state, while forest management units are divided into state-owned forests and collective forests. In a case study of Heilongjiang Province, China, where there are many state-owned forest areas, the correlation between the conservation of natural forest resources in state-owned forest areas and local economic development was significant until the early 2010s; however, coordinated environmental and economic development was limited after 2015 [12]. The authors also found that the free exercise of forest rights under the collective forest rights reform, which was implemented in 2003 and transferred the right to manage and control forests to local people, had a generally positive impact on management incentives [13]. A significant issue for the future will be comparing forest conservation and the promotion of forestry in China, specifically focusing on state-owned forests directly managed by state-led organizations and collective forests where management is decentralized to the local people. Determining whether successful afforestation can be linked to appropriate utilization in the area is important for the evaluation of afforestation projects and forest resource management. In addition, researchers have begun analyzing how the disclosure of these topics by forest companies and governments (i.e., CSR reports) to their stakeholders (i.e., shareholders, customers, and employees) is being evaluated on social media to make environmental investments in the forest sector more favorable [14].

In Japan, afforestation progressed from the 1950s to the 1970s, mainly in coniferous cedar and cypress plantations. By 1980, the forest cover had reached 68%, with planted

forests accounting for 40% of the forested area. As a result, there are no studies comparing forest cover and economic development across regions. It has been noted that the success of afforestation projects in Japan led to a gradual increase in forest accumulation, resulting in a significant reduction in the high incidence of land cover loss throughout the country in the 1950s [15]. However, resource under-utilization has become a major forest policy issue in Japan, as more than 50 years have passed since the afforestation projects were implemented. Forest stocks have increased to a stage where they can be harvested and utilized; however, economic and social factors have prevented the harvesting and utilization of these resources [16]. Although the problem of over-exploitation due to deforestation has been resolved by successful afforestation projects, these projects have now created under-utilization issues.

Economic factors contributing to these under-utilization issues include the high cost of forestry due to the rising cost of labor associated with economic development and Japan's steep topography, and in particular, the strong exchange rate of the Yen resulting from the Plaza Accord of 1985. This puts the country at a disadvantage when competing in the market against overseas forest products. In addition, social factors including the small-scale ownership of private forests and the depopulation and aging of mountainous areas are barriers to utilization. In Japan, approximately 55% of forests are privately owned, and the micro-dispersed ownership structure hinders efficient resource use. A previous study [17] revealed that as the generation involved in afforestation ages and retires, management succession fails, forest management and boundaries become unclear, and the level of forest management declines, particularly in micro-owned areas. Even in many forest producers' cooperatives and authorized neighborhood associations that were established by reorganizing the remaining historical forest commons (Iriai Forest), management is becoming increasingly difficult owing to low timber prices, a decreased number of members, and tax burdens [18]. Ota also emphasized that the members had maintained an attachment to and responsibility for the forests of Iriai origin and a sense of public contribution.

In response to these socio-economic challenges, the Japanese government has worked to overcome under-utilization by clarifying ownership boundaries that had become unclear, creating forest plans by grouping small private forests into estates, promoting forestry mechanization by outsourcing to large forestry companies, and reducing production costs. The government has also been zoning environmental and production forests and promoting final felling through clear cutting in production forests [19]. To promote these plans, a forest environment tax was introduced in 2018 [20]. Despite these initiatives, a recent report [21] highlighted that the road networks in forests, which are an essential production base for increasing forestry productivity, are inadequate, implying that more timber removal processes are required in Japan than in Central European countries with the same sloping forestry, and therefore, no immediate economic benefits can be expected.

In addition, biomass power plants are being built through a feed-in tariff for renewable energy to promote resource use (i.e., to utilize construction and sawmill waste, as well as materials generated from thinning) and CO_2 reduction as renewable energy. However, a previous study [22] conducted an inter-industry analysis of the economic and environmental effects of a forest biomass power plant. The study revealed that the economic effects were estimated in terms of investment and job creation; however, the plant may not be effective in contributing to the global environment in terms of CO_2 reduction, as stated in the forest policy.

