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Full Length Research Paper

Japanese Perceptions of Climate Change and their Behavioral Intentions of Visiting Cherry Blossom Festival

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We surveyed visitors to Japanese cherry blossom festivals to examine perceptions of climate change, blooming times, and future intentions to visit festivals under flower timing. We distributed questionnaires to visitors at three festival sites. Among 266 respondents, the majority (>60%) thought that global warming was occurring while less than 30% thought that global warming was affecting the flower timing of cherry blossoms. Thirty percent of respondents wanted to visit the festival even if the cherry flowers started to fall during the festival period. Multiple regression analysis revealed that the closer visitors' residences to festival site, the more likely they responded that they would visit festivals even if cherry blooms were finished ($p<0.05$). As global climate change continues and flowering times advance, future Japanese cherry blossom festivals might become more localized with a smaller number of visitors.

Keywords: behavioral intention, cherry blossom festival, climate change, Japan, perception, visitor

INTRODUCTION

Impacts of climate change on plants, animals, and human lives have been recorded and monitored all over the world. Climate change has influenced the timing of flowering, and migration and breeding of birds (Higuchi, 2008; Primack and Miller-Rushing, 2012). Human livelihoods are also affected by large-scale environmental alterations caused by climate change (Berkes, 2001; Nakashima et al., 2012).

Traditionally, people in Japan have enjoyed watching the flowering of cherry blossoms (*Prunus jamasakura*, *Prunus yedoensis*), the national flower of the country, for hundreds of years. One of the oldest manuscripts in Japan, Nihonshoki, written in the eighth century, describes how people enjoyed watching cherry blossoms (Ogawa, 2009). Even now, cherry blossom viewing is popular all over Japan. Hirosaki, located in the northern region of Japan, is one of the most famous and popular sites to enjoy cherry blossom and attracts more than two million visitors to its cherry blossom festival every year (Kobayashi, 2009).

Studies have shown that rising temperatures generated

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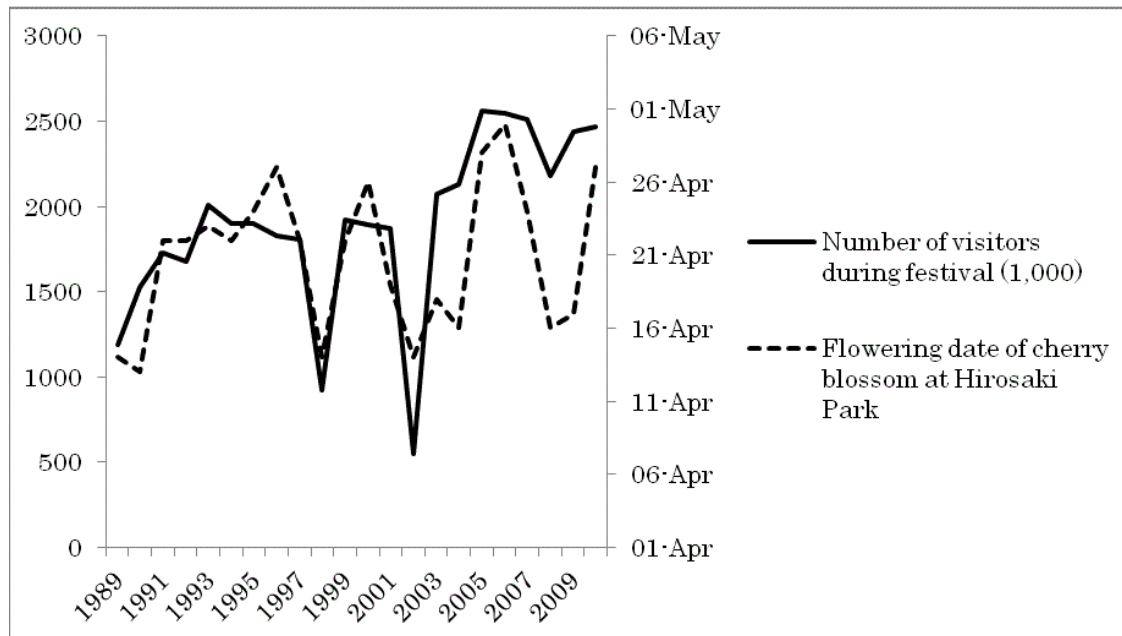


Figure 1. Flowering date of cherry blossom (*Prunus jamasakura*) and number of visitors during the cherry blossom festival in previous 22 years (Association of Green at Hirosaki City, 2011).

