Investigation on the Awareness and Preference for Wood Culture to Promote the Values of Wood: III. Living Environment and Trend of Wood Utilization

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ABSTRACT

Improving public awareness of wood is crucial for expanding the use of wood and establishing a wood culture. In this study, the environment and trends of the public's wood utilization were analyzed using a questionnaire survey and online text mining at a time when eco-friendly practices are gaining popularity. As a result of reducing climatic and environmental concerns and its positive physical and psychological effects, the use of wood is predicted to rise in areas intimately connected to everyday living, such as wood furniture, wooden structures, and interior materials. Nonetheless, there was a negative awareness that wood was expensive, difficult to maintain, and associated with deforestation. The correlations between wood-related search terms on major Korean portal sites were analyzed and categorized into five groups: Wooden architecture, cultural education, woodworking, wood industry, and wood policy. As a building material, wood was seen as more traditional and friendly than reinforced concrete and stone. Eighty-six percent of respondents expected to utilize wood as a building material in the future, regardless of whether the wood is domestically produced or imported. Sixty-five percent responded favorably about the effects of wood on the health of wooden home inhabitants. It is believed that both active publicity and quantifiable value analysis of human and environmental friendliness are required to increase pro-environment awareness of wood utilization.

Keywords: wood, wood culture, living environment, trend of wood utilization, text mining

1. INTRODUCTION

According to the Intergovernmental Panel on Climate Change (IPCC), it is critical to retain forest carbon storage and to constantly produce wood, fiber, and energy from forests as annual yields in order to maximize the impact of a long-term sustainable forest management plan (IPCC, 2007). When compared to functionally similar petroleum or mineral resources, wood products often have lesser environmental implications (Lippke *et al.*, 2011; Werner and Richter, 2007; Werner *et al.*, 2005). In particular, from the cascading viewpoint, wood may be exploited step by step from basic material to numerous uses. Because wood is eventually used as fuel, it provides environmental benefits over other materials (European Commission, 2011). Timber supplies were destroyed in Korea during the Japanese colonial era and the Korean War (Hur, 2005), but reforestation was

effectively carried out owing to the adoption of a robust system and economic growth that reduced dependence on forests (Lee *et al.*, 2017). As a result, the growing stock per hectare increased from 5.7 m^3/ha in 1953 to 165.2 m^3/ha in 2020. However, as of 2009, the growing stock of age classes IV and V grew significantly, whereas the growing stock of age classes II and III fell progressively, resulting in forest aging. The rate of greenhouse gas absorption in the forest sector has progressively declined from 12.4% in 2000 to 8.9% in 2010 and 6.4% in 2017 (KFS, 2020). As a result, one of the challenges to deal with the climate problem is to create and maintain forests, which are carbon sinks, and to expand the usage of wood, which is a carbon storage.

To revitalize wood utilization, Korea Forest Service (KFS) established the Act on the Sustainable Use of Timbers (KFS, 2013), and is developing various policies and laying a social framework for wood utilization and wood culture promotion. The public's perception of wood and wood culture, on the other hand, is restricted to cultural assets such as *hanok*, furniture, and crafts or wood products. Furthermore, there are mutually conflicting ideas that the usage of wood has a positive impact on the environment by increasing the carbon storage effect and that it is deforestation via logging (Han and Lee, 2021a). Wood culture resources are tangible and intangible products created by human cultural activities that include the cultural worth of wood or wood utilization in terms of conservation, discovery, and utilization (Han *et al.*, 2021). Due to a lack of understanding about wood cultural resources, the general public's degree of engagement is low, despite a reasonably high desire to utilize it (Han and Lee, 2021b).

Recently, as the public's interest in eco-friendliness and health has grown owing to improved living standards. As a result, awareness of wood as a natural material has improved and the ratio of selecting wood as a material for residence and living has risen. Consequently, studies are being conducted to quantify the beneficial impacts of utilizing wood as a building material on the human body and the environment. According to one study, the sense of seeing or touching wood modifies the human physiological index (Ikei *et al.*, 2017). Furthermore, it was found that wood installed indoors lowered stress (Burnard and Kutnar, 2015), enhanced sleep quality, and made individuals feel more comfortable (Morita *et al.*, 2020). In Korea, researchers investigated effects of essential oils extracted from wood against inflammations (Yang *et al*., 2019), bacteria (Ham *et al*., 2020), and skin and lung diseases (Ahn *et al*., 2018, 2021).

A survey was undertaken in this research to evaluate the present state and needs linked to wood cultural experience of the general public, with the objective of boosting the social and educational value of wood. The survey questions were classified into seven categories: (1) Awareness of wood culture, (2) use characteristics of wood, (3) preference and demand for wood culture, (4) awareness for wood culture sub-field, (5) awareness for wood cultural resources, (6) trend of wood utilization, and (7) wood-related living environment. The survey was conducted in such a way that the respondents were asked questions about the details of each survey item. The survey results were analyzed in four parts: "Awareness of wood and cultural experience" (Han and Lee, 2021a), "Awareness of wood cultural resources by type" (Han and Lee, 2021b), "living environment and the trend of wood utilization", and "preference and demand for wood culture". Based on the survey results, this study analyzed the public's living environment and the trend of wood utilization.

