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To cite this article: C Liu and K Furuya 2018 *IOP Conf. Ser.: Earth Environ. Sci.* **179** 012014

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Attitudinal differences toward riversides based on the distance between local resident and users with the Arakawa River, Japan

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Abstract. The role of rivers includes flood control and irrigation, as well as offering a place for people to interact with nature in daily life, especially for physical exercises and sports in Japan. However, in Japan, many people do not view the riversides as places for recreation; the rules for use, and the process of getting permission is also very complicated. This research argues that partial revision of existing rules regarding the use of riversides will increase the diversity of activities. The objective of this research is to clarify attitudinal differences towards riversides based on the distance between local resident and users, with the Arakawa River in Japan. In May 2017, questionnaire survey items were derived from the Arakawa Future Image Plan of 2010. This survey was administered from the end of May until the middle of July in 2017. A chi-square test was applied for the result analysis. An attitudinal difference between local resident (n=121) and users (n=63) was examined in two parts: regional understanding, and the utilization of riversides. According to the study results, the perceptions towards riversides are influenced by the distance from the river and the river's utility pattern. Particularly, differences were seen in people's viewpoints concerning riverside usage patterns

Keywords: Arakawa Riversides, local resident, perception, usage patterns, users

1. Introduction

It is generally acknowledged that green open spaces can provide many benefits in terms of amenity, recreational opportunities, improved health, child development, social interaction, ecosystem services, and community identity [1]. In Japan, riverside areas play important roles in social interaction and child development. The reason that riversides play an irreplaceable role in child development is that many student activities are held around them.

The construction of landscapes and environments psychologically reflects how humans understand nature, as well as how they affect it. In turn, these activities reflect how humans are affected by nature [2, 3]. As special public open spaces, the effective attraction distance of riversides is relatively broader. The usage of riversides is therefore diverse. It is essential to understand people's perception of the river, as well as their preferences for using the riverside during the planning and management stages [4, 5]. It is a basic acknowledgement that different effective attraction distances exist according to the location and acreage of a green open space. Distance is an important factor that not only affects how people use the open space, but also affects how they perceive it. Most articles covering the subject focus on the perception towards riversides without considering factors of distance.



This research intends to clarify the attitudinal differences towards riversides based on their distances to local residents, as well as the attitude of users of the riverside along the Arakawa River in Japan. In addition, this study will explore the relationship between riverside usage patterns and cognition of the riverside.

2. Study Areas

The Arakawa River is 173 km long, and has a 2,940 square kilometer basin. The river flows through the Saitama Prefecture and Tokyo. For this study, we selected the section of the Arakawa River that flows through Tokyo's Katsushika Ward (Figure 1). Katsushika Ward covers an area of 34.80 square kilometers. The ward contains 227,222 households, and has a population density of 12,770 per person per square kilometer. The open space available for public use covers 21.9% of the total area in Katsushika Ward. However, the river accounts for 60% of the public open space. What is more serious is the uneven distribution of parks and green open spaces in Katsushika Ward. The riverside is expected to play a role as an open space for residents to interact with nature in daily life, as well as an evacuation site for times of emergency. Katsushika Ward is also devoted the creation of a blue-green network [6]. For that reason, we selected Katsushika Ward's section of the Arakawa River to perform a survey among local residents.

The user survey area is located downstream of the Arakawa River in Katsushika Ward, and covers an area that is 6.9 to 10.4 km from the estuary. In this area, there are six baseball fields, one football pitch, one parking lot, and one waterside park. The area to the left of town is all lawn space. Since Metropolitan Expressway No. 6 lies between the riverside and the residence area of the Ayase River, access to the riverside is limited. The Ayase River has no surveyed riverside area for people to use. To reach the Arakawa riverside, users must cross bridges that span the Ayase River. Due to the overhead structure of Metropolitan Expressway No. 6, it does not impede access to the riverside.