by global climate warming are affecting the flower timing of cherry trees (Higuchi, 2008). Cherry trees are now flowering 5.5 days earlier than records of the previous 25 years at Takao, about 50 km from the center of Tokyo (Miller-Rushing et al., 2007) and 5.3 days earlier than the previous 54 years at the center of Tokyo (Higuchi, 2008). Areas where the cherry tree flowering overlaps the national holiday helps attract visitors. Early bloom of cherry trees might affect visitor numbers. Stakeholders of the festivals (e.g. managers, steering committee) worry that visitors will feel reluctant to attend the cherry blossom festival if flowers finish blooming before the holidays (Sakurai et al., 2011). In Hirosaki, data records of tourist numbers and timing of cherry flowering for the previous 20 years demonstrated that in the years with lowest numbers of visitors (1998 and 2002) cherry flowers bloomed much earlier than normal years (Figure 1) (Association of Green at Hirosaki City, 2011). About 25% of the annual income from product sales in Hirosaki are generated during cherry blossom festival periods (Hirosaki City, 2010) and a decrease of visitors due to changes in flower timing of cherry blossoms could negatively affect the economy of the local community (Sakurai et al., 2011; Sakurai and Kobori, 2012).

Influence of global warming on flower timing of cherry blossoms have been well studied (Higuchi, 2008; Ministry of the Environment, 2008). Other studies found that the potential decrease of visitors was a major concern of festival stakeholders (Sakurai et al., 2011; Sakurai and Kobori, 2012). However, no research has been conducted to understand visitors' perceptions of climate

change or whether change in flower timing affect their decision to visit the festival. Our study examines these primary research questions:

1. What are visitors' perceptions of climate change and its impact on flower phenology of cherry trees?
2. What are visitors' intentions in visiting cherry blossom festivals under different flowering conditions?
3. How do visitor perceptions of climate change and its impact on cherry flowering as well as intentions to visit festivals differ among different sites and visitor socio-demographic backgrounds?
4. What factors (among perceptions of climate change and its influence to flower timing of cherry trees, and socio-demographics) affect visitors' behavioral intentions to visit the festival?
5. Will people visit the festival in Hirosaki to see flowers of apple trees instead of cherry trees if the cherry blossoms finished blooming?

Understanding visitor perceptions will help festival stakeholders to predict the social and economic impacts of climate change on the culturally significant cherry blossom festival and regional community.

MATERIALS AND METHODS

Study sites

We chose three sites; Kakunodate town at Akita prefecture, Hirosaki city at Aomori prefecture, both located in the northern region of the country, and

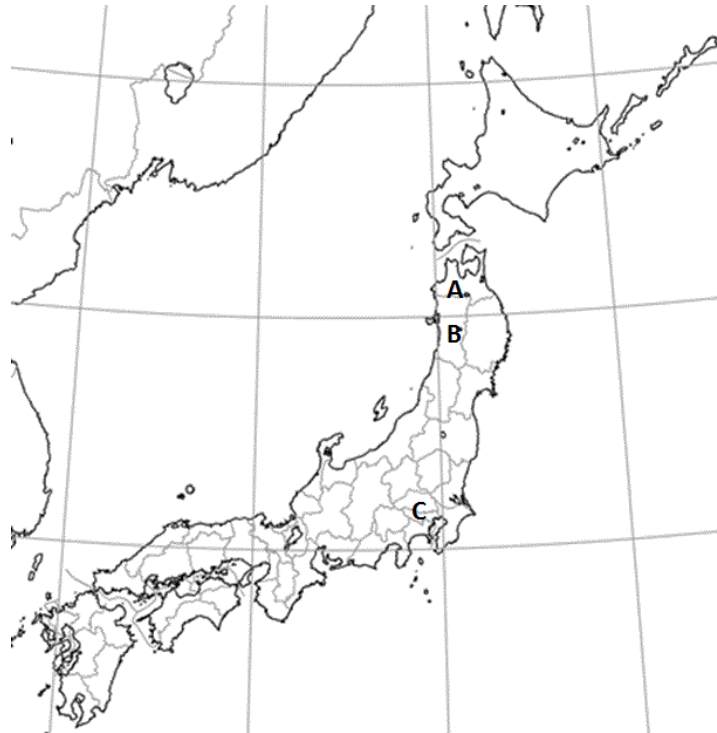


Figure 2. Study sites: (A) Hirosaki in Aomori, (B) Kakunodate in Akita and (C) Nakano-ku in Tokyo, in Japan.

