

Perspective

# Managing Risks Arising from Conservation Complexities of Forests: Insights from China's "Chief Scheme" Practice

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**Abstract:** Forests play a critical role in combating climate change. It takes China from timber production to ecosystem rehabilitation and then to the future of carbon neutrality. Even though China's forestry has made great achievements, there remain many problems with its sustainable management, especially the difficult balance between rural livelihood and forest conservation. Under these circumstances, the forest chief scheme was transformed from local trials to a national mechanism. This article seeks to analyze the origin and evolution of the "forest chief" scheme and the complexities and challenges related to China's sustainable forestry development. Taking the risk governance framework, this study provides a systematic overview of the functioning of the "forest chiefs" element integral to sustainable governance. It offers innovative ways of top-down participation in the specific context by integrating the adaptive risk governance approach, thereby provoking critical thinking about sustainable forest governance.

**Keywords:** forest resources; China; sustainability; governance; rural livelihood



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## 1. Introduction

Forests play a critical role in the climate system by storing carbon. Since 1750, forests have been estimated to naturally absorb approximately half of the carbon emissions from the atmosphere [1]. Forest loss and degradation on a large scale would cause significant changes in wind patterns, hydrologic cycles, and moderating floods, etc. Forests also influence the world's temperatures and local temperatures, the atmospheric moisture, soil erosion, and soil degradation, and thereby the stability and productivity of agriculture towards climate variations [2]. In light of the urgent need to mitigate climate change, many governments turn to forest governance as it is the best nature-based solution, which often is more cost-effective than alternative means of carbon storage. In fact, forests provide more than ecosystem services. They provide people with food, wood, energy, and other raw materials for forest-based industries. The contributions also include economic benefits and the well-being of local communities. All these benefits mentioned here are related to the Sustainable Development Goals (SDGs) of the United Nations. Nevertheless, forests continue to be challenged by human-induced land-use transformations [3].

After undergoing excessive forest exploitation from the 1950s to the 1980s, driven by rapid economic growth and population expansion, the Chinese national government recognized the importance of sustainable forest management [4]. The 1998 floods in the Yangtze River basin created a shift from timber production to ecosystem rehabilitation, with a ban on logging in ecologically sensitive natural forests [5]. By 2017, all commercial logging in natural forests had been banned. After a series of key forestry ecological programs (e.g., The Natural Forest Protection Program and The Conversion of Cropland to Forest Program), China's forest area and stocking both maintained steady growth for more than 30 years. By the end of 2020, China's forest coverage rate rose to 23%, with a forest area of 220 million

ha [6]. Even though China's forestry has made great achievements, there remain many problems for its sustainable development, such as the poor quality and productivity of forests, the gap between domestic timber supply and rapidly expanding consumption, and the heavy budget burden of afforestation and reforestation for local governments [4,7].

To boost the protection of forest resources and ecological restoration, in January 2021, the general offices of the Communist Party of China Central Committee and the State Council issued a guideline to implement a "forest chief" scheme nationwide. The scheme will clarify all levels of forest chiefs' responsibilities in protecting forests by measuring their performance in forest coverage, forest stock volume, etc., in accordance with local conditions [8]. The scheme, which aims to guide local governments to pay attention to the environmental concern instead of focusing only on economic growth, is thought a crucial step in enhancing local responsibilities regarding ecological protection. Additionally, the role of government officials at the provincial, city, county, or township levels to undertake principal responsibilities enable the overall management of forest resources with coordinated support, instead of forestry bureaus struggling by themselves.

There have only been a few reviews of the development of China's forestry policies [7,9,10], but an update from the governance perspective is necessary. This study seeks to analyze the origin and evolution of the "forest chief" scheme and the complexities and challenges related to China's sustainable forestry development. The primary focus of this article is to provide a systematic overview of the functioning of the "forest chiefs" element integral to sustainable governance.