In recent years, climate change has caused frequent heavy torrential rainfall disasters during the typhoon and the rainy season in Japan, with an increasing number of days where the hourly rainfall level exceeds 50 mm [15]. Landslides and floods caused by heavy rains have damaged mountain villages, leading to the rapid depopulation of aging villages [23]. In addition, many forest roads have been damaged in various regions, and research on how to rebuild forest roads and make them more disaster-resistant is urgently needed [24]. Suzuki, Y. et al. [25] suggest that, in Japan, where the terrain is steep and the geology is

complex, special precautions, such as extensively excavating the soil beneath the roadbed on the cut slope side before compacting the roadbed, are needed while constructing spur roads to ensure that they have sufficient strength.

These issues related to under-utilization, such as low resource utilization and inadequate infrastructure, along with problems associated with the monocultural structure of conifer plantations are highlighted. The spread of cedar pollinosis, intensification of driftwood catastrophes caused by landslides, and forest damage caused by wildlife are becoming more serious, especially in reforested areas [26]. In short, Japan, which was one of the first countries to successfully restore its forests, needs to develop resilient forests that can withstand disaster risks. While torrential rain disasters have the potential to cause the disappearance of mountain villages, some villages are seeking to recover from disasters through activities to create new forest landscapes, with the cooperation of external organizations and former residents. The recovery of these communities will require residents to form their own initiatives. A previous study [23] has meticulously described the recovery process and presented the nature of resident-led recovery in communities affected by disasters.

3. Future Research Issues for Sustainable Forest Management and Disaster-Resilient Forestry in East Asia

The above discussion shows that the pertinent issues for forest science research differ in China and Japan, which are at different stages of forest restoration. Due to differences in land area and political systems, it is unlikely that the challenges faced in Japan will manifest themselves in other countries. However, East Asia has a high population density, and there are similarities in the transformation of the social structure: the shift of the population from rural to urban areas (creating a working population that supported rapid industrial development), agriculture and forestry becoming comparatively minor industries and East Asia becoming a major importer of round wood and forest products, and the declining birthrate and increasingly aging population [27]. There are also similarities in the natural environment, such as the Asian monsoon climate and the high rates of plant growth during the summer, which necessitate intensive weeding work to preserve the success of artificial afforestation and natural regeneration. Therefore, the forestry challenges that arose in Japan after the success of its early afforestation projects may spread to other East Asian countries in the future. Comparative research is needed not only between China and Japan but also with other East Asian countries.

We found that a deeper understanding of current forest problems, which are exacerbated by climate change, can be gained by reviewing not only empirical social science research on Japan (based on field studies) but also natural science research on mountain disasters and forestry operations. To promote disaster-resilient forestry in the future and successfully revitalize rural villages through diverse forest use (not just for timber production), it is necessary to move from a monocultural forest plantation structure ("far from natural forests") to "closer-to-nature forests" [28] suitable for East Asia. This points to the need to consider the creation of "close-to-nature forests" that incorporate research findings related to silviculture and forest management theory. Our paper is limited in its discussion of these theories. The EU Commission's Forest Strategy 2030 indicated in 2021 [29] that production forests also need to explore close-to-nature forestry, with an emphasis on biodiversity conservation, to prevent the consequences of climate change.

4. Conclusions

This paper discusses forest management issues that have arisen after successful afforestation efforts in East Asia, using case studies from China and Japan. While sustainable forest management issues have been discussed in Europe based on comparative studies of forests and forestry in different countries, there has been little comprehensive forest science research based on the similarities and differences between East Asian countries. In Asia, where torrential rain damage occurs yearly (and is exacerbated by climate change), there

is a need for collaborative research and discussion on measures to address nature-based forest conservation and resource use issues.

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