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# FOREST AESTHETICS AS A BASIC IDEA FOR FOREST MANAGEMENT FROM THE PERSPECTIVES OF LIGHT QUALITY, ECOSYSTEMS, AND SUSTAINABILITY IN JAPAN

**Abstract**: Forest conservation as a living environment is essential for human survival. Attention is focused on Forest Aesthetics created by von H. Salisch at Postel in Poland, who managed economic forests to realize their functional beauty. Although an idea of Salisch introduced to Japan by 1895, lectures on Forest Aesthetics did not continue in universities located in lower middle latitudes. The main reason is that Forest Aesthetics depends on stand structure, creating sunshine filtering through canopy on the forest floor and the incident light makes the forests look beautiful. Action of light quality also plays an important role in forest beauty. Forest Aesthetics encompasses the ideas of ecosystems, sustainability, and family affection. Although Forest Aesthetics was proposed in 1885, there was no scientific term of "ecosystem" and ecological service that time. Now once again, it is about time to reevaluate the Forest Aesthetics produced in land of Poland.

**Keywords**: Forest Aesthetics, H. von Salisch, sustainability, light quality, ecological service

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## INTRODUCTION

Forest Aesthetics (Forst Ästhetik in German) was first published in 1885 by Jkr. H. von Salisch in Postel, western Poland (formerly Germany) (Koike, 2021: 30–35). The philosophical and technical book was revised up to the third edition in 1910, incorporating the idea of landscape architecture as well as forest stand management based on the practices of his own property. The prefix Jkr. H. von Salisch (hereafter Salisch) was used for those belonging to the Prussian aristocracy especially with military contribution. The concept of Forest Aesthetics was introduced to Japanese Imperial Universities of Tokyo, Hokkaido, and Kyoto in/around the early 1900s; however today, only Hokkaido University continues to give a lecture on "Forest Aesthetics". Consequently, the concept Forest Aesthetics is not commonly appreciated despite of its essential significance for forest management (Salisch, 1902 through Coor Jr. and Wehlau, 2008; Shimizu, 2006; Koike, 2021) but also providing something new for the forest visitors with civilization (Gwiazdowicz and Wiśniewski, 2011: 425–428). At least, Shinshu University in the central part of Japan is the sole institution that practices the concept of reforestation of Hinoki cypress (*Chamaecyparis obtusa*; e.g., Shimizu, 2006; Shimizu et al., 2006), and it is also associated with aesthetics, so it is dragged by the word, "aesthetics".

Terada (2022) belongs to forestry company at Nara Prefecture near Kyoto (both were old capital, Japan) has recently presented an interest renewed from forest aesthetics, and here in this mini-review, we tried to organize the thoughts of forest aesthetics, and to present the scope of application and forest creation. To this goal, 1) we propose the contemporary significance on forest aesthetics; 2) we review the perception of Forest Aesthetics from the management of forests and landscapes inspired by gardening. Emphasis was made on the scenery from the characteristics of light quality.

## DEVELOPMENT OF FOREST AESTHETICS: A COMPARISON WITH JAPAN

As mentioned above, "Forest Aesthetics" is a technical book that pursues the functional beauty of planted forests, consisting mainly of Scots pine (*Pinus sylvestris*) and aims to create better forests (Salisch, 1885).

The author, H. von. Salisch, who was also a landowner aristocrat, summarized the results of forest management of about 1,000 hectares inherited from his grandfather with their residents (Figure 1). As we will be explained later in detail, forests are regarded as aggregates of organisms such as trees and prey for hunting. An old saying, "With right trees in right places" in mind, we develop production infrastructure, i.e., forest roads and harvesting system, etc., aiming for sustainable forest management that is resistant to various damages (Prof. C. Wanger, 1878 cited after Tsutsui, 1995: 39–40). H. von Salisch had a management policy that allowed hunting (game management) and timber production in the territory (so called as "Park") and ultimately made the forest looks beautiful. For example, by using topography and creating a depth (as Vista), a forest stand looked seemingly vast. In addition, he aimed to produce trees with thick trunks by planting deciduous oak (*Quercus* sp.) trees as rows along with forest roads in his own forest.