2. MATERIALS and METHODS

2.1. Subjects of survey

From October 20 to October 29, 2020, an online web panel polled 2,500 general individuals over the age of

19 in Korea on the present state and needs for wood cultural experience. When compared to conventional surveys such as phone surveys and in-person surveys, online web panel surveys save time and money. Furthermore, it may be set in various designs and formats, and survey respondents' replies can be reviewed quickly (Ryu and Moon, 2014). However, the online web panel survey has a problem in that a representativeness error arises, which indicates that the target population and the sample frame are inconsistent (Gim and Kim, 2004). To address the limitations of this online web panel survey, the sample was collected based on the composition ratio of the population by gender and age in 17 Korean metropolitan cities and provinces using proportional allocation based on the composition ratio of the population by gender and age in Korea. The information about the subjects of survey is the same as in earlier research (Han and Lee, 2021a, 2021b), and respondent information by gender, age, educational background, family income, and regional classification is shown in Table 1.

Table 1. Characteristics of a respondents

		Number of respondents	Ratio
Total		2,500	100
Gender	Men	1,264	50.6
	Women	1,236	49.4
Age (years)	Under 29	461	18.4
	30−39	435	17.4
	40−49	524	21.0
	50−59	540	21.6
	Above 60	540	21.6
Level of education	High school graduate or less	466	18.6
	Attending university	110	4.4
	University graduate	1,688	67.5
	Post-graduate degree	236	9.4
Family income (million)	Less than KRW 3	675	27.0
	KRW 3−5	752	30.1
	KRW 5−7	601	24.0
	KRW > 7	472	18.9
Age of youngest child	Under 7 years	263	10.5
	Elementary schoolchild	258	10.3
	Middle and high school student	253	10.1
	Undergraduate / Adult	772	30.9
	No kids	954	38.2
Area	Capital area	1,274	51.0
	Non-capital area	1,226	49.0
Division of area	Metropolitan city	1,126	45.0
	Provincial area	1,374	55.0

Adapted from Han and Lee (2021a) with CC-BY-NC.

2.2. Survey items

The main contents of the survey on the current status and requirements associated with wood culture experience consist of seven items: Awareness of wood culture, use characteristics of wood, preference and demand for wood culture, awareness for wood culture, awareness for wood cultural resources, trend of wood utilization, and wood-related living environment. The details of these seven items are presented in Table 2. The present study analyzed the survey results for some of the fourth item "awareness for wood culture sub-field", the sixth item "trend of wood utilization", and the seventh item "wood-related living environment". The survey items analyzed in this study are indicated by bold font in Table 2. The questionnaire used in this survey can be found in an appendix of the previous study (Han and Lee, 2021a).

Table 2. Details of the survey on the status and requirements of wood culture experience

Classification	Details
Awareness of wood culture	• Free association image of wood and wood culture • Feeling closer to wood • Awareness of wood • Awareness of wood-related occupations • Awareness and participation in main projects related to wood culture experience
Use characteristics of wood culture	• Use status of wood cultural experience - Cultural heritage; architecture of wood; playing with wood; cultural festival; cultural education; cultural contents; and wood products • Most recently experienced wood culture-related activities/programs • Satisfaction with the most recent wood culture experience activities/programs
Preference and demand for wood culture	• Preferred products using wood • Effect of wood culture experience • Intent to participate/use based on the type of wood culture • Preferred method of progress in wood culture experience program • Appropriate program operation time • Intent to pay for wood culture experience program • Presence of children and age group of children • Wood culture experience programs with children and reasons for participation • Promotions to revitalize wood culture experience
Awareness for wood culture sub-field[*]	• Experience and awareness related to wood education • **Opinions on the main materials of traditional Korean houses** • **Opinions based on research related to the health of residents of wooden houses** • **Opinions on the effects of forest bathing when decorating indoors using wood** • **Types of houses for living** • Opinions on the environmental consideration of wood use • Concrete or wooden houses and which one has a longer lifespan
Awareness for wood cultural resources	• Awareness of wood cultural resources • Items considered important among wood cultural resources • Level of interest and reasons for wood cultural resources • Sufficiency and necessity of information on wood cultural resources • Experience/intention to use wood cultural resources within the next year • What can be obtained through wood cultural resources? • What aspects to focus on to popularize wood cultural resources?

Table 2. Continued

Classification	Details
Trend of wood utilization[*]	• **Future changes and reasons for using wood (products)** • **Areas where wood use has become more active recently**
Wood-related living nvironment[*]	• **Type of current residential form** • **Intent to use wood for building, remodeling, or interior designing** • **Important conditions when using domestic wood** • **Information on the possession of household items using wood in the living space** • **Level of wood use in major activity spaces apart from residential spaces** • **Presence or absence of wood experience facility in the vicinity**

[*] The items analyzed in this study were marked in bold type.
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2.3. Survey on expert and text mining on the trend of wood utilization

A survey of 18 people, including experts from associations and organizations related to wood and wood products, and university professors in the field of wood utilization, was conducted to analyze the difference in awareness between the general public and experts about the trend of wood utilization presented in Table 2. Text mining was also performed on search results for "wood" in Google, Naver, and Daum portal sites using Textom (IMC, Daejeon, Korea), a big data analysis and collection tool. From September 2017 to August 2020, these three main portal sites gathered 19,991 pieces of information (Table 3). UCINET, a web-based statistical analysis application (Analytic Technologies, Lexington, KY, USA), was used to analyze the gathered data.

