

Cedars of the North Mountains: Historical forest culture and practices in modern day nature policies

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HIGHLIGHTS

- In Kitayama, north of Kyoto, *Cryptomeria japonica* or Japanese cedar, or *sugi* production has occurred for 600 years.
- Kitayama *sugi* constitutes an indispensable resource to preserve Kyoto cultural treasures such as teahouses, and a unique Sukiya-zukuri architectural style.
- Japan's national forest policies are not aligned with small scale Kitayama *sugi* production.
- It is necessary to seek new value chains around non-traditional services that the Kitayama complex provides to assure its durability.
- New and multiple value chains require policy integration across multiple policy domains that do not have a tradition to integrate easily.

SUMMARY

The region north of Kyoto is referred to as Kitayama, which literally translates as North Mountains. The region is the location of *Cryptomeria japonica*, Japanese cedar or *sugi*, production in Japan. Cedar logs grown there are used as pillars in the construction of buildings in a typical Japanese minimalist style, but also traditional rooms included in modern houses. Cedar was planted widely in Japan following World War II not only to rebuild the economy but also to grow raw materials to contribute to post-war housing reconstruction. In Kitayama, cedar has been grown for over 600 years and using specific silvicultural techniques by a community that has a unique cultural legacy which developed around cedar cultivation. The Kitayama *sugi* economic-socio-cultural-ecological complex thrived following World War II but is currently under stress. Demand for its highly priced products is declining. It is recognized in Japan and by the city of Kyoto as a valuable cultural historical heritage and efforts are being made to preserve it as such. The success of these efforts has been mixed so far. This paper reviews the Kitayama *sugi* economic-socio-cultural-ecological complex in order to understand how historical indigenous forestry practices change over time and how they might be dealt with in advanced societies such as Japan.

Keywords: Kyoto, Japan, *Cryptomeria japonica*, traditional forest management, integrated forest, cultural policy domains

Cèdres des montagnes du nord: culture et pratiques forestières historiques dans les politiques de la nature contemporaines

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Cèdres des montagnes du nord: culture et pratiques forestières historiques dans les politiques de la nature contemporaines La région située au nord de la ville de Kyoto est connue sous le nom de Kitayama, soit «les montagnes du nord» en traduction littérale. Cette région est le lieu de production du *Cryptomeria japonica*, cèdre japonais ou *sugi*, en japonais. Les troncs des arbres qui y sont cultivés servent de poteaux dans la construction d'un style d'architecture japonaise, ainsi que dans les pièces de réception traditionnelles incluses dans les maisons modernes. Le cèdre japonais a été massivement planté au Japon après la Seconde Guerre mondiale pour reconstruire l'économie du pays, pour produire la matière première servant à la reconstruction de logements après la guerre. À Kitayama, le cèdre a été cultivé depuis plus de 600 ans par une communauté qui a développé un patrimoine culturel unique autour du cèdre et de techniques sylvicoles qui lui sont propres. Le complexe économique social culturel et écologique du Kitayama *sugi* a prospéré après la Seconde Guerre mondiale, mais il est aujourd'hui en déclin. La demande pour ce produit à coût élevé est en baisse. Il est reconnu au Japon comme un patrimoine culturel important de la ville de Kyoto et des efforts sont mis en œuvre pour le préserver en tant que tel, bien que le succès de cette entreprise est connu des résultats inégaux jusqu'à présent. Cet article revisite le complexe économique social culturel et écologique du Kitayama *sugi* afin de comprendre comment les pratiques forestières autochtones historiques changent au cours du temps et comment elles pourraient être traitées dans des sociétés développées comme le Japon.

Cedros de las montañas del norte: Cultura y practicas forestales históricas en políticas de naturaleza moderna

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La región ubicada al norte de la ciudad de Kioto es conocida como Kitayama, que se traduce literalmente como Montañas del Norte. La región es el lugar de producción de *Cryptomeria japonica*, el cedro japonés, o cómo suele llamarse en japonés, *sugi*. Los troncos de los cedros que son allí cultivados son utilizados en la construcción que sigue el estilo de la arquitectura japonesa tradicional, incluyendo edificios enteros, así como, habitaciones o el acabado interior de casas modernas. El cedro japonés se sembró ampliamente en Japón después de la Segunda Guerra Mundial para reconstruir la economía del país, especialmente con la intención de producir materia prima para la reconstrucción de las viviendas después de la guerra. En Kitayama, el cedro ha sido cultivado durante más de 600 años por una comunidad que desarrolló un legado cultural único en torno a su cultivo, aplicando técnicas silvícolas propias. El complejo económico-socio-cultural-ecológico de Kitayama *sugi* prosperó después de la Segunda Guerra Mundial, pero en la actualidad está en declive. La demanda de sus productos de alto precio está disminuyendo. En Japón y en la región de Kioto esta práctica y sus paisajes resultantes se están siendo reconocidos como un valioso patrimonio histórico cultural. Están surgiendo esfuerzos para preservarlos, pero el éxito de estos ha sido desigual hasta ahora. Este artículo investiga el complejo económico-socio-cultural-ecológico de Kitayama *sugi* para clarificar cómo las prácticas forestales indígenas históricas cambian con el tiempo en sociedades avanzadas como Japón.

INTRODUCTION

Forests are places where people live, and a resource that people turn to, to meet livelihood needs. Livelihood strategies evolve and adapt to the unique environments where they are being pursued (Meggers 1954). The adaptation results in accumulating knowledge of how livelihood needs can be met more effectively and efficiently through interaction with the environment. Natural resource dependence in general, and forest dependence in particular, generate an imprint in cultural life. The dependence on forests is given explanation and meaning. Where that happens, narratives and codified practices become established that culturally recognize forest dependence. The narratives and codified practices are recognized as constituting part of the cultural heritage, world view, and traditional knowledge of the people who become their guardians (de Jong *et al.* 2017).

Such socio-cultural attributes of forest practices are an important part of the features that define people's identities. Cultural attributes of forest dependent livelihood strategies are significant considerations in national and international forest governance (Bull *et al.* 2018). People who have a cultural identity composed of language, shared discourse, social organization, material life, and forests and forest cultural practices, derive rights related to all of those. Rights are expected to be recognized over territories where the forests are located, supporting auto-determination and the preservation of unique cultures. These rights are recognized in multiple international treaties, including ILO Convention 169, the Convention on Indigenous and Tribal People, and the UN Declaration on the Rights of Indigenous Peoples. They are also expected to be recognized in multiple treaties and initiatives that address forests, like the CBD, SDGs, REDD+ and Bonn Challenge (Almeida 2016).