## 2. Concept and Characteristics of the "Forest Chief" Scheme

### 2.1. The Origin: Knowledge Transfer from the "River Chief" Scheme

The river chief scheme (RCS) originated from Zhejiang's and Jiangsu's practices in collaborative governance in 2003 when dealing with complex water pollution under the fragmented administrative system. The mechanism advocates that government leaders act as "river chiefs", taking responsibility for water management in their respective administrative regions. The main tasks of the river chiefs include water pollution prevention and control, water environmental management, water ecological restoration, water resources protection, shoreline management, and related law enforcement [11]. In December 2016, the central government released "the Opinions on Full Implementation of the River Chief System Across the Country". By June 2018, the RCS had been fully implemented in 31 provinces [12]. More than 300 thousand river chiefs were nominated at the provincial, municipal, county and township levels, and 29 provinces extended the RCS to the village level, with 780 thousand village chiefs appointed [13]. From 2007 to 2017, all eight regions having implemented RCS showed positive results: the length of polluted rivers decreased significantly, the proportion of rivers being cleaned increased to a large extent, and the water quality improved substantially [14].

The outcomes of the RCS greatly depend on its root in the culture of China's unitary system of government, which makes the top-down hierarchy of RCS operate effectively. First, the RCS, which comprises a relatively closed water environment management system, is essentially a "head responsibility system" that utilizes the centralized power of heads in specific jurisdictions to solve complex water issues. Second, to break "local protectionism", enhancing local responsibilities through the top-down administrative approach could reduce the possibility that levels of government give priority to economic development. Third, the RCS enables the transformation of water governance from segmented administrative regions and multiple departments to a collaborative model with the necessity for integrated goals. Fourth, the RCS provides a mechanism for regular collaboration among departments instead of campaign-style governance involving relevant entities in a specific period of time, which is important for the sustainability of governance and water resource management in the long term [11,13,15].

Although natural resource management is easily trapped in the zone of fragmented governance and insufficient collaboration, the RCS provides a way of integrated man-

agement that addresses interdepartmental and cross-regional issues. After the effective operation of RCS in water management, such a “head responsibility system” soon diffused to other issues in environmental protection in China, such as lake management, coastline management, waste separation and management, and forest management [15]. The core is that the top-down hierarchy system combined with the performance assessment of specific leaders in managing environmental issues can raise the priority of those issues by clearly assigning responsibility, as government officials tend not to make environmental management part of routine administrative tasks due to the promotion tournament in economic growth [14]. In this way, sustainable development could become a feasible solution.

The forest chief scheme (FCS) duplicates the logic of intergovernmental power distribution combined with its top-down hierarchy. Chiefs at the provincial, city, county, and township levels are appointed by central authorities. Chiefs at high levels are responsible for managing and monitoring chiefs at lower levels, and chiefs at lower levels shall report regularly to their superiors. Different levels of chiefs have corresponding tasks to accomplish, from goal setting to the formulation of management plans and detailed work implementations. Chiefs at the village level can be selected in accordance with specific conditions. In general, forest chiefs are responsible for the protection and restoration of forests, large-scale afforestation, monitoring and supervising forest resources and safeguarding forests against fires, etc. The offices of the forest chief system—the coordination center—which is composed of chiefs and staff from relevant departments, should be established to offer support to forest chiefs at different levels. The conference system, which allows forest chiefs at different levels and leaders from various departments to convene on cross-jurisdictional issues, should be set up to promote horizontal cooperation [16]. After the full implementation, forestry administration authorities are no longer the sole organizations in charge of forestry governance. Levels of government take responsibility for, while forestry bureaus provide guidance on, resources statistics, conservation advice, and forest resource management and services, as well as other technical assistance.

## 2.2. The Evolution: From Local Trials to a National Mechanism

Learning from RCS experiences, Anhui Province took the lead in trialing the forest chief scheme in March 2017. In September 2017, Anhui Provincial government issued the “Opinions on the Forest Chief Scheme”, stipulating the full implementation of the forest chief scheme in the province in 2018 based on the “head responsibility system”. Their responsibilities shall be clearly defined. Afterwards, a series of supporting institutions were issued, such as “Opinions on deepening the Forest Chief Scheme and optimizing the environment for forestry development” and “Opinions on large-scale afforestation”. There are a total of 52,000 forest chiefs appointed at the provincial, city, county, township, and village levels, covering all the forests and ensuring clear responsibilities. In 2019, Anhui established the first national pilot demonstration area of the forest chief reform. The FCS was recognized by the national government and included in the newly revised Forest Law [17].