Figure 1: Church of Family Salisch at Postelin, Poland

Source: Photo by TK. Koike, 2011

## THE CONTEMPORARY MEANING OF FOREST AESTHETICS

A question was raised during discussion at one reforestation site in the Sar Ainu[1] region of central Hokkaido, northern Japan, "What is the purpose of Forest Aesthetics?" To this question, we explained the short history of its development in Japan and overseas. The questioner was an engineer, administrating a local town in the Ainu region, and perhaps, this person was not of the importance of Forest Aesthetics techniques in the field of reforestation. The following commentary was made based on a Japan--Germany comparison in the perceptions of forests by one of the authors (Ueda 2011, 2019b). When the idea of forest aesthetics was established, there was no concept of ecosystem (air, soil, and all living things including forests), which meant the organic (physical combination) of organisms (Salisch, 2008 after Cook Jr and Wehlau: xiii–xlvii). Of course, there was no idea of "ecosystem services" (MA 2005) at the time (Table 1). Furthermore, the idea of attachment of family or sustainability was not clearly included in "ecosystem". As Gwiazdowicz and Wiśniewski (2011) traced the foundations of Salisch's forest aesthetics as far back as they could ever go, and traced them back to 1791 in his textbook. The term "Forest Aesthetics" encompasses these and anticipates the SDGs.[2] This explanation was, then, acknowledged by the members of administration and summarized in the Table 1.

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[1] The Ainu people are indigenous to northern Japanese, especially in Hokkaido Island. They have their own language far from Japanese and unique mythology in which everything in nature is believed to have a soul. In the 1900s, Polish (also Lithuanian) cultural anthropologist "Mr. Bronisław Piotr Piłsudski" gave lectures to the Ainu people, who had no written language (Koike T.T. et al., 2022), and introduced 50 stories from the Sar Ainu (named after the Saru-river; "Sar" in Ainu word means wet reed field) exhibited at the Anglo-Japanese Exhibition in London. When there was upheaval preceding World War I, Piłsudski escaped to Switzerland. In 1917, he left for Paris, where he worked at the Polish National Committee, which had been founded by Roman Dmowski, the political archrival of Józef Bronisław's younger brother; Józef Klemens Piłsudski served as the Chief of State and First Marshal of Poland (from 1920).

[2] "Sustainable Development Goals" are considered SDGs and were adopted by the UN General Assembly in September 2015. The content of the plan is to "solve the world's environmental, discrimination, poverty, and human rights problems by 2030," and 17 goals are being implemented in various regions of the world to achieve this plan and goal. Currently, each of the forest valorization systems includes "aesthetical values" as part of cultural values (e.g. MA, 2005; IPBES, 2019).

Table 1: A comparison between development of an idea of forest community or ecosystem and Forest Aesthetics in Japan

| | Progress in Idea of Ecosystem and services | Advancement of Forest Aesthetics |
|---|---|---|
| 1805 | A. von Humboldt (Geography of plants) | – |
| 1864 | G.P. Marsh (also 1965) Nature's Sendces | – |
| 1877 | K.-A. Mobius (Biocenose) | – |
| 1885 | – | H. von Salisch (Forest Aesthetics 1st edition; no photos) |
| 1886 | – | Prof. Zentaro Kawase (Forest Policy) introduction to Japan |
| 1902 | Prof. Manabu Miyoshi published "Beauty of Plant ecology" and proposed "Landscape" | The 2nd edition of Forest Aesthetics with photos |
| 1905 | – | "Forest Aesthetics" as the regular lecture in Germany but only one year |
| 1910 | – | The 3rd edition of Forest Aesthetics by H. von Salisch |
| 1918 | – | Prof. Y. Niijima and J. Murayama published Forrest Aesthetics |
| 1926 | Dr. Volodymyr I. Vernadskyi (Ukraine) proposed "biosphere" | – |
| 1934 | – | Prof. K. Konda reviewed "Historical analysis of Forest Aesthetics" |
| 1936 | Dr. A. G. Tansley proposed "ecosystem" | – |
| 1939 | Dr. A.G. Tansley proposed "ecotope" and define its regime | – |
| 2000 | Daily, G.C. Ecological services (MA) | – |

Source: Koike T.K. et al. (2022) and Koike T.T. et al. (2022).

In Japan, Forest Aesthetics has been typically practiced in Hinoki-cypress (*Cryptomeria japonica*) plantation forests of Shinshu University in Nagano prefecture, central part of Japan. Another example is a forestry-man, Mr. Tsutomu Hayami of The Hayami Forestry Company in the Owase region, Mie Prefecture in south-central Japan. He and his company got the first certification of the forestry certified company (FSC) for

his man-made forests. In his book "Creating Beautiful Forests" (Hayami, 2007: 179–190), he described as follows: "I did not intend to create man-made forests just for the beauty of scenery but forests that my offspring would use to live on. As a consequence, people admire, 'Oh! You've created a beautiful forest'." This is considered as the essence of economic forest management (Salisch, 1902 after Coor Jr and Wehlau, 2008: 1–12).

