

Visiting Peri-Urban Forests and Mountains During the COVID-19 Pandemic: Empirical Analysis of Environmental Factor and Awareness of Visitors via Large-Scale Online Survey

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Abstract

This research analyzed the status of visiting peri-urban forestlands and mountains during the first emergency period in Japan via large-scale online questionnaire survey. We examined in explorative manner correlating factors with visits; i.e. social-economic attributes as well as environmental factors of residents (such as land use patterns of residential areas), and their awareness on forestlands. Results implied that environmental factors could provide a basis to encourage the residents to visit peri-urban forestlands and mountains during the pandemic. Peri-urban areas with forestlands have such environmental factors, and the residents who visited peri-urban forestlands and mountains tended to live in peri-urban areas. As for the awareness of the visitors, the expectations for forest functions were identified as another influential factor to facilitate them to visit those places. The residents who visited the area (forests and mountains) had relatively high expectations for mental and educational functions of forest. The environmental factor might be able to encourage to have such expectations. In future research, the relationships between the environmental factors and expectations or awareness of residents for peri-urban forest need to be explored.

1. Introduction

During the COVID-19 pandemic, access and use of green areas are largely affected by lockdown and other measures and policies (Derks et al. 2020; Honey-Rosés et al. 2020; Venter et al. 2020). The unequal access is discussed as one of the emerging injustices particularly in urban contexts. Influence of the pandemic on physical and mental aspects are discussed extensively in the existing studies (Freeman & Eykelbosh 2020; Xie et al. 2020), considering the values of green areas. Preliminary studies identified the changes of numbers of visitors in green areas. Certain studies further analyzed personal attributes of the visitors in addition to the overall numbers (Uchiyama & Kohsaka 2020). Still, the target green areas are limited to parks, gardens, and agricultural lands. It is necessary to identify the status of visiting other types of green areas such as peri-urban forestlands which can provide spaces for relaxation, education, and other activities for visitors from urban and peri-urban areas. Furthermore, peri-urban forestland is one of the essential components in biodiversity and ecosystem managements (Uchiyama et al. 2015; Uchiyama & Kohsaka 2019; Verdú-Vázquez et al. 2021).

Considering such limitations of existing studies, the purpose of this research is to identify the status of visiting peri-urban forestlands and mountains during the emergency period in Japan and to detect factors which correlate with visiting there. In this paper, socio economic attributes and environmental factors of residents, and their awareness on forestlands were focused because such factors might have correlation with visiting such areas.

2. Materials And Methods

An online questionnaire survey was conducted to identify the status of visiting peri-urban forestlands and mountains. The survey period was from 31 July to 1 August 2020. Although there are discussions of

merit and demerit of online survey (Pforr & Dannwolf 2017), online survey is useful method especially during the pandemic (Islam et al. 2020). The questionnaire was distributed to respondents in Aichi prefecture, Japan two months after the first emergency period (16 April–14 May 2020) of COVID-19 in Japan. During this period, the Japanese national government discouraged the residents from going out of their houses and especially visiting areas over prefectural borders. There were no penalties for the residents, even if they did not follow the statement of the government, but there were large impacts on the behavior of residents, particularly as Japanese society has relatively high peer-pressure for social norms and unified behavior. For example, it was reported that 37% of residents in Aichi did not visit green areas during the emergency period in previous studies for urban greens (Uchiyama & Kohsaka 2020). The residents were discouraged from visiting even hiking places but some of them were visiting there (Fig. 1).

The research site, Aichi Prefecture the third largest metropolitan areas with relatively good access to mountain and forestlands in Japan. The capital city is Nagoya City and the population size of its metropolitan area is the third largest in the Japanese metropolitan areas. The total number of respondents was 1244. The ratios of female and male were 47.6% and 52.4% respectively. The ratio of over 60 years old respondents was 36.6%, and other five-year age groups had similar ratios (from 7 to 11%), except the youngest age group of 20–24 years (2.9%).

The following information was asked in the questionnaire to identify the status of visiting peri-urban forestlands and mountains at least once in the emergency period. In the previous research, we analyzed answers of questions to ask about status of visiting green areas which were relatively frequently visited by citizens in the period (Uchiyama & Kohsaka 2020). In that research, sample size of respondents who visited mountains was too small to analyze, only 22 respondents visited mountains as main green area where they visited relatively frequently.

- Socioeconomic attributes: Gender, age, annual household income, number of children in the household;
- Environmental factors: Zip-code district (the sizes of the areas and the ratios of land use categories in individual zip-code districts were computed and used in the analysis)
- Status of visiting peri-urban forestlands and mountains: Whether respondents visited mountains and forestlands during the emergency period (Answer: Yes/No);
- Awareness on the functions of forestlands (Respondents were asked about their awareness which they had before and after the emergency period).