The subject of debates on peoples and their forests, the importance of forests in livelihoods, in worldviews and identity, are mostly indigenous people. There are numerous cases, however, in which forests play a central role in the livelihoods

of people, who may not identify themselves as such. But they may have adopted practices, narratives, beliefs, and norms that recognize the relationship with forests. Protagonists of those cases may recognize a collective identity that sets them apart from wider society, for instance of the mainstream society of the country in which they reside (e.g. Tabbush 2010).

These cases are relevant for analysis as they raise questions of how the forest-related cultural heritage of such groups needs to be dealt with (e.g. Takahashi *et al.* 2017). Theoretically they are also of interest because questions can be posed as how those cases, several of which are from advanced economies with strong democratic institutions and governments, are to be addressed in governance and policies. Questions can be asked such as, are these cases similar to examples of indigenous economic-social-cultural-ecological forest dependence complexes, in low, medium and high per capita GDP countries? And if so, do they constitute part of a continuum of such complexes, along an economic and socio-political gradient? And if one accepts the latter, does, or should this, have implications for international and national forest governance proposals that promote the recognition and support of these complexes? Following this line of argument, is it appropriate to recognize economic-social-cultural-ecological forest dependence complexes in advanced countries as possible future versions of those complexes that until now are mostly recognized to exist in countries that suffer from forest governance challenges?

Our paper analyzes the case of Kitayama *sugi*. Kitayama literally translates as North Mountains and refers to a mountainous region north of Kyoto, Japan. Kitayama is the location of intensive *Cryptomeria japonica*, Japanese cedar, or *sugi* production. *Sugi* production has taken place in the region likely since the 14th century and the species is grown applying specific silvicultural practices by a community that has a unique cultural legacy which developed around Kitayama *sugi* cultivation. The economic-social-cultural-ecological forest dependence complex of Kitayama (Kitayama *sugi* complex) has its origins in the 14th century and production has continued for 600 years, but it has for the last 50 years experienced

dramatic changes and at present is looking towards a difficult future.

The paper tries to answer the following questions: What are key attributes of the Kitayama sugi economic-social-cultural-ecological forest dependence complex? How has it evolved over the years and what are the challenges that it faces today? What are or have been proposals to preserve the Kitayama sugi complex, and how economically, socially and politically feasible are those proposals? What are the implications of the case of Kitayama sugi for supporting similar cases in advanced economies elsewhere in the world? And do cases like these have implications for the design of national and international recognition and support for corresponding indigenous economic-social-cultural-ecological forest dependence complexes in less advanced economies, and if so, what are they?

The paper is divided in the following sections: a summary of key economic, social cultural, and ecological attributes of sugi tree production in Kitayama, its dynamics and future prospects; a review of how the Kitayama sugi complex, its relevance and challenges, are addressed by actors in charge of forest legislation, policies and public administration, and what have been private and policy and public administrative proposals that aim to preserve this unique cultural treasure of Japan; a discussion of the implication of evidence provided in the previous sections; and finally the conclusions.

METHODS

Analytical framework

According to some definitions, systems constitute “a cohesive group of interrelated human-made or natural parts”. The systems concept was used to represent nature as ‘ecosystems’, already in 1935 (Tansley 1935). The possibility to use the systems concept to represent nature-based productive human practices has become common since the 1970s. Agriculture in general, but also agricultural practices of specific groups, producing a narrow or broad range of crops and in specific locations with their own environmental features, but also unique socio-economic dynamics, were being analyzed using systems theory (e.g. Fresco 1987). The term agro-ecosystems was proposed as the counterpart to nature ecosystems. Agro-ecosystems are, for instance, defined as “complex systems in which many species interact, with ecological processes that take place at different spatial scales, and with strong interactions between ecological and management processes” (Loeuille *et al.* 2013).

The closest equivalent to agroecosystems to represent people-forest productive interactions is the concept of socio-ecological systems (Cote and Nightingale 2012). The socio-ecological systems concept can be viewed as similar to agroecosystems, but with a significantly stronger emphasis on the interactions between the social components of the system and the ecological components of the system. Often socio-ecological systems are represented as two complementary but interacting systems, the social systems and the ecological

systems. One key characteristic of socio-ecological systems is that the two systems significantly influence each other, resulting in feedback mechanisms. Many socio-ecological system academic treatises draw ideas from contemporary ecosystems theory, and recognize, attributes such as resilience and resistance (e.g. Waide and Willig 2012). Following the same logic, attributes that are considered in the social system in socio-ecological system analyses include vulnerability and resilience (e.g. Cote and Nightingale 2012, Bauer *et al.* 2018). The socio-ecological systems concept is increasingly being used in studies on community forestry and other local forest management practices (e.g. Sunderland *et al.* 2017, Bauer *et al.* 2018), each of which have recognizable economic, social, cultural and ecological components (Pagdee *et al.* 2007, Baynes *et al.* 2015, Balée 2013). They all qualify as economic-social-cultural-ecological forest dependence complexes.

The socio-ecological systems concept has been questioned by some (e.g. Sterling *et al.* 2017), for its limited recognition of the complexity of the social system. Socio-ecological systems analysis, these critics hold, is not able to consider the local, contextual and cultural dynamics and interactions between people and ecological systems. We argue that the alternative that these critics propose, the biocultural approach, provides equally limited opportunities to recognize interactions that are not part of the narrow biological and socio-cultural components of the complex that is subject of analysis. The latter, for instance include non-local trends and processes, as in the case analyzed here, demand for Kitayama sugi wood, changes in timber trade trends, or policies and public administration interventions.

We propose in this paper to recognize the Kitayama sugi realm as an economic-socio-cultural-ecological forest dependence complex. This conceptualization of this realm represents a grounded theory approach to defining the analytical framework for this study without major ambition to suggest this concept as a competitor or alternative to socio-ecological systems theory, the biocultural approach or any other analytical approach. The economic-socio-cultural-ecological forest dependence complex concept certainly has similarities with socio-ecological systems thinking. However, it provides more weight to the non-nature, or non-ecological aspects of the complex, and allows for the recognition of attributes such as culture, and its manifestation in values and narratives as internal drivers of the dynamics of the complex, as proposed by the biocultural approach (e.g. Sterling *et al.* 2017). Identifying it as a complex, rather than a system, which would have been conceivable, avoids overemphasizing ecosystems attributes, like resilience, resistance, or vulnerability. What is of more interest in the analysis of the Kitayama sugi complex are the interactions of multiple factors, factors that are the focus of a range of independent academic domains. Table 1 provides an overview of the attributes of the Kitayama sugi complex.