Moreover, there is another important phrase that refers to the creation of planted forests, "One generation of trees is coincided with three generations of people" (Figure 2). The use of renewable resources and sustainable forestry relies on the aesthetics (or functional beauty in a forest) of planted forests, commonly known as Forest Aesthetics (e.g., Salisch, 1902 after Coor Jr and Wehlau, 2008: 12–15; Koike, 2021: 80–92; Masaka 2022). The advocacy of forest aesthetics must be adopted in terms of the resource management stream of resilience in forests (Miyashita et al., 2012: 100–113; Reyer et al. 2015); "forest aesthetics" are a guideline to create artificial forests with functional beauty in order to hand on to our offspring. In other words, we should develop mixed forests with "right trees in right place", while considering road construction, improvement of resistance to climatic disaster. Forest aesthetics represents one of ways to appreciate ecosystems, as well as sustainability, heritage for the future, etc. as proposed by C. Wagner (after Tsutsui, 1995: 39–40; Koike 2021: 53–57).

Figure 2: Aged man and his granddaughter cultivate big red pine in Gifu Pref. in central Japan

Source: courtesy of Dr. H. Yamakawa (2015) after journal of "Sanrin", No.1568.

## UNDERSTANDING FOREST AESTHETICS AND ITS BACKGROUND

Recently, Masaka (2022), a forest ecologist, made the introduction for the idea and goal of Forest Aesthetics as follows: "Forest Aesthetics implies not only the use of woods, but also decent landscape managed with technologies that perpetuate forests. Practical forestry managements, should protect forests from weather damage, pests, and insects." Forest aesthetics is an ideal forest management guideline, however, why has this guideline been not continued in southern Japan? One reason may be ascribed to the aftereffects of the Sino-Japanese and Russo-Japanese Wars; in order to recover the drop in national economics and resources due to the wars, extensive reforestation through whole Japan neglected the idea of Forest Aesthetics. If the Japanese continue to rake fallen leaves and use trees excessively, only Japanese red pine (*Pinus densiflora*) can grow in the mountains of south of Honshu, Japan (Honda, 1900). The red pine can grow in nutrient poor site, such as mountain ridge.

Consequently, "Satoyama"[3] areas in southern parts of Japan turned into coniferous monoculture all at once by the government in 1908, and "inefficient" natural regeneration and conventional management methods were neglected except Hokkaido. This project was evident also in the "Boshin Rescript" as the order of "Meiji" (Era name) after the emperor (Ono, 2005). During the Second World War, former Germany also carried out "predatory forestry" while advocating superficial nature conservation (Uekötter, 2006: 1–16). However, we do not think that orientation of Forest Aesthetics (= the pursuit of functional beauty in economic forests) will go out of fashion.

As mentioned above, the significance of forest aesthetics has not received much attention except mountainous Nagano (ca. 1,200m a.s.l.; latitude 35~36°N) or Hokkaido in the north (latitude 42 °N~45 °N). Forest Aesthetics should not be used in a philosophical context but in a technical theory to pursues functional beauty. We will illustrate the trends in Germany, Japan, U.S.A. etc., in the past 10 years.

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[3] Satoyama; Japanese traditional rural landscape close to village.

Figure 3: An example of Japanese Garden (Gardening around 1840)

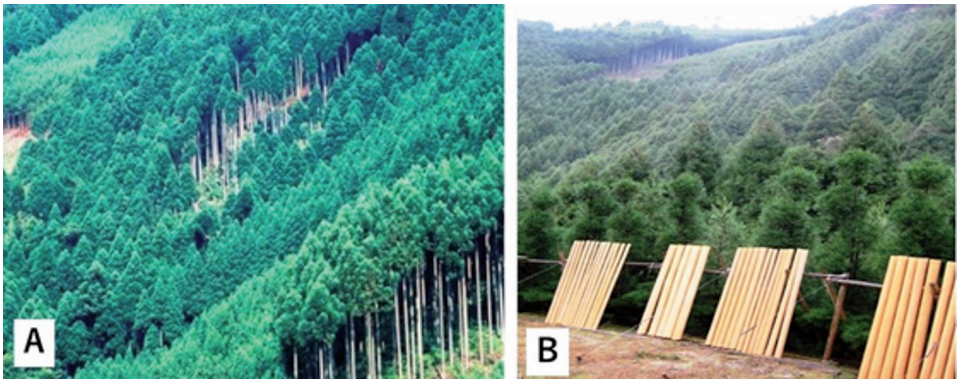
Source: Photo by Mr. Y. Koike.