Nakano-ku in Tokyo (Figure 2). Kakunodate and Hirosaki were chosen because two of the biggest cherry blossom festivals in the country take place in these areas. Kakunodate is famous for cherry trees in the samurai district (where soldiers used to live in the 1600s) and along Hinokinai River (Japan-guide.com, 2013). The cherry blossom festival starts at the end of April and continues to the beginning of May hosting about one million visitors annually.

The cherry blossom festival in Hirosaki takes place in Hirosaki Park where about 2,600 trees of around 50 species of cherry trees are planted (Kobayashi, 2009; Hirosaki Tourism Convention Association, 2011). The festival takes place from April 23rd to May 5th annually and hosts more than two million visitors.

The schedule of these two festivals overlap with the Golden Week holidays, the national holidays during the period of April 29th to May 5th allowing people from all over Japan to visit the festival. Therefore, economic impacts of festivals on local communities are huge as demonstrated by the fact that more than 40% of Kakunodate's annual income is generated from tourism income from the cherry blossom festival (Tourism Department of Kakunodate Town, 2009). In both Kakunodate and Hirosaki, flower timing of cherry blossoms have been monitored since the 1940s, revealing that flowering date has advanced around 5.5 days in both sites in the previous 60 years (Higuchi,

2008).

We chose the third study site, Nakano-ku, because it hosts one of the biggest cherry blossom festivals in Tokyo. The cherry blossom festival in Nakano-ku takes place along the Nakano Street in Tokyo, and hosts about 250,000 visitors each year. The festival is held in the first weekend of April annually, not associated with the national holiday. Although managers of the festival were thinking about the possibilities of changing the date of the festival since the cherry trees were flowering earlier, they have not, yet, changed the date (Sakurai et al., 2011).

Survey

A questionnaire was developed based on the literature and our previous studies regarding people's perception of climate change and its impact toward cherry blossom flowering (Sakurai et al., 2011; Sakurai and Kobori, 2012). Since the word "global warming" is more commonly used than "climate change" in Japan, and it refers to climate change as well, we used "global warming" in the questionnaire.

The questionnaire included six items regarding perceptions of climate change and its influence on flower timing of cherry trees, two items regarding people's intentions in visiting festivals in different situations of flower timing, and three items regarding socio-

Table 1. Questionnaire items and response scale

Categories	Items	Response scale
Perceptions of climate change and its influence to flower timing of cherry trees	1. Global warming is occurring	1=disagree, 2=slightly disagree, 3=neither option, 4=slightly agree, 5=agree
	2. Influence of global warming toward human is serious	
	3. I worry about the influence of global warming	
	4. I know what global warming is well	
	5. Global warming is affecting flower timing of cherry blossom	
	6. Flower timing of cherry blossom advanced because of global warming	
Intentions to visit festival in different situation of flower timing	1. I want to visit the festival even if the cherry flowers start to fall during the festival period	
	2. I want to visit the festival even if most of cherry flowers finished blooming during the festival period	
Socio demographics	1. Gender	1=male, 2=female
	2. Age	1=under 19, 2=20-29, 3=30-39, 4=40-49, 5=50-59, 6=60-69, 7=70 or more
	3. Location of area where visitors came from	1=same city/town, 2=same prefecture, 3=same region*, 4=outside the region

* The country was divided into three regions; Tohoku (northeastern portion of Honshu, the largest island of Japan, and includes Kakunodate and Hirosaki), Kanto (central portion of Honshu which includes Nakano-ku), and other area besides Tohoku and Kanto.

demographic items (Table 1).

In Hirosaki, we added a question regarding people's intentions to view flowers of apple trees (*Malus domestica Borkh*) instead of cherry trees if the cherry blossoms finished blooming. Apple trees bloom about a month after the cherry blossom, and a previous study found that managers of cherry blossom festivals in Hirosaki hope that visitors would come to view apple trees if the cherry trees have bloomed out (Sakurai and Kobori, 2012). We wanted to understand if people would visit festivals to see apple flowers instead of cherry blossoms.