In our conceptualization we do not consider policy, or public administration as being an integrated part of the complex, something that is done, for instance, in the sustainable livelihood framework (Scoones 1998). We consider policies

TABLE 1 *Attributes of the Kitayama sugi economic-social-cultural-ecological forest dependence complex*

| Complex attributes | Description |
|--------------------|---|
| Economic | Kitayama sugi production constitutes a unique economic sector and supply chain. Actors include producers, merchants, carpenters, architects, construction companies, and people who buy or rent houses. |
| Social | Kitayama producers have their own social organization. Their networks extend beyond their own community as they have developed strong relationships with buyers of wood, but also with carpenters and architects. |
| Cultural | Kitayama producers have their own traditional knowledge, including ecological knowledge, which is transmitted orally among members of the producer group. They hold their own values and perceptions and have developed related local narratives. |
| Ecological | Kitayama sugi production is about planting trees and tending Kitayama forests. These forests constitute the natural environment in the Kitayama region, which determine the ecological processes. |
| Forest dependence | The Kitayama sugi complex represents a community of producers who for much of its history derived their livelihoods from producing trees. |

and public administration drivers as not being part of the Kitayama sugi complex, but rather as external drivers that influence the complex. Sugi producers have had interactions and apparently also support from Kyoto prefecture and city administration since 1960, although we could not trace what the nature of this support has been. Despite this, policies and public administration do not have the same intrinsic relations with the complex as drivers that are part of the complex itself. This, for instance, is evident by the structure of the paper. The next section of the paper characterizes the Kitayama sugi complex, but in that characterization hardly any reference is made to policy or public administration. This is different for the economic, social, cultural and ecological attributes. These need to be part of the characterization of the complex in order for readers to be able to understand the Kitayama sugi complex and the argument the paper tries to make.

Research methods

Information needed to answer the questions formulated above relates to the Kitayama sugi complex on the one hand, and on the other hand to policies and public administration interventions by policy makers at the national sphere and policy makers and public administration actors of the prefectural forest administration. The information on the Kitayama sugi complex was obtained from a review of the scarce literature that is available on Kitayama sugi. Much of the limited information available on Kitayama sugi is in Japanese and addresses silviculture, management, and marketing aspect of the complex (e.g., Forestry Experimental Station, Kansai Branch 1975, Handa and Morita 1979, Iwai 1986). The information from the literature provided information on economic performance of the complex. The information on social and cultural aspects was all derived from participant observation and semi-structured interviews with Kitayama sugi producers

as well as a recent report on the complex for designation of the area as a cultural heritage landscape (Kyoto City 2019).

All authors of the paper have over the last two decades made several visits to the Kitayama region, to workshops and production sites, as part of work visit with groups of students or excursions with forestry researchers. Jacquet, has been engaged in studies on Japanese architecture including on the historical development of the Sukiya-zukuri style. As such he has made multiple visits to Kitayama sugi producers to understand the role of pillars produced there in the transformation of traditional Japanese architecture of Kyoto (Jacquet *et al.* 2021). Particularly for this paper, during the second half of 2020 two extensive interviews were held with Osamu Nakata, one of the last remaining Kitayama sugi producers.^{1,2} One interview was undertaken by Flores Urushima and Jacquet and one together between de Jong, Flores Urushima and Jacquet. Before the interview, a list of questions was prepared between the interviewers, and these questions guided the interview. If points of interest emerged, further questioning was undertaken to explore them. The questions particularly addressed the complex's history, the social organization and its change, local values, and ethics among Kitayama sugi producers and how these were reflected in local narratives.

Information on the ecological dimension of the Kitayama sugi complex was also obtained during those interviews. Information of this dimension is part of the traditional ecological knowledge of Kitayama sugi producers, and this ecological knowledge could be revealed adequately when interviews were being conducted. Information on national, prefectural policies and public administration was obtained from interviews with two prefectural officials Masaaki Kataoka and Shuhei Kobayashi. These interviews were undertaken by Takahashi in January and February 2021 and focused on understanding Kyoto Prefectural Government's position on Kitayama sugi and its producers and about the legislation and policies pertinent to the case and on their implementation.

¹ <http://nakagen.blog114.fc2.com/>

² <http://www.nakagen.jp/>

An interview with Seiichiro Hirose, the Kitayama branch representative of Kyoto City Forest Owners' Association, was conducted by Takahashi in January 2021 for the purpose of investigating the relationship of forest owners with forest policy.

THE KITAYAMA SUGI ECONOMIC-SOCIAL-CULTURAL-ECOLOGICAL FOREST DEPENDENCE COMPLEX

There are few details on the origin of Kitayama sugi production or of what the Kitayama complex was like during much of its early history. A legend attributes the origin of the unique Kitayama sugi production and processing to the advice received from a monk, who, when he passed through the Kitayama region fell sick. Villagers took good care of him with shelter and food. The monk, once he was healed, advised villagers to “polish sugi trees with the sand collected at the basin of Bodai-taki waterfall”.³ The polishing of sugi trees using sand that is specially selected for that purpose, is one of the unique features of Kitayama sugi cultural practice.

Kitayama sugi logs are used predominantly as pillars without being sawn. This use is closely linked to the Sukiya-zukuri, an architectural style which developed since the 16th century. The essence of the Sukiya-zukuri style are small rooms with a size of four and a half tatami mats⁴ and a tokonoma or alcove, where typical Japanese art, like ikebana flower arrangements or scrolls are displayed. Toyotomi Hideyoshi, the great unifier of Japan, engaged the famous tea master Sen no Rikyū, who introduced the use of simple, rustic, nature like elements in his tea-ceremonies, and this is linked to the origin of Sukiya-zukuri architectural style relying on simple calming design and using natural, earth and wood colors. It is the contrast to the Shoin-zukuri architectural style that emphasized large and splendidly decorated spaces. Kitayama sugi, because of its unique qualities which are a result of where and how the tree is grown became an indispensable ingredient in Sukiya-zukuri architecture. Since then, Kitayama sugi was used in teahouses, i.e. designated buildings where tea ceremonies took place, guest rooms in temples, or in other buildings where the style was applied (Flores Urushima *et al.* 2022).