### 1) Experiences in Munich, Germany

School of International sustainability, Technical University of Munich (TUM) organized a seminar on "Basic understanding forest science and sustainability in Bayern, Germany." One of the members, Prof. R. Mozandl, who considers himself the successor of Prof. H. von Cotta, the "father of forestry" (in Tharandt Higher Forestry School opened by H. Cotta). Prof. R. Mozandl gave a question that "it is quite interesting to know that forest aesthetics continues in Japan. As we know Japan has beautiful gardens (Figure 3); what attracts you about forest aesthetics?" We summarized the historical background and present circumstances in Japan in response to his question. He said, "I see, the forests of Hokkaido are different from those in other parts of Japan that I am familiar with." They seemed to think that Sugi-cedar (*Cryptomeria japonica*) and Hinoki-cypress were typical tree species of Japanese afforestation, and imaged the Kitayama Forestry in Kyoto (Figure 4).

The Kitayama Forestry in Kyoto, the old capital of Japan has a history of nearly 700 years, which produces exquisite logs with polished, smooth surfaces, an important component of traditional Japanese houses used as pillars (Koike and Koike, 2012). The pillars are produced from "designed

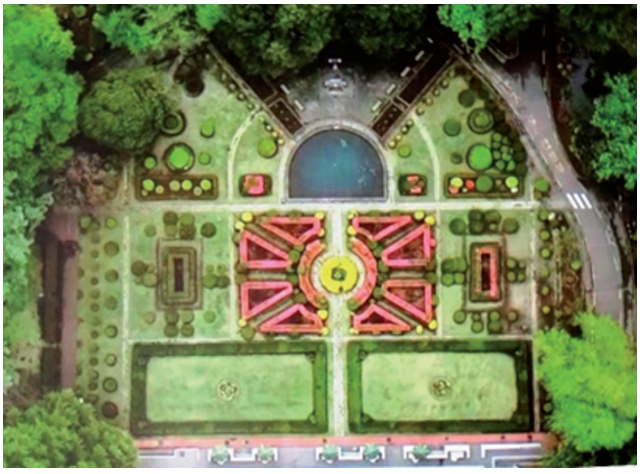
Figure 4: Forest landscape in the Kitayama forestry region




Source: Photo offered by Kyoto Prefecture office (A), and Polished poles (B) in the same region of Kitayama by TK. Koike.

wood", whose unique production process has turned into a tourism resource as the scenery of Kitayama region (Figure 4).

Figure 5: A French style garden in Utsunomiya University near Tokyo during spring season (Red colour shows full bloom of *Rhododendron* sp. This garden is National Registered Monument (Related to Places of Scenic Beauty) from 2017)



Source: Photo is adopted from Utsunomiya University You-tube site (courtesy of Prof. T. Ohkubo).

The composition of gardens in Europe is mainly based on French gardens with geometric arrangement (Figure 5). On the other hand, Japanese gardens have changed with time, partly due to the slight influence of

China-Tang and Song Dynasty China, but "curved shapes and left-right asymmetry'' characterize Japanese gardens (Mitsui, 2008: 1–28).[4]

According to Wakui (2006: 1–37, 62–100), who coordinated the general producer of the venue for the EXPO-2005, Aichi, Japan, which was held under the theme of biodiversity conservation. The International Garden and Greenery Exposition in Osaka 1990, the composition of Western and Eastern gardens was said to be influenced by underlying religious views. For example, in Europe, there is a "covenant" that humans rule the earth in place of God (Jesus Christ), so the problem is whether it is in order from the sky. Japanese gardens, by contrast, are influenced by Buddhism, which aims for self-discovery as suggested by Gwiazdowicz and Wiśniewski (2011). Consequently, Japanese gardens are believed to be modelled after natural landscape.