Learning from past experiences, “The Implementation Plan for the national pilot demonstration area”, issued by the Anhui Provincial government in 2019, proposed 17 specific measures concerning the five major tasks of protecting, increasing, managing, using, and revitalizing greeneries. Performance assessment to enhance individual responsibilities, financing institutions to support the development of forestry, and other measures to advocate further innovations were emphasized.

After Anhui’s trials, the FCS diffused to other provincial regions such as Jiangxi, Guangdong, Shandong, and Chongqing. These regions obtained substantial improvement both in the ecological environment and satisfaction of citizens. In 2018, Anhui Province invested RMB 0.51 billion in forestry. In 2019, the total output value of forestry amounted to RMB 434.8 billion. More than 20 thousand business entities related to forestry were created. The frequency of forest fires, damaged forest areas, and direct economic costs in 2018 were reduced by at least 60% compared to in 2017 [18]. Since 2017, the probability of

forest fires has been controlled at under 0.05% yearly [19]. Due to the full support from relevant departments after implementing the FCS, the afforestation speed and the quality of forest resources have risen to a large extent [20]. Anhui's FCS offers replicable experiences for the whole country, and the scheme was introduced nationwide in 2021. As of Jan. 2021, there were already 23 provinces carrying out the scheme. By June 2022, full implementation should be achieved in the whole country [21].

### 3. Analysis from the Risk Governance Perspective

This part focuses on the question of whether the “forest chief” scheme could lead to sustainable governance and solve the old problem—the sustainable use of resources and local economic development not restricted to the Chinese context. The risk governance framework, developed by the IRGC (International Risk Governance Council), involves the environmental, economic, and societal contexts, which largely influence how the scheme will be implemented and thereby the effectiveness of ecological protection [22]. The IRGC framework provides a broad analytic perspective and insights into how we can improve forest governance. Fires are normally treated as zero-tolerant risks. However, the health of forests is also threatened by other known (e.g., pests and plant diseases) and unknown risks. Adapting to climate change should involve active forest risk governance not only from techniques of afforestation and ecological protection but also the cooperation of different actors to establish resilient systems avoiding resistance and conflicts in forest management. Human activities, such as seasonal picking behaviors, farming with fertilizers, and other chemicals and burning crop residues, have impacts on the health of forests. Land use could be changed between cropland and forestland due to policy changes. Man-made disasters (e.g., illegal logging, setting fires) could occur if loggers are no longer needed or due to the unfair distribution of gains and losses, etc.

The key elements drawn from the framework are presented in the following section, where a literature review is the main method of analysis. Additionally, we added some inputs based on our field investigations in pilot areas of Jilin Province. We conducted in-depth face-to-face interviews after the main stakeholders were identified (see Table 1). In total, we interviewed 97 people (see Table 2) in May 2021 for this explorative study. The selection of the respondents began with one national forestry bureau staff and continued with the identification of other relevant actors using the snowball technique. The interviewed individuals were selected based on their best available local knowledge about the FCS. Therefore, we tried to approach these interviewees as the most active and knowledgeable in the FCS pilot phase. The in-depth interview used less structured and open-ended questions to gather respondents' views and perspectives concerning forest governance.

During the interview, we mainly asked the following questions:

- What are your opinions about problems existing in forest conservation?
- Please introduce the experiences and achievements of FCS as you know.
- Do you have any advice on the FCS?

After the results from the interviews had been compiled and analyzed, we integrated other findings into the analysis framework.