Kitayama sugi silviculture

In addition to its processing, Kitayama sugi has its own silvicultural practices, which guarantees the trees' unique quality. Kitayama sugi production involves unique silvicultural measures and harvesting and processing procedures. The villages in Kitayama have similar ranges in soils, climate, and topography. Tree growing is undertaken on mountains and in valleys, but cypresses and cedars cover the slopes of ridges that are relatively low, but often quite steep. Sugi trees grow

quick and straight, even in the valleys, where light is significantly less. The wood is moderately soft and easy to be processed. New plots are planted using tree cuttings. The steep geography of the mountains surrounding Kyoto, the organization of the spaces for living and the spaces for production, and the mosaic landscape of the cultivated trees areas have formed the unique Kitayama landscape, characteristically different from other forest landscapes in Japan (Figures 2 and 3).

An important part of the silviculture includes planting and tending of the sugi plantations. Planting materials are carefully selected. In the village of Nakagawa a 400 year old Cryptomeria tree, named *daisugi* is preserved from which cuttings are harvested for the planting of new sugi plots. Trees selected to harvest cuttings for planting need to be well developed, with large crowns, and they must have had the right light exposure. The light exposure of selected trees defines exactly from which part cuttings are harvested to assure that straight trees will grow. The cuttings are planted in locations and at distances, taking into consideration the type of soil, the light that the site receives and the wind to which the site is exposed.

One key element of Kitayama sugi silviculture is treatment of standing trees (Handa and Morita 1979, Iwai 1986, Kyoto City Government 2019a). Sukiya architecture has its own aesthetic and the wood used needs to have precise, ideal proportions. To obtain the highest quality of stems with a near cylindrical form and knot-free surface both lopping and pruning of branches is required. The interventions that are applied assure that the trees develop trunks with a diameter that change as little as possible for much of the stem length, and which result in similar tree ring width throughout the stem. The branches of sugi trees are trimmed every three years for knot free wood. A Kitayama sugi stand typically contains trees that only have a remaining upper crown. However, during lopping, higher up branches also need to be pruned to the right length to assure these effects and assure the typical Kitayama sugi wood with the right wood density.

Equally important to stand silvicultural treatments is the harvesting of Kitayama sugi trees. In Kitayama, mature sugi trees are logged during the summer when the sun's rays have a near vertical angle and directly reach the forest floor and the air temperature is high. The trees are cut in August on days on which it is not raining. Loggers climb into the top of trees and peel off the bark from top down while the trees are still standing. After this operation is completed, trees are cut in a circle. Ropes are used to direct the trees towards each other in the center of the circle, until they form a structure similar to the pole skeleton of North American teepee. These structures of logged sugi trees are left for one week to receive sunlight to dry the wood naturally. When this happens, the tree crowns continue their photosynthesis, sucking up nourishment and moisture from the sapwood. Trees become lighter this way and can more easily be transported to the village.

³ <https://www.kyotokitayamamaruta.com/history/>

⁴ Tatami mats are traditional flooring in Japan houses. They have a standard size of 0.9 × 1.8 m.

Once the trees arrive at the village, they are hand polished with sand, and since modern times with hot water. Before the polishing of logs, they are immersed in water, washed and dried. The polishing is with sand that is collected in areas nearby. The natural drying process is completed inside storehouses from October until December after which they are ready to be used for various purposes. Natural drying of trees preserves natural oils, which happens less when drying in ovens is applied. Natural drying increases wood durability and improves the color of the stems and avoids cracking, which makes them more valuable for interior use.

The total revenue of Kitayama sugi producers varies tremendously, based on the quality of respective logs. Estimates from 1975 (Forestry Experimental Station, Kansai Branch 1975) suggest that harvesting a single ha of Kitayama sugi can yield around 2 900 stems. The rotation time of Kitayama sugi is between 25 and 35 years. As a single tree can yield two pillars, that would be a total of 5 800 pillars of 3m. The Forestry Experimental station provided a price of 30 000 JPY per polished pillar or about 100 USD at the 1970s exchange rate, which is a total income of 174 000 000 JPY or USD 580 000 for harvesting one ha. Handa and Morita (1979) gave an average of JPY 5 000 per polished stem, which would yield a total of 29 000 000 JPY/ ha, or 97 000 USD. According to local informants, the best quality pillars nowadays may fetch up to 1 million JPY or close to 10 000 USD (from field interviews). In comparison, the revenues from Japanese cypress and cedar plantation per ha respectively amounted to 7 000 000 JPY (23 000 USD) and 4 000 000 JPY (13 000 USD) in the early 1980s (Yamauchi 1983). The rotation time for these plantations are around 50 years.

Social organization and change

The Kitayama sugi complex has its unique social organization, but one that has changed dramatically over the last 50 years. Sugi production may involve multiple local actors who play different roles. They include owners of the land where the trees are grown, people who undertake the tending of sugi stands and harvesting of trees, and people who engage in the post logging preparations of the logged sugi stems. Until the 1960s, the production of logs was largely a family business, and the family unit would take care of all or several of the operations. They grew trees on their own land. Family members occupied living spaces in buildings where the processing of the sugi timber also took place. Landowners would organize the tree planting on their land, assure the proper tending took place, and organize the harvesting and post logging processing. If family labor did not suffice, workers would be engaged to do various part of the process, but mostly from the same or neighboring villages. The entire family, or the owner and workers would share detailed knowledge and responsibility on the requirements of Kitayama sugi production, abiding by strict work ethics and a code of conduct to guarantee the expected wood quality.

The owners of the processed sugi trees often had their network of buyers who included log traders, architects and