Table 3. The number of data collected using Textom with "wood" as the keyword

Channel	Section	Number of data collected
Naver	Blog (https://section.blog.naver.com/)	3,000
	News (https://news.naver.com/)	2,586
	Cafe (https://section.cafe.naver.com/ca-fe/)	3,000
	Knowledge iN[1] (https://kin.naver.com/)	3,000
	Subtotal	11,586
Daum	Blog (https://blog.daum.net/)	2,578
	News (https://news.daum.net/)	2,199
	Cafe (https://top.cafe.daum.net/)	2,893
	Subtotal	7,670
Google	News (https://news.google.com/)	735
	Total	19,991

[1] Knowledge iN = 지식iN (in Korean).

3. RESULTS and DISCUSSION

3.1. Trend of wood utilization

3.1.1. Changes in the utilization rate of wood products and the reasons

The general public replied to the idea that wood utilization will rise in the future with a positive rate of 79.3% and a negative rate of 20.7%. Females (81.3%) had a higher positive rate than men (77.3%). According to the age of the respondents, the proportion of positives was 70.7% for those aged 29 and under, 74.3% for those in their 30s, 80.9% for those in their 40s, 84.3% for those in their 50s, and 84.1% for those aged 60 and over. Thus, the positive rate increased with age.

"Counterplan for environmental issues such as climate change" (34.5%) and "positive influence on the body and emotional aspects" (30.0%) were mainly suggested as reasons for thinking that wood utilization would increase [Fig. 1(a)]. In addition, various opinions regarding the reason for thinking that wood utilization would not increase were presented, such as utilization for multipurpose, and visual beauty were presented. On the other hand, "high price" (28.2%), "difficult to manage" (23.4%), "incompatible with smart modern society" (18.3%), and "environmental impact of cutting" (17.4%) and "hazardous chemical treatment" [11.6%; Fig. 1(b)]. In the figure, N denotes the number of respondents.

While some believed that wood utilization will rise as a means of addressing environmental issues such as cli-
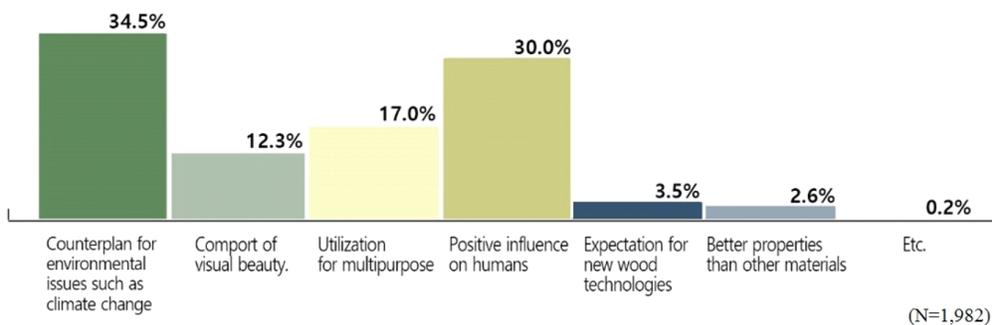
(a)
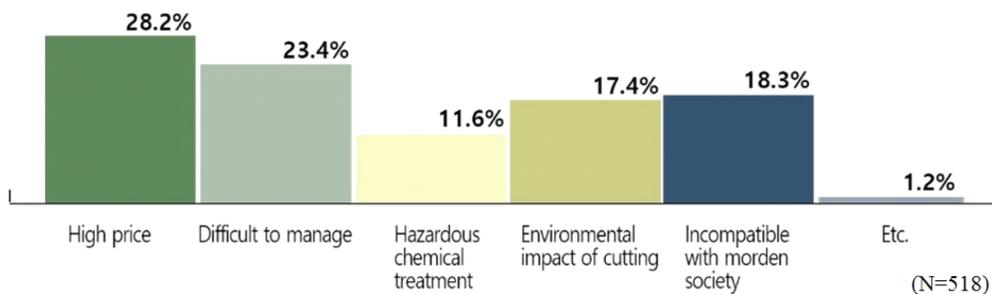
(b)

Fig. 1. The proportion of respondents answered why you expect the wood utilization would increase (a), and why you do not expect the wood utilization would increase (b).

mate change, others believed that wood utilization will not increase because logging for wood production causes environmental problems. These findings are consistent with the survey findings on the associated image of "wood" and the perception of "wood utilization" (Han and Lee, 2021a). Concerning negative reactions to wood, such as "logging" and "expensive," it is vital to shift public opinion via publicity that wood functions as a carbon storage and is a sustainable recycling resource (Lippke et al., 2011). Furthermore, for negative perceptions of wood utilization such as "old material," "difficulty in management," and "chemical treatment," publicity is required to improve negative perceptions by utilizing research results such as strengthening the effect of preservative treatment of wood products (Cahyono et al., 2020; Lee et al., 2020; Priadi et al., 2020) and toxicity analysis of chemicals such as preservatives and flame retardants used in wood.

As shown in Fig. 2, the fields in which wood utilization is currently most active were surveyed as, in descending order, (1) woodworking and do-it-yourself (DIY; 36.9%), (2) wooden furniture such as wooden dining table and chair (22.1%), (3) wooden architecture such as wooden house, wooden bridge, and traditional architecture (18.9%), (4) wooden household items such as kitchen utensils (9.1%), (5) wood interior decorations such as floor and wall boards (8.4%), and (6) wood fuel (biomass) such as wood pellets and wood chips (4.5%).