At each site, we distributed questionnaires randomly to all visitors that we encountered at the festival sites while walking for about one hour. We let people fill in the questionnaire by themselves on-site. Most of the visitors agreed to participate in this survey although we were unable to track the number of people who rejected our offer. We understand that this method introduces bias since respondents were chosen by researchers at certain sites and times of the festival, and this limits generalizability of the data (Vaske, 2008). Nevertheless, this method was chosen as most feasible under the capacity and logistical ability we had. We could not get approval from IRB (Institutional Review Board) since this process is not common or thoroughly developed in Japan at this time, and universities authors belong do not have IRBs that specifically approve the social studies. We conducted a study in Nakano on April 6th and 7th, in Kakunodate on May 1st, and in Hirosaki on May 2nd in

2012. We received 72 responses in Nakano, 98 responses in Kakunodate, and 96 responses in Hirosaki.

Analysis

We used SPSS 18 (IBM, Inc.) to summarize the data and to conduct a statistical analysis. A one-way ANOVA with Post hoc Tukey comparisons was conducted to understand the differences in people's perceptions among festival sites. Multiple regression analysis was used to analyze the relationship between people's perceptions and socio-demographic items, and their behavioral intentions at all three sites. P-value of less than 0.05 was used to judge the significance level.

RESULTS

Socio-demographics

In Kakunodate, the largest proportion of respondents were in their 60s (22%) while in Hirosaki, it was respondents in their 40s (27%), and in Nakano, it was respondents in their 20s (37%) (Table 2). Sixty-five percent of respondents in Hirosaki and 49% in Nakano lived in the same city/town as the festival and did not travel far. Only 10% of respondents in Kakunodate answered that they lived in the same town.

Table 2. Socio-demographic backgrounds of respondents in three study sites

	Frequencies (%)		
	Kakunodate	Hirosaki	Nakano
Gender			
Male	31 (34)	41 (42)	39 (57)
Female	61 (66)	57 (58)	29 (43)
Age			
10s or younger	8 (9)	2 (2)	0 (0)
20s	15 (17)	13 (13)	25 (37)
30s	14 (15)	20 (21)	18 (27)
40s	12 (13)	26 (27)	10 (15)
50s	11 (12)	20 (21)	7 (10)
60s	20 (22)	12 (12)	6 (9)
70s or more	11 (12)	4 (4)	1 (2)
Visited from			
Same city/town	9 (10)	61 (65)	34 (49)
Same prefecture	35 (39)	19 (20)	24 (35)
Same region	27 (30)	11 (12)	11 (16)
Outside the region	18 (20)	3 (3)	0 (0)

Table 3. Visitors' perceptions of global warming and their intentions to visit festival under different flowering condition

	Mean score (<i>n</i>) [*]		
	Kakunodate	Hirosaki	Nakano
Global warming is occurring	4.35 (96)	4.54 (98) ^a	4.08 (72) ^a
Influence of global warming toward human is serious	4.46 (95) ^a	4.46 (98) ^b	4.06 (72) ^{ab}
I worry about the influence of global warming	4.22 (95)	4.33 (98) ^a	3.83 (72) ^a
I know what global warming is well	3.56 (95)	3.48 (93)	3.26 (72)
Global warming is affecting flower timing of cherry blossom	3.59 (94)	3.68 (98)	3.32 (72)
Flower timing of cherry blossom advanced because of global warming	3.14 (95)	3.24 (98) ^a	2.78 (72) ^a
I want to visit the festival even if the cherry flowers start to fall during the festival period	2.82 (88) ^{ab}	3.63 (95) ^a	3.59 (66) ^b
I want to visit the festival even if most of cherry flowers were out of bloom during the festival period	2.43 (89) ^a	3.14 (95) ^a	2.97 (64)

^{*} Same alphabets refers to the significant differences between scores ($p < 0.05$).

Perceptions of climate change and its influence on cherry blossom flowers

Among all respondents of the three sites, more than 60% of respondents agreed that global warming was occurring and that its influence on people was serious. About half of the respondents agreed or slightly agreed that they worried about the influence of global warming. Less than 20% of respondents agreed that they understood global warming well. While 26% of respondents thought that global warming was affecting flower timing of cherry blossoms, only 15% thought that flowers bloomed earlier due to global warming.

Post hoc Tukey tests revealed that significantly more respondents in Hirosaki thought that global warming was occurring ($p < 0.05$), influence of global warming toward

human was serious ($p < 0.05$), and worried about the influence of global warming ($p < 0.05$) than those in Nakano (Table 3). Significantly more respondents in Kakunodate thought that influence of global warming toward human was serious ($p < 0.05$) than those in Nakano. Significantly more respondents in Hirosaki thought that flowering of cherry blossoms advanced because of global warming ($p < 0.05$) than those in Nakano.