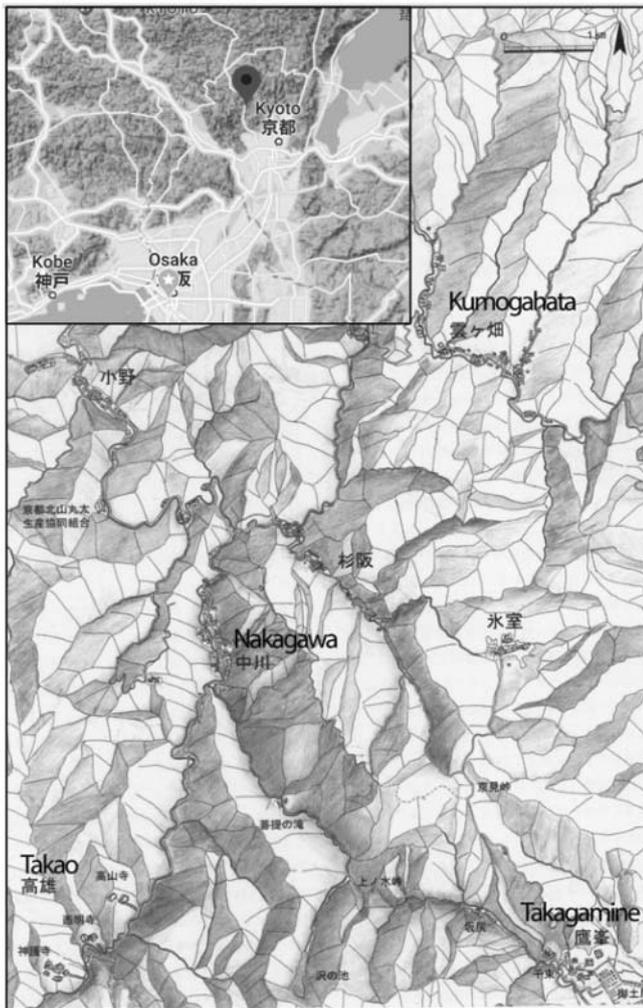
carpenters with whom they maintained long-term close relations. Kitayama sugi producers held close ties with buyers, who commonly expressed their admiration and gratitude for the sugi trees that they had acquired, and which they valued highly. This gratitude and appreciation cemented long lasting relationships between sugi producers and buyers of the trees (Flores Urushima *et al.* 2022).

Dramatic changes in the social organization of the Kitayama sugi complex began since the second half of the 1960s. The post-World War II years saw a tremendous increase in *Cryptomeria japonica* planting as well as the planting of Japanese cypress (*Chamaecyparis obtusa*) and Japanese larch (*Larix kaempferi*) throughout Japan in mountainous areas, except for a large part of Hokkaido as well as Okinawa. The purpose was to provide wood for reconstruction and boost economic activities (Matsushita 2015, Takahashi *et al.* 2021). Now 40%, or 10 million ha, of Japan's forest area is planted with these species. A significant boost in Kitayama sugi demand resulted when famous architects such as Isoya Yoshida (1894–1974), Togo Murano (1891–1984), and also Kazuo Shinohara (1925–2006) reinterpreted the Sukiya zukuri style and developed a new Sukiya style in their architectural designs. The new architectural style became widely applied in single Japanese style rooms of modern houses and apartments. In these rooms, which typically have tatami floors and sliding doors, sugi is used especially for interior pillars of tokonomas, or ornamental alcoves part of such rooms. Kitayama sugi was and still is favored in this architecture for its pleasant pale yellowish color.

This led to a dramatic increase in Kitayama sugi demand since the late 1960s, and production increased as a result. The Kitayama region includes several villages located north of Kyoto, including Takagamine, Takao, Nakagawa, Onogo and Kumogahata (Fig. 1). Until 1955, only an estimated 20% of the mountain areas was planted to sugi (Flores Urushima *et al.* 2022). This increased sharply since the late 1960s, when the demand for Kitayama sugi expanded. The boost in demand for Kitayama sugi resulted in the expansion of sugi planting into Keihoku-cho, Yagi-cho, and Hiyoshi-cho, all located in Kyoto Prefecture. While this happened, however, Nakagawa, Takao and Onogo continued to be recognized as the areas of true Kitayama sugi production (Handa and Morita 1979). Nowadays, Nakagawa has an estimated 200 ha of Kitayama sugi plantations (Kyoto City Government 2019a). Forests, including with *Cryptomeria japonica* are still present in the other villages, but these are not tended sugi plantations anymore.

The impacts of the dramatic increase in demand and production were complex. Kitayama region landowners tried to boost production, for which they began to use more land, and hire more people, including from outside the region. Workers became less tied to one producer only, but began to work for various producers, when their help was needed. Eventually, many of those workers started sugi production on their own, in the new areas to meet the increased demand. According to Nakata (from interviews), the new sugi growers either did not hold the knowledge that true Kitayama sugi

FIGURE 1 Region north of Kyoto of Kitayama sugi production (map based on Kyoto City Government 2019a)



producers held on how to grow trees to produce the high-quality wood, or they did not share the work ethics and code of conduct to which Kitayama growers held themselves.

A second change of major impact was the establishment of a Kitayama Maruta (logs) Productive Cooperative in 1951⁵, which continues to cooperate until today (Figure 3). Eventually, in early 1970s an independent, multi-story warehouse was built in Nakagawa to shelter the activities of peeling and polishing cedar, drying the logs, and storing processed logs. During the 1970s, the cooperative had more than 120 members and its total sale reached 1.5 billion yen for one year, roughly 5 million USD at the early 1970s exchange rate. In villages where sugi production was taken up following the increase in demand small processing facilities and warehouses were established. This is also the period that in Japan government policies promoted modernization of the forest sector, to reorganize traditional organizational structures into forest producer cooperatives (Takahashi *et al.* 2017). The establishment

of the cooperative led to a profound reorganization of Kitayama sugi production, but also an abandoning of traditional arrangements and social relations. As a result, for instance, family businesses began to sell their wood to the cooperative, and not directly to buyers anymore. They stopped preserving their networks and stopped producing to meet the demand of their customers. Rather they adapted production and the management of their stock and family enterprises to produce as their production capacity allowed.

The pinnacle of a dramatic increase in Kitayama sugi demand and increased production was followed by an equally dramatic decline in demand which has occurred since the 1990s – and again, with wide-reaching consequences for multiple aspects of the Kitayama sugi complex. The main reason is that the popularity for the modern Sukiya style architecture has declined. While in the 1960–1980 period a large number of houses were built with at least one room in this style this practice declined during the 1990s. Since the 2000s in modern apartments and houses such rooms are not always included anymore and the pace of new constructions has also diminished. Nowadays Kitayama sugi pillars are not included anymore in new apartments or houses, and if similar pillars are incorporated, less expensive imported wood is used. The Kitayama Maruta Productive Cooperative only has 30 members left of which only eight are full time producers. Its annual sales have declined to about 20 million yen per year, or about 190 000 USD.

In present times, the Kitayama sugi supply chain has changed from being a seller's market into a buyer's market. Remaining full time and part time Kitayama sugi producers must do their best to find buyers interested in their excess stock of sugi wood. This implies that producers must accommodate the expectations and demands of prospective buyers, as further discussed later.