**Table 1.** Major stakeholders in the forest chief system.

Actors and Stakeholders	Roles and Responsibilities	Interest Focus
National government	Nationwide implementation of the forest chief scheme; enhancing local responsibilities; overall management	Long-term protection of forest resources
Provincial governments and prefecture forestry bureaus	Detailed implementation plan based on trial experiences; mobilizing the implementation in counties; clarified organizational framework	Achievements in green development, innovation monitoring, and ecological protection
County forestry bureaus	Trial base for the forest chief scheme; aligned organizational structures; task assignment	Tasks accomplished with problems in financing and human resources to be solved
Township forestry stations and villages	Combined tasks due to administrative reforms; mobilizing forest rangers; division of resources and tasks	Fixing the workload for responsible individuals; clearing various rights
Forest rangers	Designated regular tasks in certain areas of forests	Accomplishment of patrol tasks
Rural residents	Tasks related to collective forests; Conversion of Cropland to Forest Program	Farming and livestock for profits; making more money off-farm if possible
Forest farm staff	Job tasks related to forest management; additional income related to forests	Under-forest economy for profits; earning money from woods if possible
Forest industry companies (state-owned)	Financed by national subsidies; tasks finished together with fighting forest fires within the system	Protecting and breeding the natural forests
Other companies	Seeking opportunities for economic development	Profits from forest resources
Academic institutions	Third-party evaluation; advice on improved management	Improved forest governance
NGOs	Education program and technical assistance	Biodiversity conservation of the forest system

**Table 2.** Interviewee information corresponding to relevant stakeholders in the forest chief system.

Actors and Stakeholders	No. of Departments	No. of Interviewees
National government	1	1
Provincial governments and prefecture forestry bureaus	1	1
County forestry bureaus	8	40
Township forestry stations and villages	0	0
Forest rangers	1	5
Rural residents	1	5
Forest farm staff	6	30
Forest industry companies (state-owned)	1	5
Other companies	0	0
Academic institutions	2	10
NGOs	0	0

### 3.1. Problem Framing

A systematic review of forest-related risks and opportunities needs to start with an analysis of what major political and societal actors (e.g., governments, companies, the scientific community, and the general public) are selected as risks and opportunities for future forest management. In technical terms, this is called framing and encompasses the selection and interpretation of phenomena as relevant risk topics [23,24]. The process of framing is mostly already part of the governance structure since governmental authorities (ministries, agencies, and management organizations), risk and opportunity producers (e.g., lumber industry and farmers), those affected by risks and opportunities (e.g., tourists and local communities) and interested bystanders (e.g., the media or those who need the forest ecosystem services) are involved and often in conflict with one another when framing the issue. What counts as risk or as an opportunity may vary among these actor groups. Whether a consensus evolves regarding what requires consideration as a relevant risk depends on the legitimacy of the selection rule. The acceptance of selection rules rests on two conditions: (1) all actors need to agree with the underlying goal (often legally prescribed, such as a forest management plan or the organization of forest chiefs); (2) they need to agree with the implications derived from the present state of knowledge (whether and to what degree the forest management practices impact the desired goal). Even within this preliminary analysis, dissent can result from conflicting values, as well as conflicting evidence, and, in particular, from the inadequate blending of the two. Values and evidence can be viewed as the two sides of a coin: the values govern the selection of the goal, whereas the evidence governs the selection of cause–effect claims. Both need to be properly investigated when analyzing risk governance, but it is of particular importance to understand the values shaping the interests, perceptions, and concerns of the different stakeholders, as well as to identify methods for capturing how these concerns are likely to influence, or impact on, the debate about a particular risk. The actual measurements of these impacts should then be carried out in the most professional manner, including the characterization of uncertainties [25,26].

A comprehensive list of stakeholders involved in the forest chief system is provided in Table 1. They have different roles and responsibilities, as shown in the table. The viewpoints of major stakeholders can be categorized as follows:

- As a critical success factor for both forest conservation and local livelihoods (provincial governments);
- As a major factor in local development (local governments);
- As a legitimate and necessary source of income (industry participants);
- As a factor for preventing forest fires (forest rangers);
- As a factor for ecological protection in the long term (national government, forestry administration authorities, and environmental NGOs).