The general public expected that wood utilization would increase in wooden furniture, wooden architecture, and interior decorations, which are closely related to the living environment.

As a result of questioning 18 experts in the wood-related fields regarding the items of the public survey on the utilization of wood and wood products, all of them responded that wood utilization would increase in the future. The highest reasons for thinking that wood utilization would increase were found to be positive physical and emotional effects (44.4%) and awareness of environmental problems (22.2%). However, expectations for the development of new technologies related to wood showed the lowest response rate at 5.6%.

Experts in the wood-related fields believed that wood utilization is becoming more active in Wooden architecture (27.8%), wood experience and education (22.2%), hobby activities such as woodworking and DIY (16.7%), wooden household items (16.7%), and wooden furniture (5.6%). This result appears to reflect the current trend that as access to the contents of woodworking and DIY using social networking services has become easier, hobbies related to these activities are increasing, and the prospect that the consumption of household items and furniture using wood will increase due to the increased interest in healthy living spaces.

Although the general public and experts predicted that wood utilization would grow due to the physical and
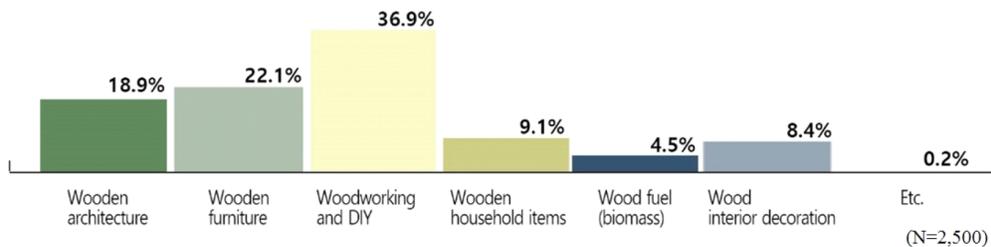

Fig. 2. The active fields of wood utilization.

emotional effects of wood as well as increased knowledge of environmental issues, expectations for the development of new wood-related technologies were low. Experts predicted that the general public's heightened interest in environmental issues such as climate change and health would lead to a rise in wood utilization in everyday life. Furthermore, they anticipated that government agencies would develop policies to increase the use of wood as a material that might adapt to climate change through the carbon storage property of wood, mirroring this trend. For example, if the Building Act is revised to allow for the building of high-rise wooden architecture, the development of new technologies and the employment of new construction techniques may bring variety and utility in the design of wooden architecture.

3.1.2. Text mining analysis for wood utilization

We gathered data on the outcomes of entering wood as a search term on major portal sites for three years, from September 2017 to August 2020, and assessed the searched words and frequency using text mining. As a result, 70 keywords were chosen based on their frequency in search results (Table 4).

Excluding wood, the search keyword, the search frequencies of tree, synthesis, products, deck, and cultural experience center ranked 2–6, confirming that interest in synthetic wood, wood products, deck, and wood culture experience center was high. The reason for the high frequency of synthesis appears to be because the advertisements of "Wood plastic composite" producers, which are called synthetic wood in the wood industry, were not filtered out in the process of text mining. The frequencies of the words experience and production ranked 12th and 13th, indicating that interest in experience through wood and the production of wood products through woodworking is gradually increasing. Key words for the wood industry included synthesis, products, deck, construction, interior, pellet, housing, architecture, and design.

Differences in search frequency by year of keywords related to wood culture such as wood culture experience center, experience, culture, woodworking, cultural experience, education, and workshop are presented in Fig. 3. The word frequencies of culture and education showed a tendency to gradually increase, but the frequencies of wood culture experience center, experience, woodworking, cultural experience, and workshop, which are mainly conducted face-to-face, showed a decreasing trend due to the COVID-19 pandemic that spread in 2020.

Similar groups were classified according to the correlations of keywords by applying the convergence of iteration correlation (CONCOR) analysis. The shape of the figure presented as a result of CONCOR was simplified as shown in Fig. 4 by removing the connecting lines because the connections according to the correlations were highly complex. Keywords derived as a result of entering wood as a search word through CONCOR analysis can be classified into five clusters: Wooden architecture, cultural education, woodworking, wood industry, and wood policy. The field that formed the largest cluster was wooden architecture, which could be divided into deck, construction, work, etc. related to the construction of country house on the one hand, and materials, installation, floor, etc. related to interior on the other. Because the clusters of cultural education and woodworking have many correlations and similarities, it was difficult to separate the two clusters. Various kinds of wooden furniture were included in both clusters at the same time. Various types of wood products such as plywood, paper, waste wood, and energy were presented for the cluster of the wood industry. Among them, energy formed a small cluster with pellets, pellet boilers, and fuel. Lastly, KFS, quality, domestic, import, illegal, and felling were included in the wood policy cluster. It appears that the legal timber distribution system was presented on the portal site along with the management and enforcement of the quality standards for wood products carried out by KFS.