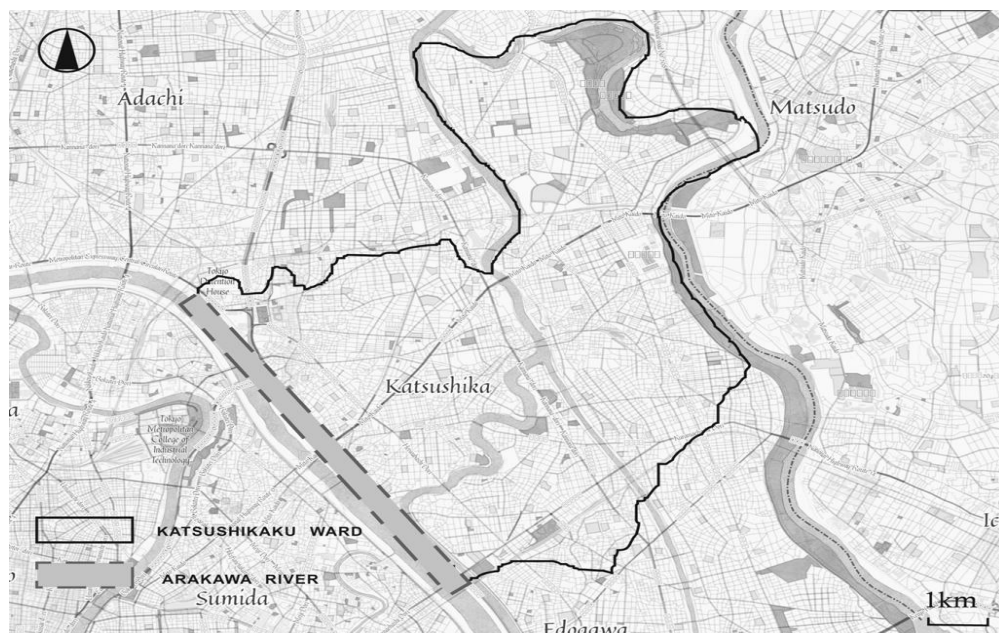


Figure 1. Study area Katsushika Ward and Arakawa River.

3. Methods

3.1. Local resident survey

In May 2017, we divided Katsushika Ward into three zones according to their vertical distance between the residential zone and the riverside. Area one (Z1) is one kilometer from the Arakawa River, while area two (Z2) is one to three kilometers away, and area three (Z3) is three to five kilometers away. A marked questionnaire was distributed to one resident per household in each of the three zones. We randomly distributed questionnaires numbering 300, 300, and 400 to the respective areas of Z1, Z2, and Z3. A total of 121 surveys were returned from the three residential areas of the study. The valid response percentages were 14.3% (Z1), 21% (Z2), and 4% (Z3). The local respondent users numbered 44 (Z1), 63 (Z2), and 15 (Z3). In this survey, respondents were first asked to answer questions about their perception of the riversides from the standpoints of their attitude toward and preference for the structure. The answer was set on a scale of 4 levels, where 4 represented “strongly agree”, 3 represented “agree a little”, 2 represented “disagree a little”, and 1 represented “strongly disagree”. Second, residents were asked if they had used the Arakawa riverside. If a resident had never used the Arakawa riverside, the reason was reviewed. If a resident had used the Arakawa riverside, they were asked to answer basic information about riverside usage. Finally, the questionnaire collected background data from local residents, including age, gender, and occupation.

3.2. Users survey

The survey was conducted along the Arakawa riverside in Katsushika Ward, and 65 responses were collected from June to July in 2017. In this survey, questionnaire survey items were derived from the Arakawa Future Image Plan of 2010. The questionnaire was divided into two parts. The first involved regional understanding, while the second involved riverside usage. Questions about riverside usage included the reasons and purpose for doing so, as well as an evaluation. Regional understanding covered perceptions toward the riverside, and preferences for its structure. As for riverside usage patterns [7], immobile use and mobile use were set. Immobile use refers to the activity of the user in a defined place, such as a football pitch. Mobile use indicates that the user is moving along the riverside for activities such as walking or cycling.

3.3. Analysis

Local residents' perception data were analysed in two steps. First, all of the local residents' perception data were analysed without the consideration of any other factor. Then, only the perception data from residents who had used the Arakawa riverside were analysed alongside the distance data. The perception data of users along the Arakawa riverside were compared with local resident users. Simple aggregation and chi-square testing was applied for the result analysis. Furthermore, the mean and deviation of the answers were determined. A Wilcoxon/Kruskal-Wallis test was also used for data analysis.

4. Result

A total of 121 valid responses were gathered from the local residents of Katsushika Ward. The responses were from 49 men, and 72 women. The largest age group was people over fifty (66.1%). There were 86 (71.1%) respondents among the 121 responses that indicated use of the Arakawa riverside, while 35 (28.9%) respondents had never done so. The local respondent users traveled to the Arakawa riverside predominantly by walking (44.2%) or cycling (51.2%).

We collected 65 responses from users along the riverside, and recorded 63 valid responses. User residences were concentrated in Katsushika Ward and four other surrounding wards in Tokyo. The respondents were 34 men, and 29 women. Most respondents were in their forties (50.8%). Riverside users chose a variety of transportation methods to get to the Arakawa riverside, such as private car (27.0%), train (4.8%), bus (3.2%), cycling (52.4%), and walking (9.5%).