As for the ratios of land use categories in zip-code districts, Japan Aerospace Exploration Agency (JAXA) High-Resolution Land Use Data (2014–2016) (https://www.eorc.jaxa.jp/ALOS/en/lulc/lulc_index.htm) were used to compute the ratios. Based on the ratios of the land use categories and area sizes of the zip-code districts, the environmental factors of respondents were analyzed. The resolution of the land use data was a 30 m square grid, and 10 land use categories were included in the data. Such high-resolution data were necessary to analyze the environmental factors of zip-code districts with relatively smaller area

sizes, which are located in urban areas. To analyze the overall environmental factors of the individual zip-code districts, the ratios of urban areas, agricultural lands, and forestlands were computed.

Regarding the awareness on forestlands, the respondents who visited peri-urban forestlands and mountains might have certain awareness. To analyze the characteristics of their awareness, we compared their awareness with that of ones who did not visit.

3. Results

As a result of the survey, it reveals that 212 (21%) respondents visited peri-urban forestlands and mountains during the emergency period. The reasons of visiting those places are shown in Fig. 2. More than 40% of respondents who visited peri-urban forestlands and mountains visited there to feel relaxed. Feeling and touching nature was the second main reason and 20 to 25% of them answered the reasons including “to see beautiful landscape”, “to leave from daily routine”, and “to visit safe place”. The reasons directly related to physical activities such as doing supports and recreations were not main reasons. This overall trend of the reasons for visiting mountains shows that the residents were visiting mountains with the reasons related to their mental health. In the main reasons, 24% of the respondents who visited mountains chose “to visit safe place” as a reason for visiting there. This result suggests that peri-urban forestlands and mountains were considered as a safe place during the COVID-19 pandemic in a certain degree.

As for the socioeconomic attributes of the respondents, there was no obvious difference between them except for gender. Figure 3 shows the ratios of male and female respondents who visited / did not visit peri-urban forestlands and mountains. The ratio of the male respondents who visited those places is relatively high compared with the female respondents. It might reflect that relatively older male respondents who might be used to or interested in visiting mountains tended to visit peri-urban forestlands and mountains. The age group, over 60 years old, has the highest ratios of respondents in both categories of respondents who visited / did not visit, and it can be assumed that the older male respondents tended to visit those areas.

Regarding household income of residents, an existing study (Uchiyama & Kohsaka 2020) shows that residents with higher household income tended to visit green areas during the pandemic. However, Fig. 4 indicates that the difference of household income between the respondent groups who visited / did not visit peri-urban forestlands and mountains is unclear. Although relatively small differences of the ratios of respondents in individual household-income groups can be seen between the two respondent groups (Fig. 4), the differences are not clear compared with the result provided by the existing study.

Furthermore, the environmental factors of residential places of respondents were examined. It reveals that the average ratio of forestland and area size of the zip-code district have statistically significant differences between the respondent groups who visited / did not visit peri-urban forestlands and mountains (Tables 1 and 2). As for the ratio of forestland, the average ratio of forestlands in the zip-code districts of respondents who visited those places is higher than that of ones who did not visit (t-test, $p <$

0.01) (Table 1). This result suggests that the respondents who visited such areas can relatively easily access to forestlands in their residential areas and they might be more familiar with forest environment in their daily life. Moreover, it could be assumed that their residential places are not highly urbanized and not fully covered by built-up areas. The environment which can allow the residents to easily access to forestlands might be a part of contexts which encourage the residents to visit peri-urban forestlands and mountains.

Table 1
Ratios of forestlands in the zip-code districts of respondents who visited / did not visit mountains in the emergency period

Ratio of forestland	Visited	Did not visit
Average (%)	8.10	4.33
Variance	332.54	158.00
Number of respondents	212	1031
Degree of freedom	254	
t value	2.87	
p value	0.004426	

Table 2
Area sizes of the zip-code districts of respondents who visited / did not visit mountains in the emergency period

Area sizes of the zip-code districts	Visited	Did not visit
Average (ha)	213.08	147.03
Variance	197,761.2	65,189.4
Number of respondents	212	1031
Degree of freedom	240	
t value	2.09	
p value	0.037421	

Regarding the area size of zip-code district, the average area size of the zip-code districts of respondents who visited those places is larger than that of ones who did not visit (t-test, $p < 0.05$) (Table 2). Because generally the zip-code areas sizes are larger in peri-urban areas compared with those in urban areas, it

can be assumed that the respondents who visited peri-urban forestlands and mountains are living in peri-urban areas in the research site. In peri-urban areas, the residents can have relatively large lands for their houses and gardens. In addition to the access to forestlands, access to nature such as plants in the gardens might be a factor which can familiarize the residents to visit natural lands such as mountains.

To identify the distribution pattern of residential areas of respondents who visited peri-urban forestlands and mountains during the emergency period, the distribution of the zip-code districts of the respondents is visualized in Fig. 5. In the figure, those of ones who did not visit are also shown and overlaid on the map. As we mentioned in the explanation of the analysis result of area size of zip-code district, the smaller zip-code districts are located in urbanized areas. The central area of Nagoya City which is the capital city of the research site, Aichi Prefecture, is indicated in Fig. 5 with red circle, and the sizes of zip-code areas are relatively small compared with those of the surrounding areas. As it is shown in the map, the green colored areas which are the zip-code districts of respondents who visited peri-urban forestlands and mountains are mainly located outside of the red circle and the sizes of them are relatively large. The result can support the assumptions which we provided based on the analysis of forestland ratios and sizes of zip-code areas, showing that residential areas of respondents who visited peri-urban forestlands and mountains are in peri-urban areas and not concentrated in urbanized areas.