Table 4. Keywords and frequency searched as "wood" on major portal sites

| Rank	Word	Frequency	Percent	Rank	Word	Frequency	Percent
1	Wood	52,595	12.7	36	House	848	0.21
2	Tree	4,874	1.18	37	Illegal	840	0.2
3	Synthesis	3,497	0.85	38	Eco-friendly	821	0.2
4	Products	3,419	0.83	39	Specialty	799	0.19
5	Deck	3,186	0.77	40	Waste wood	757	0.18
6	Cultural experience center	2,993	0.73	41	Stair	734	0.18
7	Korea Forest Service	2,913	0.71	42	Architecture	731	0.18
8	Use	2,805	0.68	43	Design	730	0.18
9	Construction	2,475	0.6	44	Osan	720	0.17
10	Processing	2,055	0.5	45	Daejeon	713	0.17
11	Industry	1,988	0.48	46	Local	699	0.17
12	Experience	1,948	0.47	47	Paper	694	0.17
13	Making	1,605	0.39	48	Treated wood	685	0.17
14	Sale	1,556	0.38	49	Cultural experience	678	0.16
15	Wood (in English)	1,503	0.36	50	Chair	635	0.15
16	Interior	1,490	0.36	51	Pellet boiler	623	0.15
17	Quality	1,456	0.35	52	Incheon	595	0.14
18	Install	1,410	0.34	53	Table	575	0.14
19	Culture	1,398	0.34	54	Floor	521	0.13
20	Income	1,369	0.33	55	Program	521	0.13
21	Manufacturer	1,342	0.33	56	Education	460	0.11
22	Signboard	1,331	0.32	57	Technic	419	0.1
23	Solid wood	1,289	0.31	58	Exhibition	404	0.1
24	Plywood	1,269	0.31	59	Building	393	0.1
25	Operating	1,249	0.30	60	Develop	375	0.09
26	Production	1,164	0.28	61	Timber house	361	0.09
27	Utilization	1,119	0.27	62	Working shop	360	0.09
28	Forest	1,096	0.27	63	Energy	357	0.09
29	Pellet	1,085	0.26	64	Fuel	353	0.09
30	Domestic	1,014	0.25	65	Apartment	346	0.08
31	Factory	1,010	0.24	66	Shelf	345	0.08
32	Work	892	0.22	67	Deforestation	327	0.08
33	Price	876	0.21	68	Country house	315	0.08
34	Wood working	871	0.21	69	Cafe	308	0.07
35	Materials	855	0.21	70	Establish	300	0.07
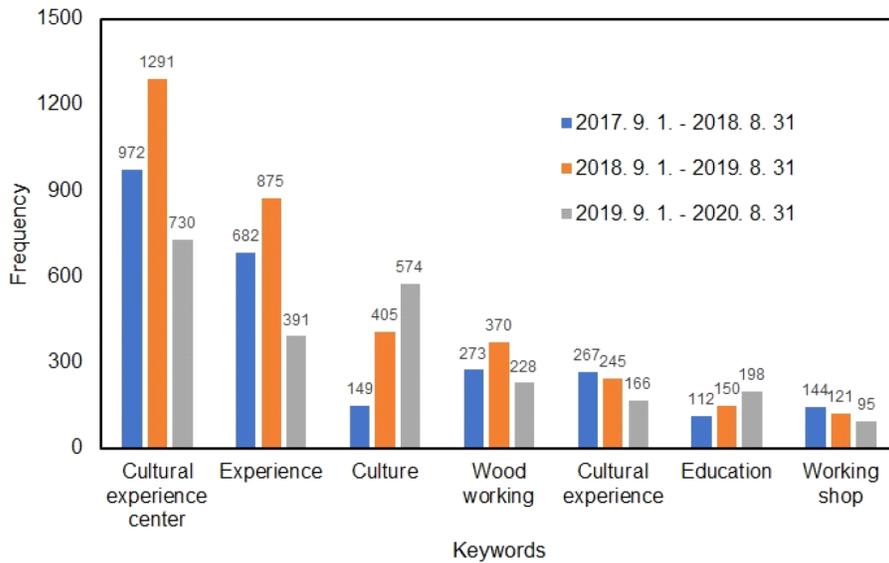
Fig. 3. Trend of search frequency of keywords related wood culture by year.
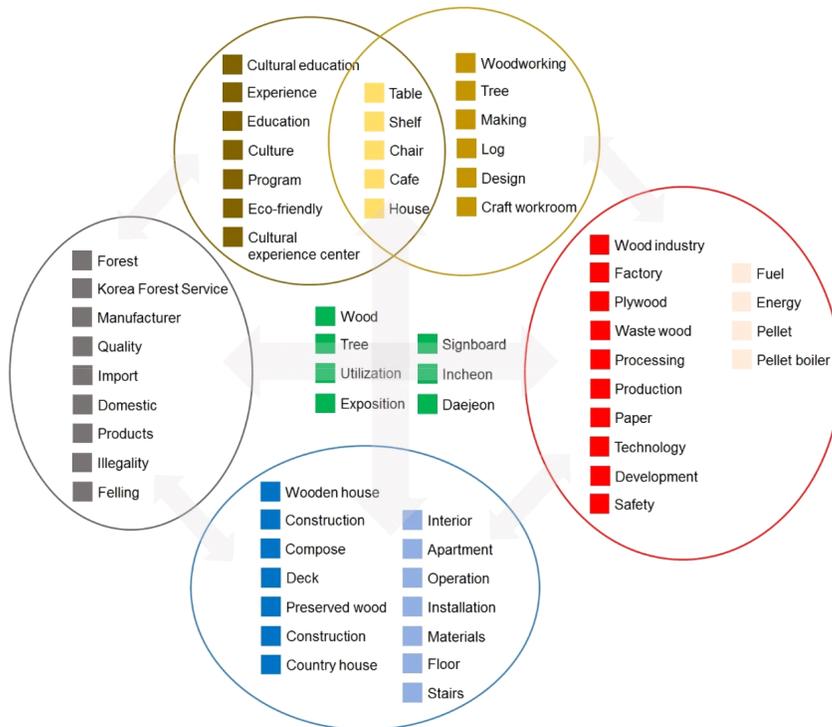

Fig. 4. CONCOR analysis of keywords related wood. CONCOR: convergence of iteration correlation.