The interests among different stakeholders can be divergent and even controversial; for example, if local communities or industry participants crave money, their exploitative actions toward forests may have irreversible impacts on the forest ecosystem. Environmental groups would resist such a way of making profits and initiate protests. In this way, there will be tension not only due to conflicting values of stakeholders, but interest contradiction would make forest conservation irreconcilable with earning income. If ecological protection and economic development were well balanced, local governments and households could enjoy the benefits of sustainable development in the long run, in accordance with the objectives of national and provincial governments. Environmental NGOs are also willing to provide technical assistance.

Due to time limits and resource constraints, the groups of actors we interviewed are shown in Table 2. We could not reach the township and village forestry staff, NGOs, and other companies. Through interviews with county forestry bureaus, we obtained the implementation information of FCS at lower levels and found out that at this early pilot phase, there is hardly any participation from NGOs and other companies outside the state-owned forest companies.

### 3.2. Challenges Related to Sustainable Governance of Forests: Complexities and Conflicts

#### • From Theory to Practice

It was found that the chiefs at the provincial, city, county, and township levels had been appointed by the upper-level government according to “The Opinions on Full implementation of the Forest Chief Scheme” issued by the central government on 12 January 2021. Appointed forest chiefs, who are normally government officials at city, county, or township levels, undertake more responsibilities rather than all responsibilities falling solely on forestry bureaus as in previous years. However, not necessarily all appointed forest chiefs are local government heads. For example, the forest chief at the city level could be a mayor, or another city may appoint a head of the city forestry bureau as the forest chief, depending on the upper-level government heads’ self-evaluation of the importance of forest conservation. Moreover, this will influence the resources allocated to implement the FCS at lower levels. The county-level chiefs also have this problem. Township-level forest chiefs are still old heads of forestry bureaus who are accordingly in charge of corresponding jurisdictions. Village-level chiefs can be appointed if necessary. With the support of the village head or community head in the FCS, the implementation and distribution of work tasks would be much easier.

Although the forest chief scheme drew on experiences from the RCS, problems for water governance remain to be solved. The RCS system encountered problems such as levels of chiefs shouldering responsibilities from many other fields, overreliance on the personal power of chiefs, and the disparity in different chiefs’ attention, which could be obstacles to FCS implementation [13]. In addition, RCS experiences may not fit in with forest conservation due to the differences between the managed objects. First, forests normally lie far away from cities, and the economic conditions of neighboring communities are mostly not very optimistic. Rural residents have economic incentives to exploit shared resources (such as illegal logging, invading the forest land, changing forest land use, and over-picking under the forest), which will affect the development of forest resources. Second, forest management requires a much greater amount of technical skills and knowledge. Frequent patrols in the short range are necessary for efficient protection. The patrol requires more manpower in the large areas of forests. Third, the benefits of forestry investment need quite a long time to be seen, with risks of fires, diseases, and other attacks by pests in between. Local government officials would rather choose to safeguard forests against fires as the bottom line. Their promotions cannot wait for long-term investment. Fourth, it is far more difficult to assess the performance of forest chiefs than river chiefs, as the management objects differ. The interviews showed that encouraging and quantifying the performance of forest patrol is still on trial. Monitoring the work of rangers could be cost consuming.

Furthermore, different provinces have to implement the FCS in accordance with their specific situations, such as the distribution of forest resources, forestry industry development, and support from local communities. The effectiveness of forest conservation will be largely influenced by the determination of upper-level governments and enforcement will in the last kilometer. Seeing an improvement in water quality is less time consuming and more straightforward than seeing the benefits of forest protection. The selective implementation of orders for forest management motivated by a promotion may go against the natural rules of forest development, particularly when the performance assessments of chiefs are not closely linked to the long-term development of forests.