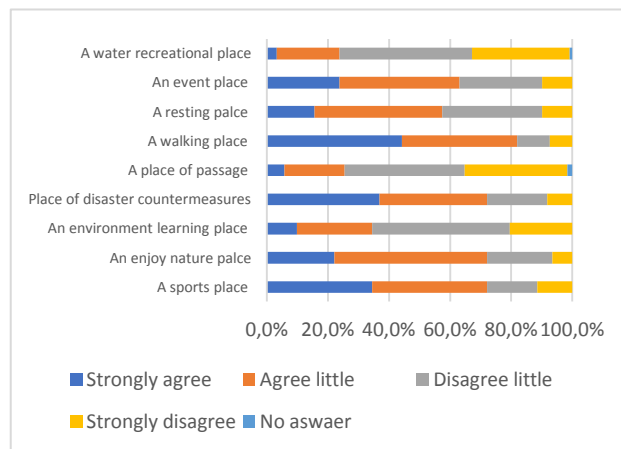


Figure 2. The perception of all local resident on riverside.

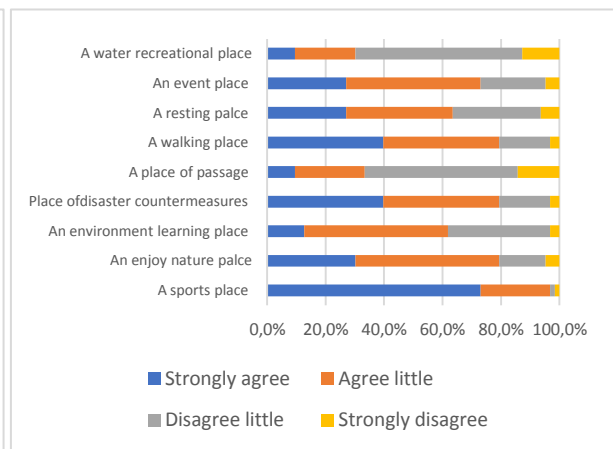


Figure 3. The perception of users on riverside.

4.1. Local resident perception

Local residents mainly viewed the riverside (Figure 2) as a place for walking (81.8%), while users along the riverside (Figure 3) viewed it as a place for exercise or sports (96.8%). A total of 73% of users strongly agreed that the riverside was a place for sports. On the whole, both local residents and users viewed the riverside as a place for sports, an evacuation area, a place for walking, and a place to enjoy nature. The agreement percentage for those four items was over 70.0%. With the exception of a place for rest, every item of data from users had a higher agreement rate than it did for local residents. This was especially true for users who agreed that the riverside was a place for environmental learning, which was two times higher than that of local residents. Finally, the riverside is highly accepted as a place in which events can be held.

Table 1. The perception of all local resident based on distance.

| Perception items | Z1 Means | Z2 Means | Z3 Means |
|-----------------------------------|-------------|-------------|-------------|
| A sport place | 3.02 | 2.86 | 3.07 |
| An enjoy nature place | 3.02 | 2.79 | 2.80 |
| An environment learning place | 2.35 | 2.17 | 2.20 |
| Place of disaster countermeasures | 3.07 | 2.94 | 3.13 |
| A place of passage* | 1.65 | 2.10 | 2.13 |
| A walking place* ** | 3.51 | 3.02 | 2.93 |
| A resting place* | 2.81 | 2.46 | 2.80 |
| An event place | 2.88 | 2.65 | 2.93 |
| A water recreational place | 1.94 | 1.97 | 1.87 |

Note: Means are based on a four-point rating scale. Body type is means over 3.00.

* Significant different between Z1 and Z2 ($P < 0.05$)

** Significant difference between Z1 and Z3 ($p < 0.05$)

The local resident users' perception data (Table 1) was analyzed by using a t-test. The agreement rate for the riverside as a place for walking decreases gradually in the three areas (Z1, Z2, and Z3 ($P < 0.05$)). When comparing Z1 and Z2, significant differences were found in the items "a walking place ($p < 0.0017$)", "a place of passage ($p < 0.0294$)", and "a resting place ($p < 0.0366$)". Then, in areas Z1 and Z3, there was a significant difference for "a walking place ($p < 0.0252$)". Comparing immobile use ($n = 26$) and mobile use ($n = 60$) among local residents, there were results for "a walking place (p

<. 0406)", "an event place ($p < .0161$)", "good sense of openness ($p < .0372$)", and "a reservation for ground ($p < .0041$)".

4.2. The users on riverside perception

While the immobile use category contained 20 males and 27 females among users on the riverside, the mobile use category for that area contained 14 males and 2 females. Here, significant differences can be seen. Between the immobile use and mobile use categories, significant differences for the items "an enjoy nature place ($p < 0.0001$)", "a walking place ($p < 0.0001$)", and "a resting place ($p < 0.0001$)" can be seen. The average values of immobile use are as follows: exercise area (3.64), place of Disaster Countermeasures (3.28). The average value of immobile use is as follows: exercise area (3.81), a walk place (3.75), a place can enjoy the views (3.44), a rest place (3.31), and an event place (3.0). From these average values, immobile users have a high evaluation of riversides function. There are also significant differences in "the entrances are not enough ($p < 0.0001$)", "difficult to approach ($p < 0.0001$)" that could be relevant (Figure 6). Immobile users attach more importance to the entrance of riverside than mobile users.