The analysis results of environmental factors suggested that the residents do not have rich experience of visiting forestlands and mountains might not have such places as their destinations to visit during the pandemic.

Regarding the awareness of the residents on forest functions, we asked about their awareness which they had before and after the emergency period. Specifically, the expectations of residents on forest functions were survey using questionnaire. As results, the ratios of respondents who expected certain functions differ between those of the respondents who visited / did not visit peri-urban forestlands and mountains. As an overall trend, the difference between the expectations which the respondents had before and after the emergency period is trivial. The different degrees of expectations between the two groups of the respondents can be seen regarding the functions such as “providing a relaxing space”, “providing an educational space”, and “purification of air and reduction of noise”. Before and after the emergency period, the ratios of respondents who visited mountains and expected such functions are higher than those of respondents who did not visit. After the period, the differences became larger for the functions such as “providing a relaxing space” and “providing an educational space” as show in Fig. 6.

The results here suggest that the respondents who visited peri-urban forestlands and mountains were highly expecting those mental and educational functions for forestlands. having such relatively high expectations for forest might be encouraging the residents to visit those areas during the emergency period.

4. Discussion And Conclusion

What is implied from our result is that the residents do not have rich experience of visiting natural lands or environment might not have options to visit forestlands and mountains in their minds if they are not exposed to such experiences in daily manner. Therefore, having such experience and environment are essential to encourage residents to have enough options to visit to maintain good mental and physical health in the pandemic period. Policies and actions to provide and share the experience are required for governments and local communities.

This study indicated that environmental factors serve as a basis for the residents to visit peri-urban forestlands and mountains during the pandemic. Specifically, peri-urban areas with forestlands have such environmental factors, and the respondents who visited peri-urban forestlands and mountains tended to live in peri-urban areas.

Furthermore, the expectations for forest functions were identified as influential factor to facilitate the residents to visit those places as well. The respondents who visited there had relatively high expectations for mental and educational functions of forest. The environmental factor might be able to encourage to have such expectations. In future research, the relationships between the environmental factors and expectations or awareness of residents for forest need to be explored, considering the values and meanings of forest from the international perspectives (Kohsaka & Flitner 2004; Kohsaka & Handoh 2006; Kovács et al. 2020)

The extinction of experience is a keyword to discuss essential roles of having experience in nature to encourage residents to understand meaning of biodiversity and ecosystem conservation. Although there are ongoing discussions about the keyword (Oh et al. 2020; Soga et al. 2018; Miller 2005), such experience is endangered especially in urban areas and developed countries. The numbers are limited but there are also existing empirical analysis with large-scale questionnaire based on official municipality data to the residents (cf. Imai et al. 2018 and 2019 for Sendai City), which implies decline in the interests and recognitions of younger generations. Through these experiences with nature during intense physical mobility limitations and mental pressures, it can encourage conservation efforts and appreciate and acknowledge the role of natures in emergency periods. In the pandemic period, options to address to the issues of mental and physical health is relatively limited, particularly for the vulnerable groups. Encouraging such groups as target groups to facilitate visiting peri-urban forestlands and mountains can be an option to address the social injustice, particularly for the younger generations. These discussions and future analysis of data can contribute to the debate related to extinction of experiences with long term analysis is enabled (with or without the continued limitations of mobility in future).

Declarations

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Conflicts of interest

The authors declare no conflict of interest.

Availability of data and material (data transparency)

Data can be shared based on a data sharing policy

Code availability (software application or custom code)

N/A

Authors' contributions

Conceptualization, Y.U. and R.K.; methodology, Y.U.; formal analysis, Y.U., investigation, Y.U. and R.K.; writing-original draft preparation, Y.U.; writing-review and editing, Y.U. and R.K.; project administration, R.K.; funding acquisition, R.K.

References

1. Derks J, Giessen L, Winkel G. 2020. COVID-19-induced visitor boom reveals the importance of forests as critical infrastructure. *Forest Policy and Economics*, 118: 102253.
2. Freeman S, Eykelbosh A. 2020. COVID-19 and outdoor safety: Considerations for use of outdoor recreational spaces. National Collaborating Centre for Environmental Health.
3. Honey-Rosés J. et al. 2020. The impact of COVID-19 on public space: an early review of the emerging questions—design, perceptions and inequities. *Cities & Health*, 1-17.
4. Imai H, Nakashizuka T, Kohsaka R. 2018. An analysis of 15 years of trends in children's connection with nature and its relationship with residential environment. *Ecosystem Health and Sustainability*, 4(8): 177-187.
5. Imai H, Nakashizuka T, Kohsaka R. 2019. A Multi-Year Investigation of the Factors Underlying Decreasing Interactions of Children and Adults with Natural Environments in Japan. *Human Ecology*, 47(5): 717-731.
6. Islam MS, Ferdous MZ, Potenza MN. 2020. Panic and generalized anxiety during the COVID-19 pandemic among Bangladeshi people: An online pilot survey early in the outbreak. *Journal of affective disorders*, 276: 30-37.
7. Kohsaka R, Flitner M. 2004. Exploring forest aesthetics using forestry photo contests: case studies examining Japanese and German public preferences. *Forest Policy and Economics*, 6(3-4): 289-299.
8. Kohsaka R, Handoh IC. 2006. Perceptions of "close-to-nature forestry" by German and Japanese groups: inquiry using visual materials of "cut" and "dead" wood. *Journal of Forest Research*, 11(1): 11-19.