Despite following the national and provincial instructions to implement FCS, there are some actual unfavorable situations mentioned in the interviews in Jilin Province. First, in this pilot phase, the institutional funding mechanism was not in place, which causes uncertainty regarding its full implementation in the whole province. Second, government heads normally pay less attention to forest chiefs compared to river chiefs, which could hinder overall support from upper-level governments. Third, the township forestry station is a critical link between goal setting and local enforcement. After administrative reforms, some stations were canceled and integrated into the township public service system, in which the transferred staff may have other responsibilities rather than focusing only on

forest management. Fourth, police and other relevant departments have difficulty staying on-site or getting to the scene at short notice. Therefore, illegal behaviors cannot be punished sometimes, as evidence collection is difficult. Local chiefs and patrols may also yield to pressure from personal relationships and revenge or hostile arson.

In addition to the above-mentioned problems, interviews show that deeper obstacles require more attention for the continued implementation of FCS:

- **Forms of Property Rights**

In China, there are two main forms of ownership of forest land—owned by collectives or owned by the state. Collective owners are normally village household groups. Collectively-owned forests are dominant in Southern China, and state-owned forests are prevalent in Northern China. After rounds of collective forest reforms, the forest use and management rights could be transferred to individual households, while ownership does not change. Previously, the use and management rights of forests were controlled by the collectives. Now, farmers are allowed to plant trees and cultivate products in their woodlands and hold ownership of such plantings. Earning income from business activities by managing forests is also possible. Such reform, with the increased management autonomy of rural households, gave rise to the working enthusiasm of farmers and led to increased forestry productivity and social welfare [27]. Afforestation and timber harvests increased dramatically, as well as the forestry-derived income of farmers [28]. Wood economy and income from under the forest are significant to rural residents and local development.

For state-owned forests, the focus of administration authorities is on forest recovery from earlier over-logging. Meanwhile, it removes the incentive of rural residents to participate in managing forest resources, as it is forbidden to cut down natural forests, and only forestry staff is allowed to engage in business activities related to state-owned forests. These rights cannot be transferred to outsiders. Our interviews in Jilin Province concerned this case. Local residents cannot gain a profit from the forests even if they are living in this area. There are tensions between individual economic activities and the protection of forests.

- **Complexities**

In addition to those difficulties caused by characteristics of managed forests, restrictions of property rights, and the various implementation contexts mentioned above, complexities for FCS implementation exist in defining the management areas of chiefs and the interaction of policies. Complexity refers to the difficulty of identifying and quantifying causal links between a multitude of potential candidates and specific adverse effects [29]. Sophisticated models of impact analysis are required if the relationship between policy measures and their effects becomes more complex. The nature of this difficulty may be traced back to interactive effects among policy measures (synergisms and antagonisms, positive and negative feedback loops), long delay periods between cause and effect (ecological impacts may occur much later than the initial launch of the policy measures), inter-individual variation, intervening variables, and others. It is precisely these complexities that make sophisticated assessments of policy impact analysis necessary since the impacts of forest management policies are neither obvious nor directly observable. Nonlinear response functions may also result from feedback loops that constitute a complex web of intervening variables [30]. Complexity, therefore, requires sensitivity to nonlinear, cascading effects, as well as to scale (i.e., at different levels).

Complexity arising from the gridding method in the administrative regions, the quantity of forest resources, or a mixture of the two has led to difficulties in assessing the performance of chiefs scientifically and fairly. Complexity arising from interactions of the policies with different goals could reduce the effectiveness of policies. For example, conflicting aims (such as grain production, forest conservation, and poverty reduction in policy aims, here referring to the first two) of the agricultural subsidy program ((ASP) to stimulate grain production to improve food security) and the Ecological Welfare Forest Program ((EWFP) a policy tool of payment for ecosystem services and compensation for



not logging forestland) have trade-offs on the land-use decisions of rural households. Farmers who receive both the agricultural subsidies and the EWFP payment are slightly more likely to expand their cropland area. The higher the EWFP subsidy is, the more isolated and poorer the households are, and thus, they have greater intentions to rent out marginal croplands.

- **Conflicts**

National and provincial governments have high expectations of the full implementation of FCS, while counties, townships, and villages are trapped in a situation of inadequate manpower and money. Here, we emphasize the added complexity—the vicious cycle—initiated by human capital. According to interviews in Jilin’s pilot areas, the area of forests in need of monitoring is 350–600 ha per ranger.