Traditional knowledge, ethics, and narratives

Discourses represent an important component of the forestry domain (Arts *et al.* 2010). However, discourses that reflect issues of international relevance and debate are not well connected to local level realities (Bull *et al.* 2018), although the importance of local discourses in forestry-based development has been recognized (de Jong *et al.* 2017). In the case of the Kitayama sugi complex local discourses are composed of local knowledge, values and ethics, and local narratives. They represent the manifestation of the cultural dimension of the Kitayama sugi complex, and as such play a crucial role in its durability and stability. The few remaining Kitayama sugi producers recognize the knowledge they hold on sugi production and how important it is to assure that the sugi wood, with its unique quality, is being produced. Interviews with producers reveal how this knowledge was transmitted, between parents and children, often when fathers and sons went out to plant sugi trees, or during winters to shake snow of trees.

⁵ <https://www.kyotokitayamamaruta.com/profile/>, accessed 2-3-2021.

Or it was exchanged between landowners and workers when lopping and pruning of branches was done, and during summer, when trees were logged.

Both the boom of Kitayama sugi demand and production and also the decline during the last 30 years caused the decline of the transmission of knowledge. During the Kitayama sugi boom years, new producers started producing sugi independently and outside of the narrow Kitayama sugi socio-cultural environment, where transmission of knowledge was part of daily practice. More important, however, are the more recent decades, during which not only the numbers of producers declined, but also the Kitayama sugi villages experienced drastic demographic changes. Producers can recognize the suitability of places where sugi trees will grow best, and how soil, light and water conditions will influence growth. They know that their efforts to remove snow off the trees can be recognized in the sugi stem's tree rings when it is been logged many years later. At present, there are almost no younger children living in the villages anymore, and few if any are considering continuing Kitayama sugi production as their lifetime professional occupation. This implies that one of the most important mechanisms of knowledge transmission has almost disappeared.

At least some of the producers feel on the one hand great responsibility to continue Kitayama sugi production, which is reflected in how they express themselves when interviewed. They realize that they are the protagonists of a rich ancient tradition. They abhor the idea that they would be the last Kitayama sugi producers and that once they are gone, this rich cultural heritage will be lost. In addition, they are fully aware of the close linkage between Kitayama sugi production and various components of Japan and Kyoto's rich cultural heritage (from field interviews). There are over 260 buildings in Kyoto city and prefecture, including townhouses, temples, and tea pavilions, that incorporate Kitayama sugi logs in their structures. Maintaining these buildings requires a continued supply of new logs.

Without teahouses built in the Sukiya-zukuri style, tea ceremonies that developed with that style cannot continue (Flores Urushima *et al.* 2022). There is even a close linkage

between ikebana flower art which needs the Sukiya-zukuri tokonoma for proper display. So, they feel that without their efforts even something as essential as ikebana flower arrangements art may diminish.

About since 2000, however, a new realism has arrived in Kitayama. People who were devoted to sugi production and its social and cultural attributes greatly value their lifestyle and how it is linked with sugi trees and the Kitayama mountains. Interviews have revealed that they express their relationship with their forest and trees as a relationship of affection. It is their deepest wish to take good care of the sugi trees on their mountains and assure the supply of wood where it is needed. But at the same time people are aware that the Kitayama sugi livelihoods can only continue if the economic side of production is sound. They also are aware that the increased frequency of typhoons and resulting increase in winds and rains are detrimental to tree growing. The few remaining Kitayama sugi producers express their desire to care for the sugi trees when walking on mountains, as they did from a young age. Interviews have revealed that they are taking efforts to achieve this, but also are aware that profits, as they were obtained before, are not likely to return. Nowadays, the former Kitayama sugi growers feel puzzled by the bleak economic prospect of Kitayama sugi growing, processing and assuring their proper use in Sukiya-zukuri architecture.

EFFORT FOR THE REVITALIZATION AND PRESERVATION OF THE KITAYAMA SUGI

Japan has been grappling with its forest sector since the early 1960s when tariffs on imported wood were drastically decreased, a process that was completed in 1964. The consequences for the sector have been dramatic. Timber self-sufficiency dropped from 96.1% in 1955 to 20.8% in 1996 and the number of people working in forestry declined from 440 000 in 1960 to less than 50 000 in 2015 (Forestry Agency 2019). Japan's current national forest policy is based on the Basic Forest and Forestry Act 2001, which aims to promote the provision of the multiple benefits of forests demanded by

FIGURES 2 and 3 *Kitayama sugi processing workshop warehouse in Nakagawa (left) and Kitayama Maruta Productive Cooperative's headquarter (right). Kitayama sugi production areas in the background*



society today and to assure sustainable forest management. Its predecessor, the Basic Forestry Act of 1964, only pursued a single objective of establishing forestry as a competitive industry that could compete with other manufacturing and commercial sectors. Concerns about climate change and water-related disasters prompted a shift in forest policy since the 1990s (Takahashi *et al.* 2021). The forest environmental discourse centered on the thinning of the 10 million hectares of planted forests established since World War II. Insufficient thinning of these planted forests has been blamed for floods and landslides (Takahashi 2009, Takahashi *et al.* 2021). Appropriate thinning was also a measure to enhance Japan's forest carbon sink function, which was an important contribution to meet the 6% emissions reduction committed under the Kyoto Protocol.

In 2009, the then ruling Democratic Party of Japan launched a Forests and Forestry Revitalization Plan to address the ailing forest sector and address the crisis of poor forest management of the 40% planted forests of the 66% of the country's territory under forest (Forestry Agency 2009). The aim was to achieve a 50% self-sufficiency of domestic timber in 10 years (Nagasaka *et al.* 2016). Until 2019 a reported self-sufficiency of 37.5% has been reached, up from 26.3% in 2010.⁶ The second Liberal Democratic Party (LDP) government under Shinzo Abe (2012–2021) presented the New Growth Strategy as its major policy initiative.

In 2019 the latest forest management law was passed in part to continue pursuing the goals of the 2009 plan, but particularly to boost efforts to address the failing management of the country's planted forests. The revisions reemphasize the importance of adequate forest management to assure forests' contribution to emission reduction strategies and in flood and landslide prevention. Major challenges at that time remained; a declining motivation of private forest owners of 58% of the country's forests to manage their forests, unclear ownership because owners had migrated to urban areas and their descendants have no interest in what remains their legal property, and a resulting lack of knowledge of property boundaries. The Forest Management Act since 2019 allows municipalities to take over the management of those forests which private owners have no intention nor ability to manage (Uchiyama and Kohsaka 2020).