9. Kovács B, Uchiyama Y, Miyake Y, Penker M, Kohsaka R. 2020. An explorative analysis of landscape value perceptions of naturally dead and cut wood: a case study of visitors to Kaisho Forest, Aichi, Japan. *Journal of Forest Research*, 1-8.
10. Miller JR. 2005. Biodiversity conservation and the extinction of experience. *Trends in ecology & evolution*, 20(8): 430-434.
11. Oh RRY, Fielding KS, Carrasco RL, Fuller RA. 2020. No evidence of an extinction of experience or emotional disconnect from nature in urban Singapore. *People and Nature*.
12. Pforr K, Dannwolf T. 2017. What do we lose with online-only surveys? Estimating the bias in selected political variables due to online mode restriction. *Statistics, Politics and Policy*, 8(1): 105-120.
13. Soga M, Yamanoi T, Tsuchiya K, Koyanagi TF, Kanai T. 2018. What are the drivers of and barriers to children's direct experiences of nature?. *Landscape and Urban Planning*, 180: 114-120.
14. Uchiyama Y, Kohsaka R. 2019. Application of the City Biodiversity Index to populated cities in Japan: Influence of the social and ecological characteristics on indicator-based management. *Ecological Indicators*, 106: 105420.
15. Uchiyama Y, Kohsaka R. 2020. Access and Use of Green Areas during the COVID-19 Pandemic: Green Infrastructure Management in the "New Normal". *Sustainability*, 12(23): 9842.
16. Uchiyama Y, Hayashi K, Kohsaka R. 2015. Typology of cities based on city biodiversity index: exploring biodiversity potentials and possible collaborations among Japanese cities. *Sustainability*, 7(10): 14371-14384.
17. Venter Z, Barton D, Gundersen V, Figari H, Nowell M. 2020. Urban nature in a time of crisis: recreational use of green space increases during the COVID-19 outbreak in Oslo, Norway. *Environmental Research Letters*.
18. Verdú-Vázquez, A., Fernández-Pablos, E., Lozano-Diez, R. V., & López-Zaldívar, Ó. (2021). Green space networks as natural infrastructures in PERI-URBAN areas. *Urban Ecosystems*, 24(1), 187-204.
19. Xie J, Luo S, Furuya K, Sun D. 2020. Urban Parks as Green Buffers During the COVID-19 Pandemic. *Sustainability*, 12(17): 6751.

Figures



Figure 1

Signage of discouraging people from visiting the hiking place and visitors of the place in Aichi Prefecture