It is assumed that the efficient protection of forests requires frequent patrols in short range, as illegal behaviors are covert. For large areas of forests, this means that much more manpower is needed. Although the FCS draws the attention of government leaders towards forest protection and tries to mobilize more people in caring about it, the fact is, there is limited manpower in the aging rural communities who can be motivated due to the challenging patrol task. Even the forestry administration authorities themselves could not attract younger employees for fixed full-time jobs. Tough working conditions and the requirement for high physical strength result in the remaining forest rangers being 54–56 years old on average, but there is no new blood to take over. The heavy workload due to limited manpower, low wages, and financing problems in implementation not only cause challenges when attracting people to join the profession, but also affect the outcome of forest conservation and management. This is a systemic problem of environmentally friendly rural development compared to simply engaging people in afforestation and reforestation. Forest protection and management can largely depend on national subsidies, while provincial and local financing pose specific challenges within negotiations about budget and policy priorities. The extensive forests located in poor rural areas cannot be improved without the safeguarding of local people in densely populated China. Therefore, the economic conditions of neighboring communities matter to the health of the forest ecosystem in the short and long term.

The balance between economic development and environmental protection is a long-lasting question. However, not all regions will go in a sustainable direction. Still, there are ecologically vulnerable areas and ecologically functional zones, such as nature reserves and state-owned forest farms. Neighboring communities had few chances of using forest resources after eco-tourism trials became easily disordered. For trade-offs, local chiefs joined and mobilized more local people in patrolling after FCS implementation. This ameliorated the human power problem but could not solve it completely. The bottom line is the prevention of forest fires. Some people took the money but did little work. The quality of their work in protecting the forests is difficult to assess. To solve this, some regions invested a large amount of money in modern internet technology (such as real-time patrol routes via smartphones). In addition, rangers were often less educated and tended not to be good at using modern management tools, such as new software. Nevertheless, the intrinsic motivation problem needs to be fixed.

### 3.3. The Path Forward: Management Recommendations

Risk management reviews the information and findings from the risk and opportunity assessment in order to evaluate and select appropriate risk management reforms. The starting point for risk management comprises three potential outcomes [31]:

- In an *intolerable situation*, the forest management practice is not sustainable and needs to be reformed.
- In a *tolerable situation*, the forest management practice is on a pathway that promises an improvement, but further policy measures are necessary to reduce the remaining risks.
- In an *acceptable situation*, the forest management practices meet the criteria for sustainability and the process of forest chiefs’ work as anticipated.

The assessment of policy options, including the implementation of forest chiefs, requires a centralized decision on the criteria that govern the evaluation of the various policies and management plans. Each management measure will have desired and unintended consequences, which relate to the (ecological and economic) risks that they are supposed to reduce. In most instances, an assessment should be performed according to the following criteria [29]:

- *Effectiveness*: Does the management option achieve the desired effects?
- *Efficiency*: Does the management option achieve the desired effect with the least resource consumption?
- *Minimization of external side effects*: Does the option infringe on other valuable goods, benefits, or services, such as tourism, local resource utilization, and water management?
- *Sustainability*: Does the option contribute to the overall goal of sustainability? Does it assist in sustaining vital ecological functions, economic prosperity, and social cohesion?
- *Fairness*: Does the option burden the subjects of regulation in a fair and equitable manner?
- *Political and legal implementability*: Is the option compatible with legal requirements and the political priorities of the government?
- *Ethical acceptability*: Are the planned options morally acceptable?
- *Public acceptance*: Will the option be accepted by those individuals who are affected by it?

Assessing and evaluating management options against these criteria may create conflicting messages and results. Many measures that prove to be effective may turn out to be inefficient or unfair to those who will be burdened. Other measures may be sustainable but not accepted by the public or important stakeholders. Risk management is, therefore, highly recommended to make use of the many excellent guidance documents on how to handle risk trade-offs and how to employ decision analytic tools for dealing with conflicting evidence and values [32,33].