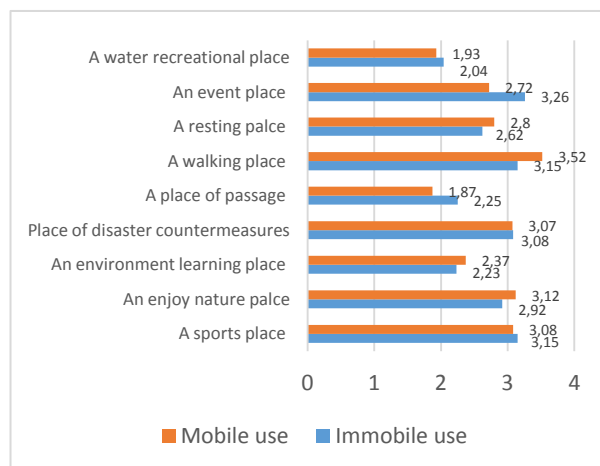


Figure 4. The perception of local resident users based on usage pattern.

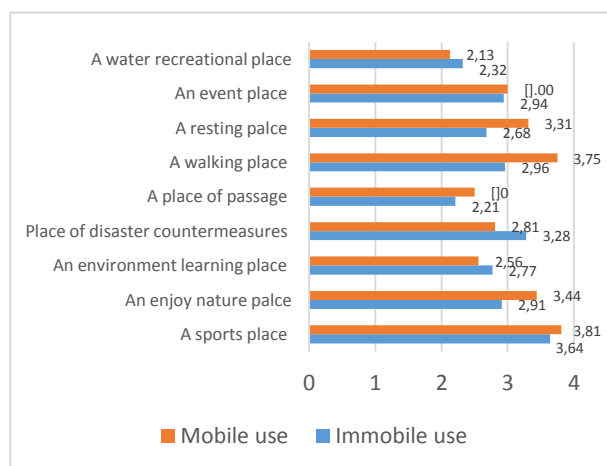


Figure 5. The perception of users on riverside based on usage pattern.

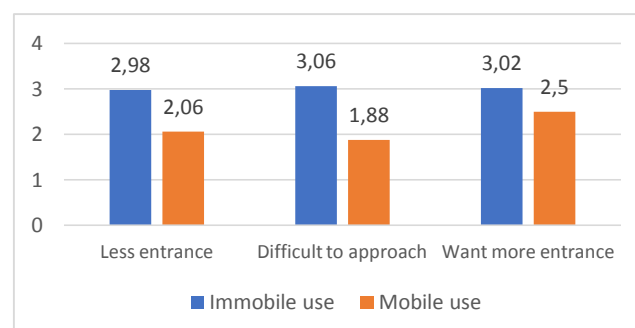


Figure 6. The perception towards riverside entrance based on usage pattern.

5. Discussion

It is well known that human behavior and environment affect each other. Yoshinomi's research shows waterfront experiences and consciousness have positive correlation [8]. Sampels research indicates resident's evaluation of the river and the frequency using of the river were influenced by resident's river experiences [9] and resident's experiences or socialites effect on their images of the river environment [10]. In this research, the relationships between human's waterfront activities and perception also can be found. Users along the riverside show differences between mobile use and immobile use. In particular, few women are involved in mobile use activities, such as walking or jogging, but women are highly involved in immobile use activities, such as watching sports. With regard to mobile use, the riverside was recognized as a walking place, a resting place, and a place to enjoy the view. Riverside access exerts a significant impact on its perception. For immobile use, it was viewed as a place to exercise and a place to deal with disasters. In summary, emphasis was placed on riverside facilities for immobile use, while emphasis was placed on using the software aspects to enjoy scenery while using the riverside in the case of mobile use.

Next, local residents use the riverside for many mobile use activities, as well as taking walks there and holding events. Inside of a 1 km distance, the riverside was especially recognized as a place to take a walk, to find passage, and to rest. Differences in consciousness were also observed at the 1 km boundary. Moreover, since the Z3 effective response percent was 4%, it was considered that local residents' perception of the riverside was low at distances exceeding 3 km.

6. Conclusions

Landscape planning for the open space of the river has been completed. However, as can be seen from this survey, the consciousness and perception among local residents differed in areas 1 km and over from areas that were within 1 km of the riverside. Through this research, we were able to clarify the difference in perception between users and local residents, as well as the attitudinal differences towards the riverside based on the distance of local residents from the riverside.

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