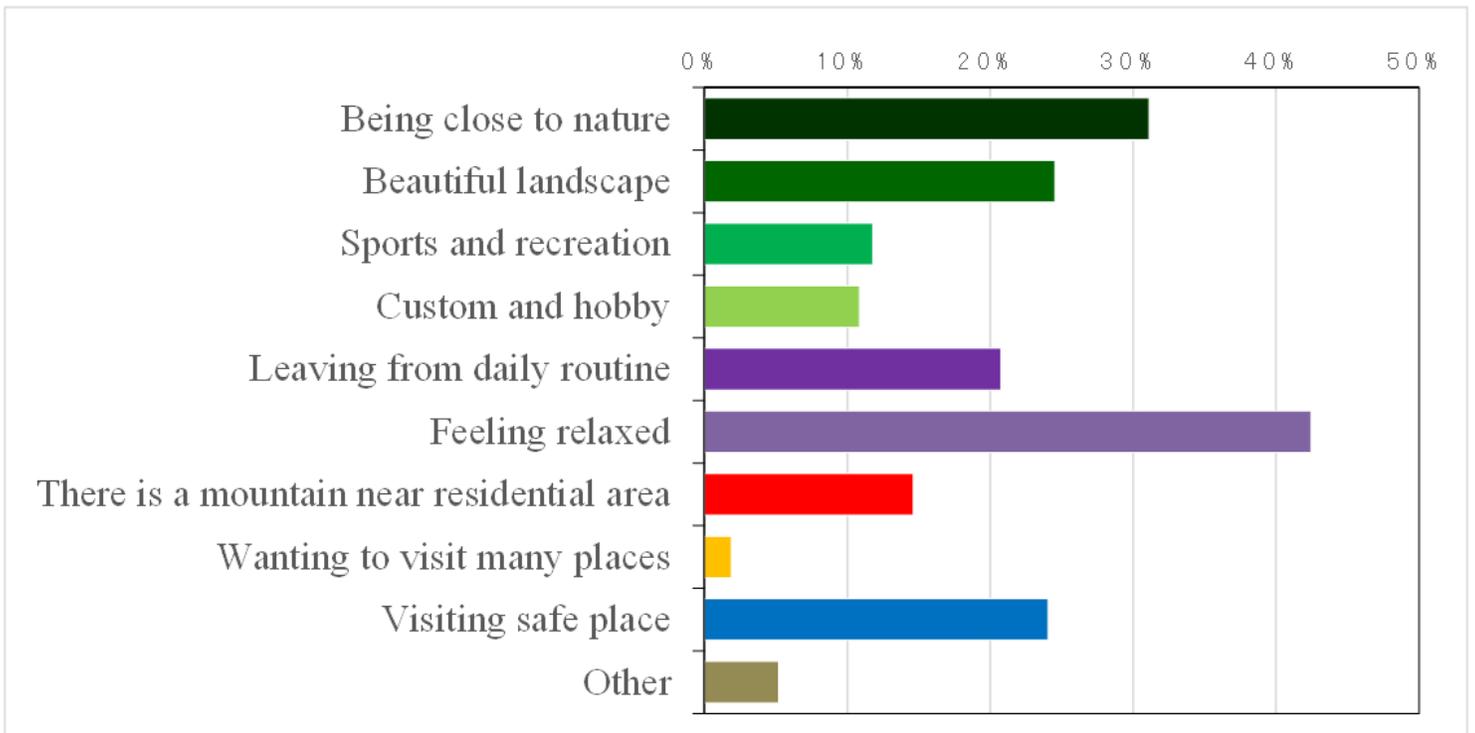


Figure 2

Reasons of visiting peri-urban forestlands and mountains

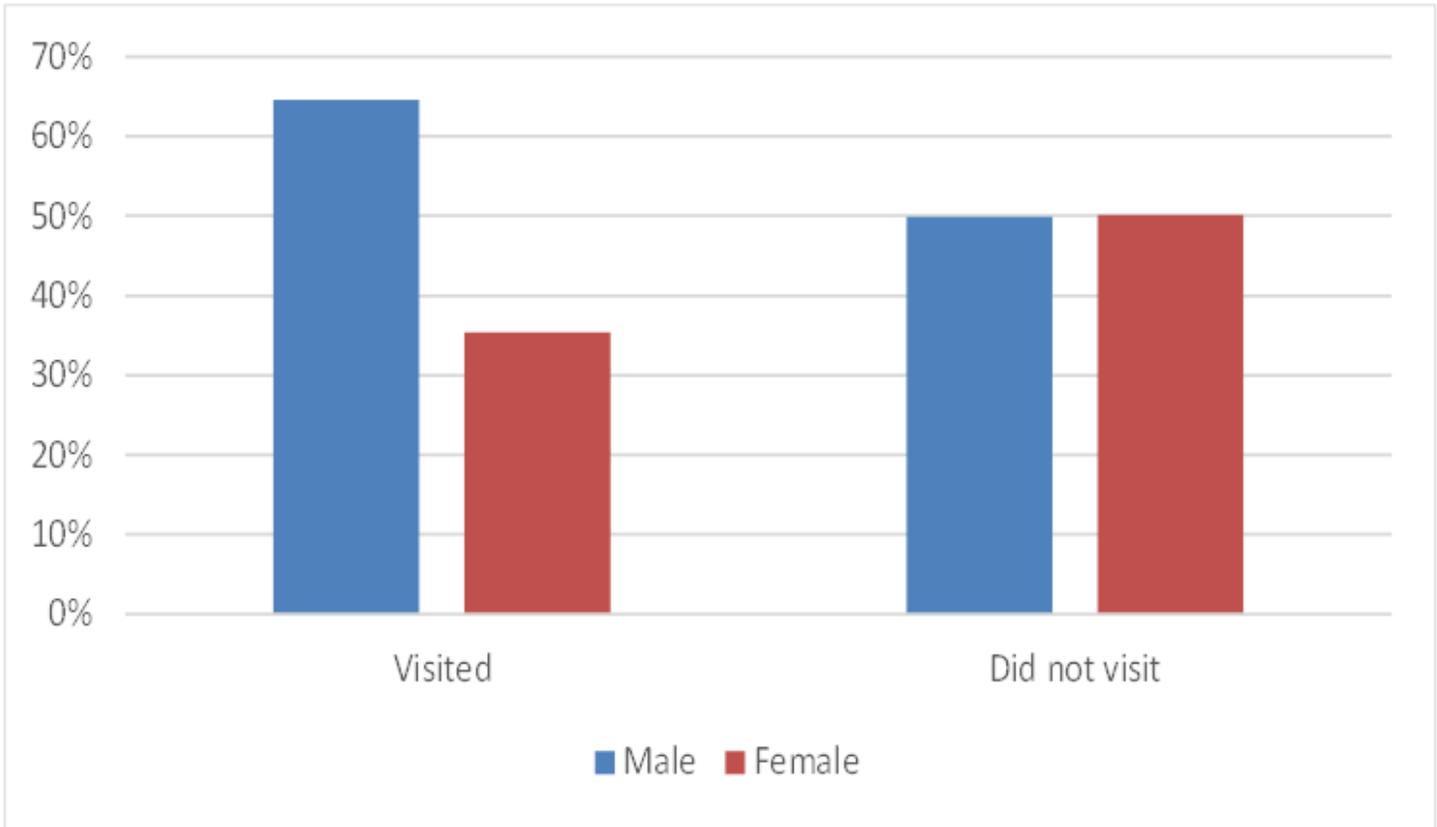


Figure 3

Ratios of respondents who visited and did not visit peri-urban forestlands