The key to sustainable forest governance is to make sure that policies and mechanisms to be implemented are considered acceptable by multi-stakeholders in terms of economic, social, and environmental dimensions. The conference system of FCS to promote horizontal cooperation will not be enough. Industries, research organizations, NGOs, and representatives of residents should be involved in the dialogues on governance when necessary.

Summarizing the experiences of the FCS in China, it is necessary to define property rights, clarify the respective responsibilities of chiefs and actors, and design incentive-compatible constraints in the principal–agent relationship, when emphasizing forest conservation from top-down leadership. Some experts worry that the FCS will not fall into the rule of man, and it will be difficult to ensure that the formalization and normalization of forest protection and management follow natural rules. Anhui’s adoption of China’s first provincial forest chief scheme regulations issued on 31 May 2021 may be of help to address this issue. The rule of law will guarantee the standardization and continuous deepening of the FCS implementation.

From Jilin’s experiences in FCS, although the “top-down” structure covering “county-township-village” levels of participation with clarified responsibilities has been established, the FCS practices have not yet paid much attention to mobilizing citizens to participate in the patrol. Bulletin boards with hotline numbers reporting misbehaviors are not very effective considering the difficulty of discovering them, collecting evidence, and other reasons. In addition to formal rules, informal institutions, social customs, and local knowledge should also be integrated. Second, environmental education programs should be reinforced. Not only did the rural residents not think very much about the importance of protecting the forests, many forestry staff members had not yet transited their minds to exploring wood resources, even though their job focus is now forest conservation after the logging ban. If intrinsic motivation is stimulated, it may ameliorate the limited manpower problem. Third, in comparison with the top-down approach, community-based management should be strengthened in China, as civil society alliances have unique advantages in supervision and management, and the persistence of the public leads to long-term development [34,35].

Fourth, market actors have not been given much freedom, as earlier failures of eco-tourism became disordered in some regions, and governments in Northern China focus more on ecological restoration. On July 16 of 2021, China's national carbon market started trading. The market-based approach internalizes climate externality, which gives rise to a new opportunity for forest management. Carbon trading has great potential to increase forest profitability. The incentives from deforestation and land-use change can now be converted to forest conservation and sustainability. Forest landowners with additional income can, therefore, be motivated to participate in carbon sequestration. Additionally, considering the poor conditions of neighboring regions around the forests, sustainable development plans could be carefully re-designed by the government so that local participation could be achieved and human capital can thus be accumulated.

Last not but not least, China's experiences expand the choice of environmental management tools and innovative ways in different contexts. Each country and region have to find its own solution that is suitable for the managed objects and should fit its specific context.

#### 4. Conclusions

This paper attempted to expand the framework on risk governance in the direction of more institutional capacity in forest management, in particular, the forest chief initiative, to include various actors and knowledge camps, such as community leaders and regional stakeholders when addressing and regulating risks of forest management. At the core of this paper was the idea of an adaptive and integrative risk governance approach. The goal was to illustrate how the different components of framing, risk and benefit estimation, risk evaluation, and risk management interact with one another and to demonstrate how the various combinations of local, regional, and national governance agencies can be addressed by different risk management strategies.

This generic risk governance model is particularly suited to deal with regional and local management tasks with a clear national policy. The risks associated with forest management include ecological, economic, cultural, and social challenges. These types of risks are all interconnected and need to be considered when effective risk management plans are designed and implemented [36].

The risk governance framework attributes an important function to public and stakeholder participation, as well as risk communication, in the risk governance process [37]. The framework suggests efficient and adequate public or stakeholder participation procedures. The concerns of stakeholders and/or the public need to be integrated into all phases of the management process. The best option for including stakeholders and affected members of the public depends on the regional context, for example, the ownership of forests. In this respect, all aspects that matter to people in forest management should be addressed and incorporated into the agenda of each forest chief. These negotiations should be guided by the principle of consilience, which is particularly suited for the Chinese cultural context. The need for reaching an agreement on the respective time and space boundaries underlines the necessity to understand and comprehend the various concepts and images that people associate with sustainable forest management.

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