3.2. Living environment related to wood

3.2.1. Perceptions about wood as building material

A survey about the general public' perception of wood as a building material was performed. First, when asked what material was most often used in Korean traditional buildings, 78.8% of respondents answered wood [Fig. 5(a)], followed by soil (10.8%), reinforced concrete (8.7%), and stone (1.7%). Furthermore, the replies to the question concerning the most familiar material among the housing materials were wood (66.4%), reinforced concrete (18.0%), soil (13.5%), and stone (2.1%) in descending order [(Fig. 5(b)]. This result implies that the general public is more familiar with wood as a traditional building material in Korea.

Among the types of houses in which respondents currently resided, apartment had the highest response rate at 68.0%, followed by villa/townhouse (11.0%), non-wood detached house (9.0%), multi-unit house (6.7%), and wooden detached house (4.6%; Fig. 6). As of 2020, the proportion of wooden (10,103 buildings) to residential and non-residential buildings (185,824 buildings) was 5.43%, and the proportion of wooden detached houses (7,924 buildings) to the total detached house (48,945 buildings) was 16.2%. In comparison to this, the occupancy rate of detached houses was relatively low among the respondents (Korean Statistical Information Service, 2022). When asked about the type of house the

(a)

(N=2,500)

(b)

(N=2,500)
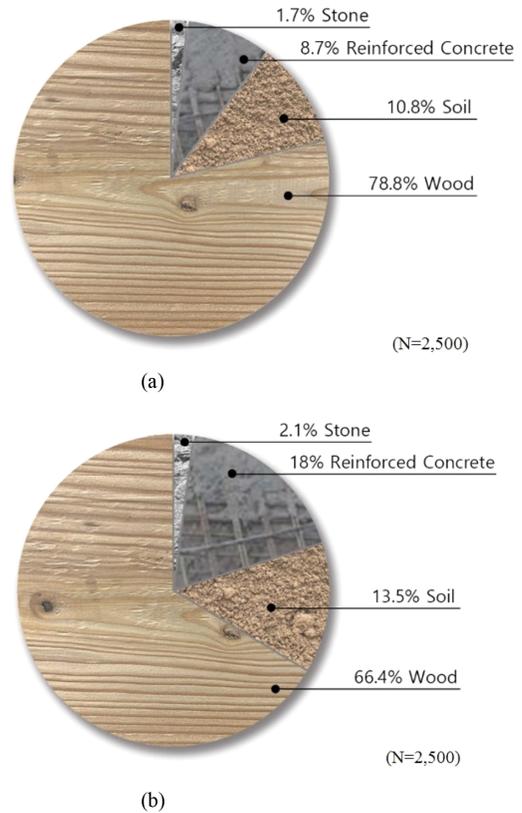
Fig. 5. Response ratio to traditional Korean building materials (a) and familiar building materials (b).

respondents would like to live in, "wooden and concrete mixed house" was the highest at 42.5%, followed by "wooden house" (31.3%) and "concrete and steel mixed
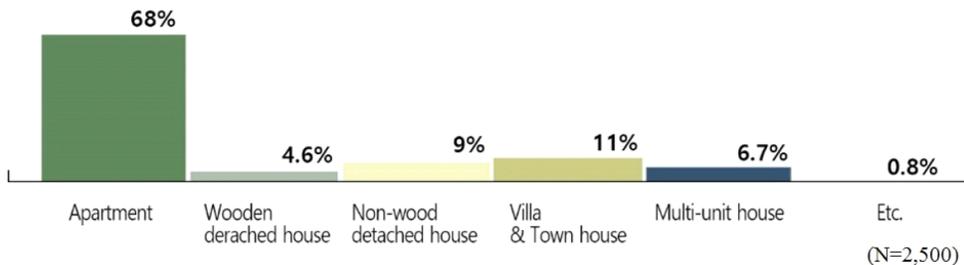

Fig. 6. The proportion of housing types currently inhabited by respondents.

house" (25.2%). The ratio of the general public who wanted to use wood as a building material for structures and interior/exterior was 73.8%, which was similar to the positive ratio of 79.3% for the opinion that wood utilization would increase in the future.

More specifically, to the question about the intention to use wood for house and interior construction, 51.1% of the respondents responded that they would use wood without considering the country of origin, and 35.5% wanted to use only domestic wood [Fig. 7(a)]. When using domestic wood, superior quality (70.6%) was considered as the most important condition, followed by low price (15.2%) and promotion of the domestic wood

industry [10.0%; Fig. 7(b)]. To respond to environmental problems such as climate crisis, it is advantageous to use domestically produced materials as building materials with the longest service life. Therefore, it is necessary to publicize the fact that using wood as a building material is good as a response to environmental problems. Moreover, it is necessary to publicize that building materials are produced according to the "standards for wood products and quality standards" defined by the Act on the Sustainable Use of Timbers (KFS, 2013; National Institute of Forest Science, 2015).