and mountains by different gender groups

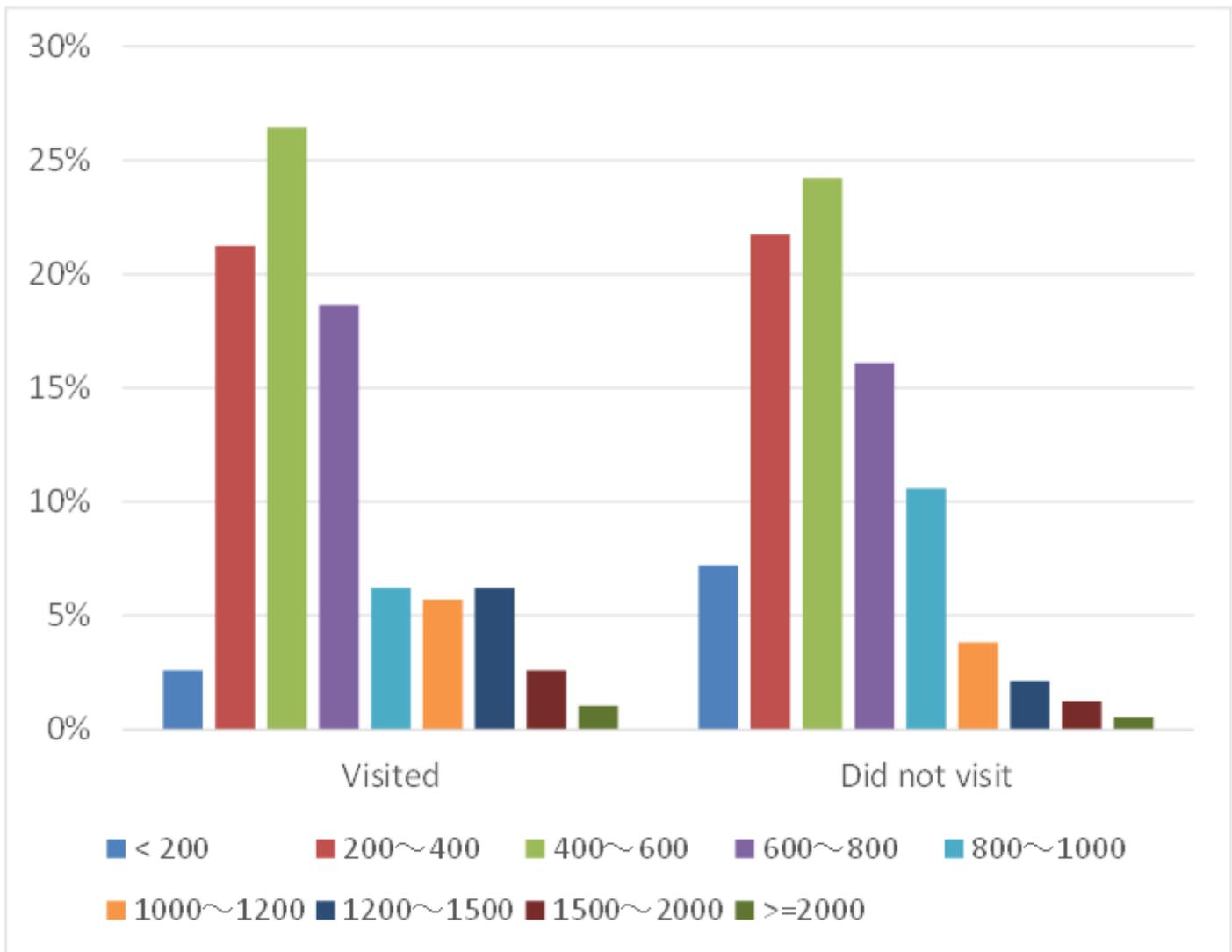


Figure 4

Ratios of respondents who visited and did not visit peri-urban forestlands and mountains by different household-income groups (Unit: million JPY)