English gardens are popular in Japan, which imitates natural landscapes and traces picturesque beauty, such as irregularity, asymmetry, and associations with the past. These gardens are large in scale and spacious to condense nature, so that we may find nature there and enjoy them. As mentioned above, there does not seem to be a trend of "restoration of forest aesthetics'' in the recent idea of German afforestation (Ueda, 2011). Also, in Munich, south Germany, we were explained that "the management method commended by forest aesthetics: "Organisieren (in German) = Order is the method of natural regeneration" (Koike, 2015). Prof. R. Mozandl, TUM emphasized another point that natural vegetation and physical environment (e.g., light, soil, nutrition, etc.) were not synonymous. These points will be discussed later.

### 2) Japanese vegetation and light environment

The Japanese archipelago is long from south to north, about 3,000 km long, and lies between 20°N and N45°N latitudes with no severe effects of latest glacial period (Adams and Woodward, 1989). Moreover, we have high amount of precipitation of around 1,800 mm/year (about 2 times higher than Europe) (*Japan Meteorological Agency*, 2023). With this historical and

[4] "Sakutei" means "building Japanese garden" and the oldest instruction book illustrated at around mid-late Heian period: 11th century (Takei and Keane, 2008: 3–37; Koike, 2021: 30–33). The author of "Sakutei" is not confirmed yet and still under discussion (Koike T.T. et al., 2022). The most important message is considered to "The art of setting stone", which is also proposed by Salisch (1902 after Coor Jr and Wehlau, 2008: 284–290) as usage of stones in forests (Koike, 2021: 80–92).

geological characteristic in Japan, we have high abundance in plant species and quite different vegetation from central Europe.

There are various ways of thinking about the classification of vegetation in Japan, it is commonly acknowledged that the Kuromatsunai Lowland (42.3°N) in Hokkaido is the border between temperate forests and sub-frigid forest, and the forest represents the northern margin of cold-temperate forests with beech trees is in the Tohoku region (Matsuda et al. 2002). From Kuromatsunai to north region, mixed conifer and broad-leaved forests including Sakhalin fir, represent the southern margin (Matsuda et al., 2002).

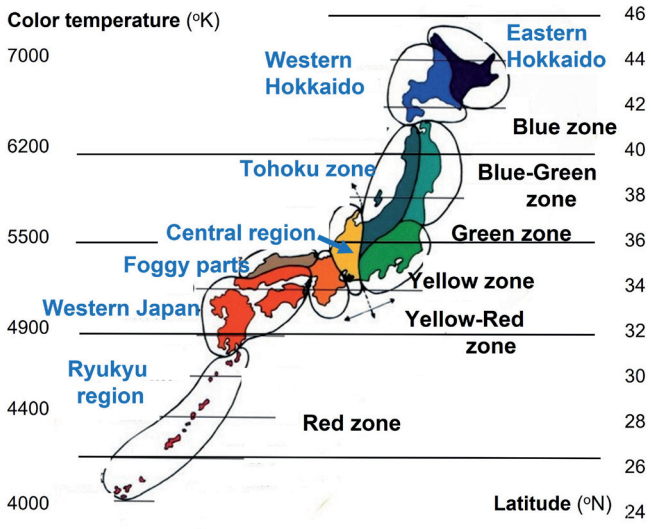
In Hokkaido, the Imperial Forest Bureau led the implementation of a natural regeneration method that was conscious of the light quality to promote seed germination and growth of seedlings (Harada, 1954: 5–20). Mixed needle-broadleaf forest in the upstream region of Saru (the location name is originated from "river basin with reed" in the Ainu) River must have fascinated Mr. Jozo Murayama. He wrote a graduation thesis that became the basis of the textbook of Forest Aesthetics (Niijima and Murayama, 1918) in line with the actual situation in Japan.

As is always the case with building construction, incident light is an important issue in the creation of forest beauty (Ueda, 2019a; 2019b). For example, the Oirase-valley walk in inland Tohoku district, one of Japan's most popular natural tourist attractions, provides two options, i.e., morning and afternoon courses. When incident lights most favour beech stands in the autumn, tourists can fully appreciate the stroll in the forest even though they are not aware of the significance of incident light. However, the role of incident light is appreciated in terms of Forest Aesthetics only in mid- and high-latitude regions; such as Poland, Finland, and Hokkaido (vs. Forest Aesthetics in China is mainly about garden theory for Inscription on Imperial Seal of China; Zhao, 2009). Forest Aesthetics was translated from German into English by Prof. W. Cook Jr. and Ms. D. Wehlau in Georgia, U.S.A. (located at 33.9°N) in 1996 and published it in 2008.