When asked about the degree of having wood products in their living space, 70.2% of the respondents answered

(a)

(b)
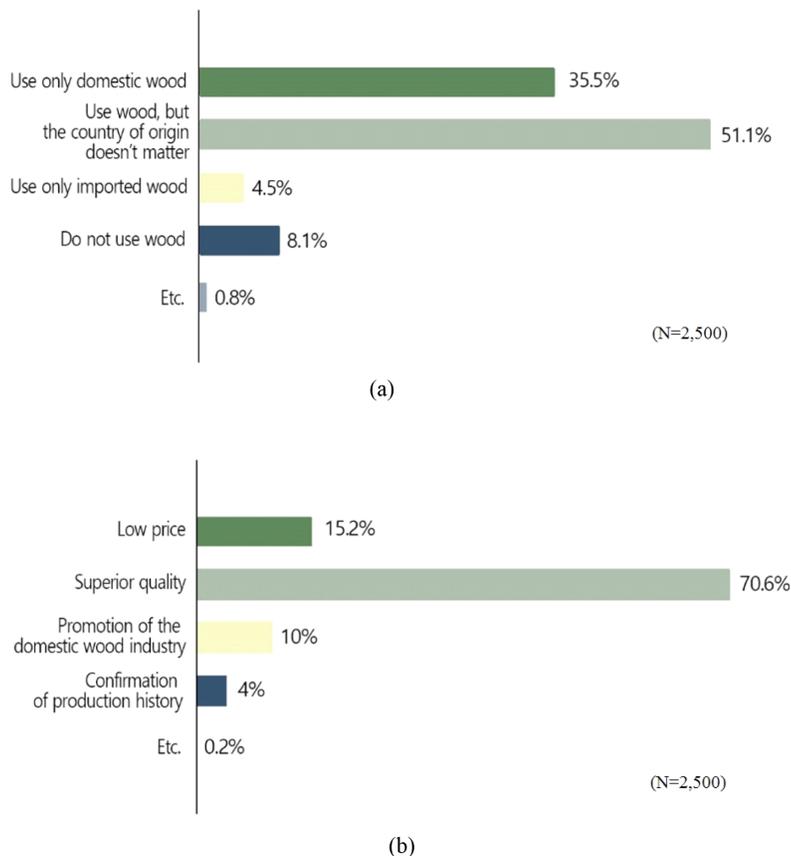
Fig. 7. Intention to use wood as a building material (a) and the most important provisos for the use of domestic wood (b).

that they had wood furniture and mainly possessed wood household items and wood ornaments (Fig. 8). When asked about the extent to which wood was used in major activity spaces excluding living spaces such as workplaces, schools, libraries, and cultural centers, 53.8% of the respondents answered that they did not use wood at all. Some respondents answered that structures such as floors, ceilings, columns, frames, and walls were composed of wood [Fig. 9(a)]. Wood products used in main activity spaces except living space were, in descending order, wooden furniture (58.4%), wood office equipment (39.8%), and wood auxiliary products for learning, exercise, and experience [26.1%; Fig. 9(b)]. The survey results showed that more than 70% of the respondents were using various items including wooden furniture, and that the wood utilization rate has been increasing recently in public facilities excluding living spaces.

3.2.2. Perception about the environment friendliness of wood utilization

Among the questions about the health of residents of wooden houses, the positive rate was 65.0%, the negative rate was 8.4%, and the rate of respondents who answered "do not know" was 26.6% to the statement "the average life expectancy of people living in wooden houses is longer and the incidence of cancer is lower than those living in concrete houses". Furthermore, to the statement "research found that forest bathing effect

can be obtained when the interior of the room is made of wood", the positive rate was 70.0%, the negative rate was 9.8%, and the 'do not know' rate was 20.2%.