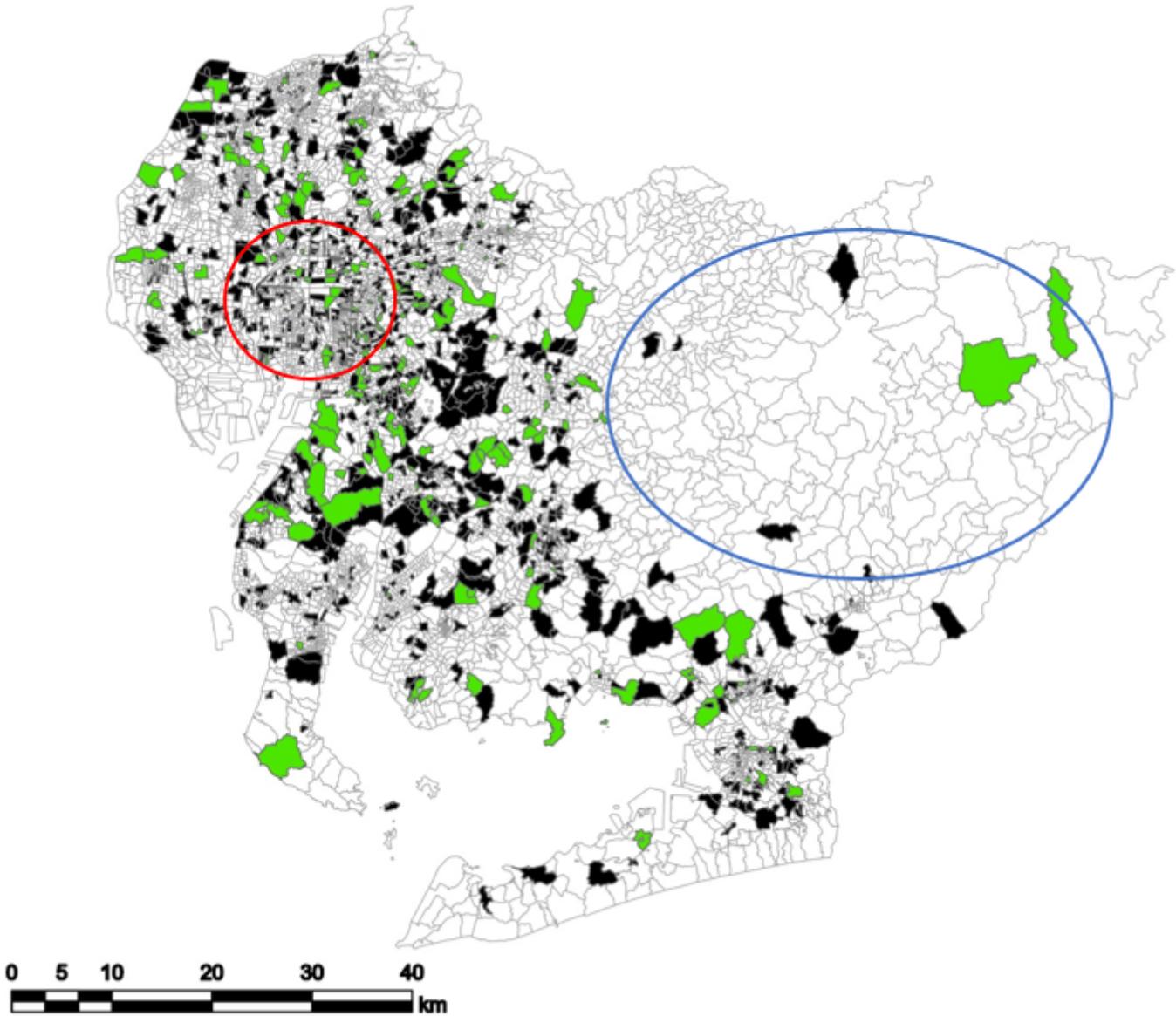


Figure 5

Distribution of zip-code districts of respondents who visited (green) / did not visit (black) mountains in the emergency period in Aichi Prefecture. Note: Red circle shows the location of central urbanized area of the capital city (Nagoya City) of the prefecture and blue circle indicates the location of mountainous area with less population.