Light quality varies with latitude in the regions where lectures on forest aesthetics are provided as a modern science from Europe at around 1908 in Japan. The functional beauty of interior forests still remains true (Sato, 1999: 123–177). As mentioned above, Japan is made up of many islands scattered along south-north axis between 20 and 45°N with highly variable light quality often softened by sea fog. A case study will be presented based on Mr. K. Sato's experience on the effect of light quality influencing preference for scenery.

K. Sato (1999) described "the atmosphere has a bluish tinge, and the green colour blends into the air" (Figure 6). On smoking, he was always impressed with the flame of cigarette lighter, "it appeared bright reddish purple at Lake Mashu in Hokkaido (43.6°N), however in Kagoshima (31.2°N), I found it blue at the base of flame".

Figure 6: Colour temperature, quality of light, specific culture and latitude in Japan Archipelago




Source: Colour temperature (unit is K: kelvin) is a scale for expressing the colour of light emitted by light sources such as sunlight, natural light, and artificial lighting. The lower the colour temperature unit (K), the warmer the colour emitted, and the higher the colour temperature unit (K), the colder the colour emitted. It is calculated from the hue that changes by warming a theoretical blackbody. Adopted from K. Sato (1999).

In Japan, forest aesthetics was conceptualized separately by Mr. Jozo Murayama as mentioned above, who published a bachelor thesis at Agricultural Science college of Tohoku Imperial University, "Discussing the aesthetic value of useful trees in Hokkaido'' (Murayama, 1916: 1–1008). At the beginning of this thesis, he made researches on the structure and function of the eye and its optical qualities. Colours seen through the eye are perceived by cone-type colour-sensitive cells that respond to the "three primary colours" and by columnar cells that perceive light and dark. These cells undergo "colour acclimation," but the basic colour sense responds regionally (Ishii et al., 2004) as well as absorption by plants in a forest (e.g., Harada 1954). In relation to this point of view, the following discussion

will be made from the point of view of colour temperature in the discussion on colour science (Sato, 1999; Ishii et al., 2004; Figure 6).

Japan, which stretches from north to south, is roughly divided into the northern type, which prefers cool colours, and the southern type, warm colours. What determines the colour preference? Sato (1999) ascribed this to the "Japan Alps" located in the central Japan like spines (around N35°), making sunlight look bluish in the morning in the northeast and reddish in the afternoon in the northwest? In addition, depending on the season, the fog blurs and smudges the sunlight, embedding watermark along the coasts of the Sea of Japan and northeastern Pacific Ocean in Kushiro (N42.6°; E144.2°) at eastmost Japan. A 'blurring effect' like ink painting and a 'watermark effect' due to the surface colour can be seen, which may be an adaptation of turbid intermediate colours occurs.

Since the authors Prof. Y Niijima, was from Tokyo (36°N) and Mr. J. Murayama (as of 1917) was from Yamaguchi city (34°N), the westernmost part of Honshu, they must have found the forests of the upper reaches of the Saru River majestic and sublime in early summer to be much impressed with the scenery. We would like to take another opportunity to discuss this area when we consider landscape creation in Hokkaido.

## CONCLUSION

At the time when forest aesthetics was born, the concept of ecosystems was underdeveloped. Also, the idea of ecosystems does not include the idea of attachment to offspring. Since the MA (2000), the concept of ecosystem services has become popular. Forest aesthetics is a system that includes these and anticipates the SDGs. The use of renewable resources and the idea of sustainable forestry underlie the forest aesthetics that emerged in the ancestral plantations of Poznań in Poland in the late 19th century. Only Poland, Finland, and Hokkaido, Japan located in the mid- and high-latitude regions do lectures on forest aesthetics continue. In the low latitudes of Japan, forest aesthetics was introduced, however, could not be sustained. The reason for this is the effect of light quality when viewing landscapes. In other words, Japanese Archipelago, which stretches from north to south, is roughly divided into the Northern Japan type, which prefers "cool" colours, and the Southern Japan type, which prefers "warm" colours. For this reason, we thought that forest aesthetics was continued

only in Hokkaido, which has a similar latitude to Poland, the birthplace of forest aesthetics. In line with the trend of resilience in forests, ideologically, the guidelines for creating forests with functional beauty for the sake of grandchildren (appropriate trees in suitable areas, creating mixed forests, resistance to weather damage, creation of production infrastructure such as forest roads) are called forest aesthetics.

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