The new law proposes a new tax mechanism that generates funds for municipalities to engage private companies in order to undertake clearcutting and replanting of forests. It is called the Forest Environment Tax and Forest Environment Transfer Tax and it is to be used for forest improvement to be coordinated by municipalities.⁷ Private owners who have no interest or who are unable to invest in forest management are invited to delegate the management of their forests to municipalities. The latter are then able to contract private companies for forest maintenance. The new law also foresees integrating small businesses into large-scale operations or associations. It

is expected that small and medium companies will be pushed out of the industry.⁸

The Kyoto Prefectural Government's forest policy emulates the recent national policy trends (Kyoto Prefectural Government 2016a,b). In 2015, it initiated the Kyoto Forestry Renaissance Plan, aiming at a 40% supply of timber to the prefecture from forests located inside in its jurisdiction by 2018. The plan established an information exchange system and improved information flows between forest resources, timber processing, and consuming industries. In 2017, the newly initiated 'Action Plan for Doubling the Production and Use of Kyoto Timber' proposed cost-cutting initiatives through the tree-growing, timber-harvesting, and timber-processing stages and promoted the agglomeration of timber production to reduce costs of forest management and harvesting among small forest owners and operators. The plan also intends to promote cooperation between forest owners' associations, forest management entities, and logging companies. During this period, businesses planned to establish a cross-laminated timber (CLT) manufacturing and build wood biomass power plants. 'The Vision for Agriculture, Forestry and Fishery in Kyoto Prefecture' in 2019 systematically describes specific visions and policies based on 'The General Plan of Kyoto Prefecture.' The forestry part of the Vision emphasizes restoration of forestry and prevention and reduction of disasters such as landslides. Regarding Kitayama forestry, it states "we will disseminate information about Kitayama sugi, bamboo and lacquer in combination with the history of Kyoto, which has been epitomized by wooden buildings of shrines and temples and help citizens in Kyoto Prefecture re-discover their values." 'The Principles of Utilization and Conservation of Forests in Kyoto Prefecture' revised in the same year states "forests in Kitayama area should be properly managed and provide timbers for housings, shrines and temples as well as household items sustainably."

Under these wider prefectural forest policies, both Kyoto's prefectural and city governments have implemented policies to support Kitayama sugi producers, but the support measures do not concur well with what are national and in turn expected prefectural and city forest policies. The prefectural government, for instance, compensates half the costs of private users when they use Kitayama logs, but only up to 40 000 JPY (about 380 USD). The total number of applications included one in 2016, three in 2017, five in 2018 and four in 2019. Kyoto prefecture has been instrumental in the branding of Kitayama sugi. For instance, it helped Kitayama log producers to apply for the regional branding scheme in 2008.

The Kyoto City (municipal) government launched the 'Support Program for Protecting Beautiful Forests in the Ancient City of Kyoto' in 2016 (Kyoto City Government 2016a). The program, which is funded by the City government, supports traditional Kitayama sugi forestry by subsidizing

⁶ <http://english.agrinews.co.jp/?p=9794>. Accessed 28 Feb 2021.

⁷ https://jsfmf.net/english/policy/Forest_ETax/Forest_Etax0.html

⁸ Mainichi, Japan, 17-5-2019. <https://mainichi.jp/english/articles/20190517/p2a/00m/0na/016000c>

65% of pruning costs (Kyoto City Government 2019b). Usually, pruning of forests under lower governments' jurisdiction is subsidized by the National (30%), Prefectural (10%) and City (25%) governments. But pruning of Kitayama sugi in some cases does not meet the conditions set by the National government, and therefore the City set up this special program. In 2016, 2017 and 2018, forests of 5.26 ha, 10.30 ha, and 6.79 ha were pruned with such support, which, with an estimated total area of 200 ha of Kitayama sugi plantations in Nakagawa alone, is not much according to the authors' evaluation. A separate pathway intended to preserve Kitayama sugi's cultural heritage have been efforts to register Kitayama forestry practices and the associated landscape as a cultural landscape. Since 2014, the Kyoto municipality in collaboration with the Nara National Research Institute for Cultural Properties have been undertaking a forest landscape survey of Kitayama (Kyoto City Government 2019a). The survey was commissioned by the Agency of Cultural Affairs as one of nine landscapes under its 'Projects for the conservation and practical utilization of cultural landscapes'.

The Kitayama sugi producers, the cooperative and other supporters have engaged in innovation and public relations campaign to increase the awareness of Kitayama sugi nationally and internationally. One well known workshop of Nakamura Sotoji (1906–1997) nowadays manufactures wooden furniture in collaboration with Danish designers under the umbrella of the KOHSEKI company, to offer a selection of contemporary furniture which is compatible with the aesthetic of Sukiya-zukuri architecture (Jacquet *et al.* 2021). The Kitayama sugi producers themselves are also exploring new income streams. The Kitayama Maruta Productive Cooperative established the Kyoto Kitayama-Sugi-no-Sato Center, provides information on Kitayama sugi production, the wood, and opportunities for its use. The prefectural government supports the cooperative in their marketing efforts with the production of a catalog and brochure, material that is distributed at information kiosks on Kitayama sugi at recurring events. These materials⁹ show not only images of the Kitayama landscape, pictures of the harvesting of trees, but also interiors of houses where ample sugi wood is used, but according to architectural designs that are not only in the Sukiya-zukuri style anymore. In 2017, 2018 and 2019, educational tours were organized to forests where forest practices, such as pruning, were demonstrated. In 2020, the prefectural government with support of the cooperative announced a pilot program, where citizens could learn about new products made from Kitayama sugi, including table lamps, benches, and toys. Approximately 400 people applied for the 21 slots available. Participants were asked to give feedback on the designs and utility.¹⁰ The expectation was to establish new production lines in which Kitayama sugi is given new uses in manufacturing of consumer products.

DISCUSSION

The Kitayama sugi complex provides multiple economic, social, cultural, and ecological services, which are of value to multiple stakeholders. However, the continuation of this complex is not assured. In its current condition, the complex has an important economic component, and the survival of the complex depends on future economic viability. Economic viability is of primary importance to Kitayama sugi producers themselves, but to others too because of the non-economic benefits they derive from Kitayama sugi trees. The complex's cultural and ecological values are of importance to local stakeholders and distant stakeholders, including prefectural and city government, and protagonists and visitors of the temples and teahouses that need Kitayama sugi for maintenance and reconstruction. Multiple local and distant beneficiaries of values and services that the Kitayama sugi complex provides can be identified, using similar reasoning.