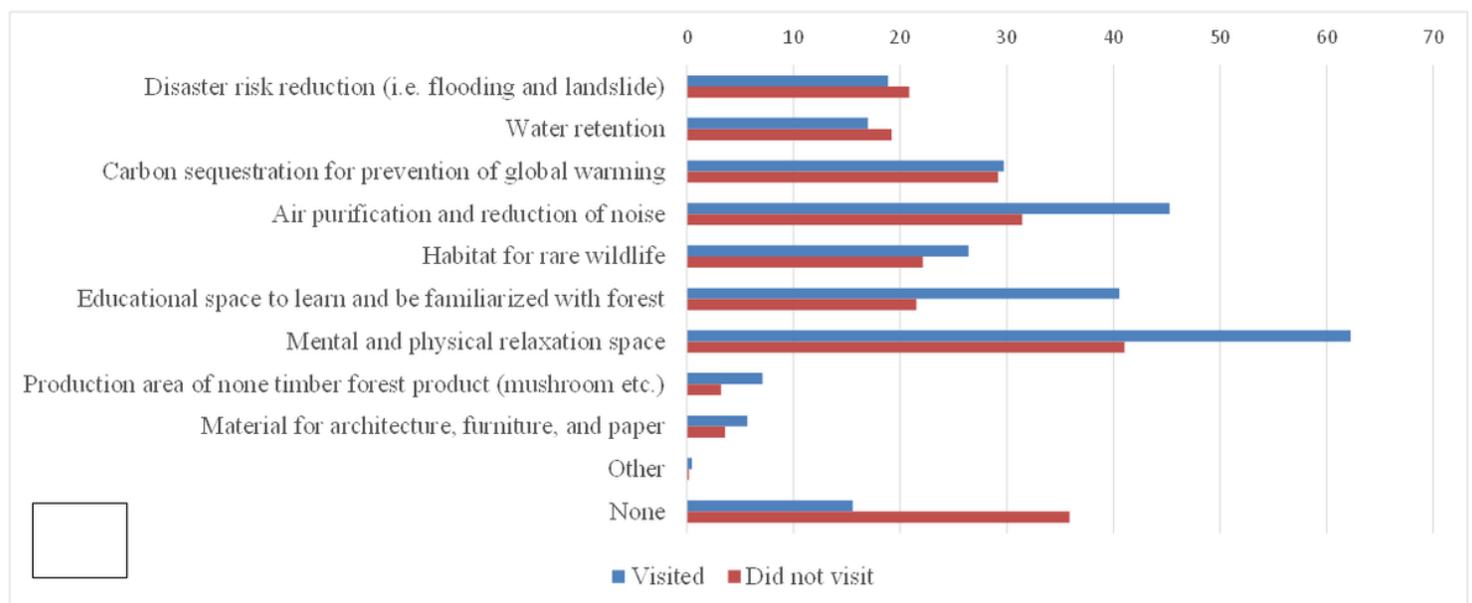
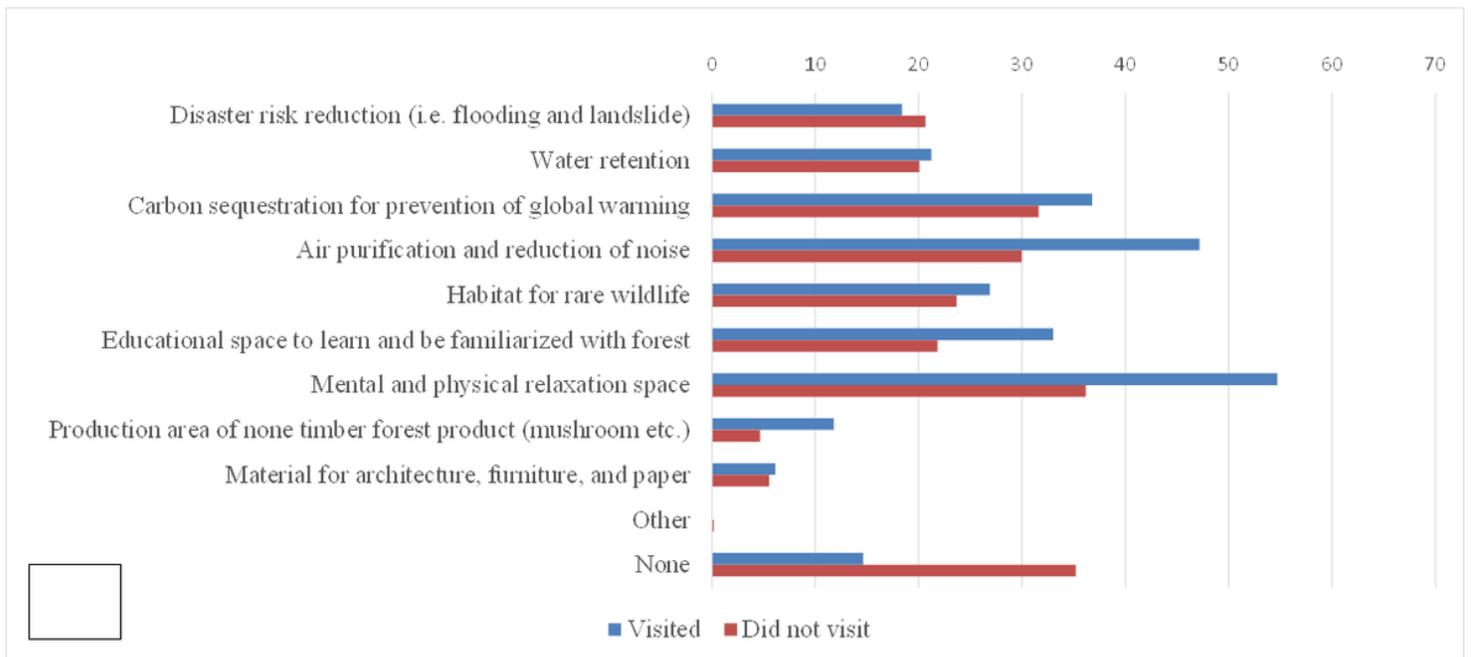


Figure 6

Awareness on the functions of forestlands (Respondents were asked about their awareness which they had (a) before and (b) after the emergency period)