Numerous domestic and international studies on the antioxidant efficacy of plant-extracted essential oils have been conducted (Lee *et al.*, 2021). In particular, it has been reported that essential oils extracted from the leaves, xylems, and flowers of major domestic conifers such as Korean red pine, Japanese larch, Japanese cypress, and Korean pine have anti-inflammatory effects (Yang *et al.*, 2019), antibacterial effects (Ham *et al.*, 2020), and effects against skin diseases and lung diseases (Ahn *et al.*, 2018, 2021). Furthermore, physiological indices such as pulse rate, blood pressure, autonomic nerve activity, and brain activity were evaluated when seeing, touching, or smelling wood to analyze the characteristics of wood that have beneficial effects on humans (Ikei *et al.*, 2017). In studies on the effect of wood used in the interior of buildings, the autonomic stress response was reduced when wood was used (Burnard and Kutnar, 2015), and it was beneficial to the autonomic nervous system and respiratory system (Zhang *et al.*, 2017). As a result of conducting a survey after living in an indoor space where wood was installed, the higher the amount of wood used, the higher the score for subjective comfort was (Tsunetsugu *et al.*, 2007), and the decrease in insomnia improved the quality of sleep and induced comfort (Morita *et al.*, 2020). Various research on the human body and
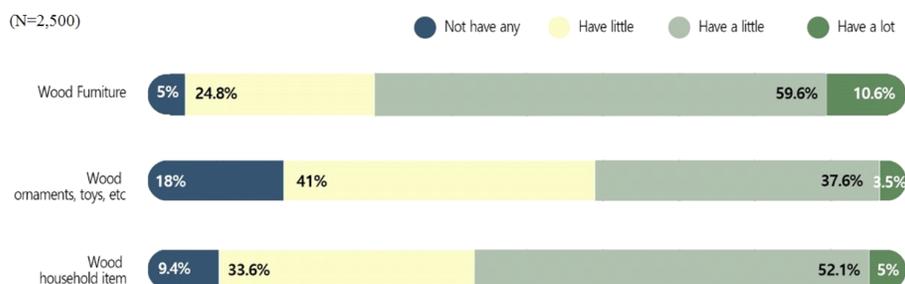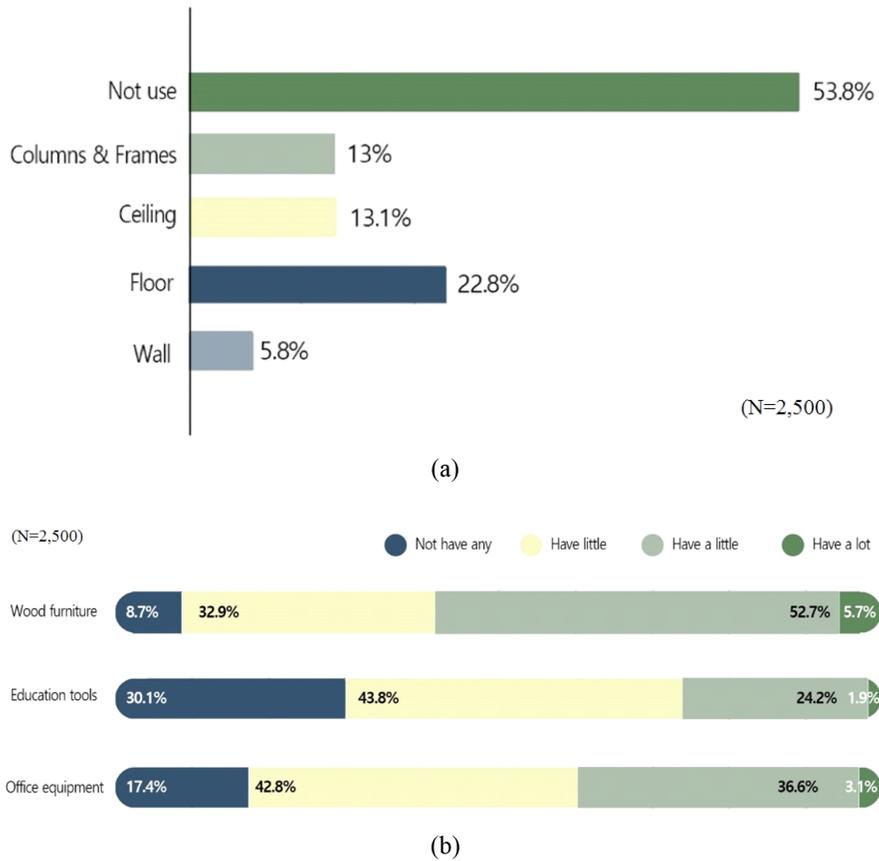

Fig. 8. Proportion of wood products used in living spaces.

(a)

(b)

Fig. 9. Proportion of location of wood use (a) and type of wood products mainly use (b) outside the living space.

environmental friendliness according to the use of wood like these has been recently conducted at home and abroad. Quantitative research results on human body and environmental friendliness can be a priority publicity method to improve the public's awareness of wood. For this purpose, research for quantitative evaluation of human body and environmental friendliness according to changes in the residential environment when domestic wood is used as interior and exterior materials of buildings including quantitative evaluation of the human compatibility of specific components produced from domestic wood need to be actively carried out.

4. CONCLUSIONS

In this study, a survey was conducted on the trend of wood utilization and living environment of the general public with the aim of preparing a plan for increasing wood utilization and establishing wood culture. In addition, text mining was performed on the results of searching for "wood" on major domestic portal sites to derive the results of the general public' interest in wood utilization. Through this, the following conclusions could be obtained.

(1) 79% of general respondents and all expert res-

pondents agreed that wood utilization would expand to address climatic and environmental issues, as well as to obtain favorable health and emotional effects. However, some respondents predicted a drop in wood utilization owing to the high cost, difficulty of management, and deforestation caused by logging. Wooden furniture, wooden architecture, and interior/exterior materials, all of which are directly tied to everyday life, are examples of fields where wood utilization has recently been active.

(2) Excluding wood, the frequencies of wood, synthesis, goods, deck, and cultural experience center were high in rankings when the term "wood" was searched for on large domestic portal sites. The keywords could be grouped into five clusters using the CONCOR methodology of dividing them into comparable groups based on their correlations: Wooden architecture, cultural education, woodworking, wood industry, and wood policy.

(3) Wood was seen as a more traditional construction material with a friendlier image than reinforced concrete and stone. The intent to utilize wood for building and interior design was as high as 86.6%, and superior quality was emphasized in particular.

(4) When asked about the average lifespan and the prevalence of cancer diseases among wooden house residents, 65% of the respondents answered that wood had a positive effect on health. Quantitative analysis of friendliness to human body and environment is required to raise awareness of the eco-friendliness of wood utilization.

CONFLICT of INTEREST

No potential conflict of interest relevant to this article was reported.

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