Questions can be asked then, what are options to assure the survival of the Kitayama sugi complex, if that is indeed a desired future? The challenges faced by Kitayama sugi producers are not well accommodated by policies at the national level. The national policy's objective of turning vast planted forests into reasonable priced usable resources and increase the volume in forest product industries represents a forest sector economic revitalization strategy (Nagasaka *et al.* 2016). The challenges for planted forests of Japan are quite different from those faced by the Kitayama sugi complex. In general, in Japan, forest management and harvesting of small holdings are costly, and policies aim at reforms that generate a forest sector economy of scale. But Kitayama intensive management requires small forest stands and intensive management. The unclear borders and unrecognized owners in many forest areas of Japan (Uchiyama and Kohsaka 2020) contrast sharply with Kitayama where owners are well aware of the borders of their forest stands because of the past successes of Kitayama sugi production.

Kitayama sugi producers suffer from a recent drastic declining demand for their highly priced and highly appreciated logs. This is the major threat, and it may lead to a decline of the multiple services provided, the logs that are indispensable for traditional buildings and the preservation of a unique cultural heritage, the Kitayama cultural forest landscape, and the emotional wellbeing of people who sustain Kitayama sugi production, among others. It also is leading to the loss of the Kitayama sugi complex's intangible attributes including local knowledge, ethics and values, and local narratives, i.e. the cultural attributes of the complex. Ironically the Kitayama sugi complex was experiencing threats to its intangible attributes when it was economically booming because of an increased interest in its main product, from the 1960s until towards the end of the century.

The prevailing policy trends that have put prefectural and city governments in charge of forestry issues within

⁹ <https://www.kyotokitayamamaruta.com/en/kitayamasugi.pdf>

¹⁰ <https://www.pref.kyoto.jp/kyotorinmu/news/documents/monitor.pdf>

their jurisdiction, but also the uniqueness of the Kitayama complex, have placed policy and public administration responsibility with Kyoto prefectural and city government. National policies are universal and comprehensive, and those that are the best for Japan's forest sector, are not adequate for the Kitayama sugi complex. The prevailing national policy is one of transforming the forest sector to an economy of scale, with private actors who manage larger areas of forests and increase their efficiency. This is not an option for Kitayama sugi producers, with their highly intensive production models. Locally specific policies are necessary to identify new markets for existing services (production of logs) and additional services that Kitayama producer can provide (new products, cultural history tourism). The prefectural government supports the development of new Kitayama sugi value chains, to enhance economic viability, and the city government has provided targeted subsidies. However, the wider forces of modernization and globalization make the preservation of the Kitayama sugi complex and its cultural forest landscape quite difficult. Even though local forest owners, log producers, architects, and government officials are looking for new ways to use Kitayama sugi, they are still struggling, with no clear and easy answers in sight.

The uncertain future of the Kitayama sugi complex, despite its value to many is partly a result of a lack of ideas to combine economic and cultural benefits into an integrated forest and cultural preservation policy. In particular, policy circles are insufficiently aware of why and how these two policy domains should and could be interlinked, although this is not a problem unique to Japan (Tabbush 2010, Campos Arce 2019). Considering the ecosystem services component of the economic-social-cultural-ecological forest dependence complex, the challenge is how to integrate policies and achieve positively balanced value chains around provisioning services (sugi logs being traded by Kitayama producers) and cultural ecosystem services (local cultural practices that shape people's identity, the cultural heritage of temples and teahouse in Kyoto). Such different types of services demand a different integration of complementary value chains each with their unique cost-benefit flows. The different services are linked to different consumers who need to be enticed to increase their use, and the compensation they are willing to expend for those services. Assuring economically viable complementary value chains is the most likely strategy to assure the survival of the Kitayama sugi complex. Implementing this strategy, however, may be a major challenge. Kitayama sugi benefit value chains focusing on provisioning services and cultural services, and possible regulating services (e.g. compensation for carbon stocks) require complex policy integration efforts across different public administration and policy domains that are not easily addressed by administrators and policy makers (Baskent 2020).

The case of the Kitayama sugi complex may have wider importance beyond Japan. Many economic-social-cultural-ecological forest dependence complexes exist around the world (Pagdee *et al.* 2007, Baynes *et al.* 2015, Balée 2013),

and significant efforts have been made in the last forty years to recognize them, to assign their protagonists rights and to protect them from outside threats that undermine their social, cultural, and ecological attributes (Almeida 2016, Bull *et al.* 2018, Campos Arce 2019). A possible conclusion from the Kitayama sugi case is that, where unique economic-social-cultural-ecological forest dependence complexes achieve economic viability but also political self-determination, durability is not automatically assured. Such complexes are, and continue to be, affected by wider economic, social and political trends, and depending on how those pan out, new threats may emerge. They may erode because of success, as happened with the Kitayama sugi complex during the 1960s and onward. Cases like Kitayama sugi that achieve a functioning integration of its economic, social, cultural, and ecological components may generate new dependencies that may undermine durability. An important example of the latter is when forest complexes develop dependencies on ecotourism, which may have negative social, cultural and economic impacts. How such developments are to be addressed requires negotiation and a weighting of how important some intangible benefits are, like the value of preservation of cultural heritage, or adaptation, for instance by generating new value chains, or social reconfigurations. Outcomes of such changes are not easy to predict, as it is not easy to predict what the future of the Kitayama sugi complex will be. It has great historical and cultural value, but it remains a part of the Japanese forestry policy domain, which itself is struggling to accommodate to rapid transforming economic and political realities.

CONCLUSIONS

The Kitayama sugi economic-social-cultural-ecological forest dependence complex has deep historical roots and is an intrinsic part of some of the major cultural legacies of Japan. But it remains principally a forestry production sector. It had its economic boom in the second half of the 20th century, but demand for its key product, *Cryptomeria japonica* logs, has drastically declined since then which threatens its economic viability. As a result, the widely recognized cultural services that the complex provides are also in danger of diminishing or disappearing altogether. The wider forest policy trends in Japan, which address profoundly different challenges than those faced by Kitayama sugi producers, does not offer much hope. Developing economically viable value chains for both the provision services and cultural services, and possibly regulating services of the Kitayama complex are the most likely options to assure its durability. This, however, creates new challenges as it requires policy integration across different administrative and policy domains. The case of the Kitayama sugi complex suggests that similar complexes, present in many parts of the world, will need to adapt continuously to new circumstances even after they have gone through the struggle of recognition, and gaining rights and self-determination.

ACKNOWLEDGEMENTS

We gratefully acknowledge the valuable suggestions made by anonymous reviewers, and thank all the interviewees and informants for their generous cooperation and suggestions.

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