Intentions to visit festivals

Among all respondents of the three sites, about 30% of respondents answered that they wanted to visit the festival even if the cherry flowers started to fall during the

Table 4. Multiple regression analysis with behavioral intentions as dependent variables and perception of climate change and socio demographic items as independent variables. *B* = standardized coefficient.

	<i>B</i>	<i>p</i>	<i>R</i> ²	Adjusted <i>R</i> ²	<i>n</i>
Intention to visit the festival even if the cherry flowers start to fall during the festival period					
Global warming is affecting flower timing of cherry blossom	0.088	0.278	0.093	0.073	237
Flower timing of cherry blossom advanced because of global warming	0.005	0.947			
Age	0.015	0.832			
Gender	-0.075	0.236			
Location of area visitors came from	-0.287	<0.01			
Intentions to visit the festival even if most of cherry flowers finished blooming during the festival period					
Global warming is affecting flower timing of cherry blossom	0.08	0.332	0.093	0.073	236
Flower timing of cherry blossom advanced because of global warming	-0.022	0.784			
Age	-0.019	0.777			
Gender	-0.06	0.346			
Location of area visitors came from	-0.288	<0.01			

festival period. When the situation changed to if most of cherry flowers finished blooming during the festival period, respondents who wanted to visit the festival decreased to 19%.

Post hoc Tukey test revealed that more respondents in Hirosaki and Nakano answered that they would visit festivals even if the cherry flowers started to fall than those in Kakunodate ($p < 0.01$) (Table 3). More respondents in Hirosaki answered that they would visit festivals even if most of flowers finished blooming than those in Kakunodate ($p < 0.01$).

In Hirosaki, 24% of respondents answered that they would view flowers of apple trees instead of cherry blossom if cherry trees finished blooming.

Multiple regression analysis revealed that among two items regarding perceptions of global warming and three socio-demographic variables (age, gender, and distance to festival sites), only distance to festival sites showed a significant relationship with visitors' intentions (Table 4). The closer a visitors' residences to the festival site, the higher the visitor's intention to visit the festival even if the cherry blossoms had started to fall ($B = -0.287$, $p < 0.01$), or even if most cherry flowers finished blooming ($B = -0.288$, $p < 0.01$) during the festival period.

DISCUSSION

Although the majority of respondents thought global warming was occurring and had a serious influence on humans, those who reported knowing about global warming were limited. This follows a previous study in Japan which found that only few people could explain what global warming was although they recognized the term (Aoyagi-Usui, 2006). Perhaps lack of knowledge regarding global warming made it difficult for people to

imagine the connection between climate change and flower timing of cherry blossoms.

The fact that people in Hirosaki and Kakunodate had more awareness and worry regarding global warming might be attributed by the nearness to nature and environment that people had in their daily lives. Previous studies found that people identified global warming from observing local phenomenon such as decrease of snow or change in flower timing (Vedwan, 2006; Sakurai et al., 2011; Nakashima et al., 2012). On the other hand, it could be difficult for people to recognize the change in local phenomenon if they lived in a big city, such as metropolitan Tokyo where people have less daily contact to nature.

Our study found that fewer than half the people had intentions to visit the festival even if the cherry blossoms finished blooming at the three sites. This implies that the worry that festival managers in Hirosaki and Kakunodate had regarding the potential decrease of visitors (Sakurai et al., 2011) is actually a practical and realistic phenomenon that will likely happen. On the other hand, this might not be an issue in Nakano since the festival is not associated with national holiday, and managers could change the dates to meet the flower timing.

Respondents who lived closer to festival sites had higher intentions to visit festivals even if the cherry flowers bloom out. This suggests that fluctuation of flower timing does not necessary mean loss of visitors living in local areas, only a decrease of visitors coming from long distances. By continuing to attract local visitors and maintaining the bond with local residents, cherry blossom festivals can be sustainable even under environmental alterations. This implies the strength of deeply-embedded culture and social norm of cherry blossom viewing among local residents, and that environmental alteration does not necessarily change individuals' culturally inherited

behaviors (Adger et al., 2009). On the other hand, Kakunodate, where half of respondents came from outside of the prefecture, can be more vulnerable to environmental change than two other sites, losing the majority of its visitors when the cherry bloomed early.

Our result showed that in Hirosaki, a quarter of respondents (24%) wanted to visit and watch apple tree flowerings if the cherry flowers finishes blooming, revealing a potential tourism opportunity for the city. This implies that promoting the flowering of apple trees and attracting visitors to view apple flowers can be one potential strategy for the community to cope with an environmental alteration. Although putting a spotlight on apple trees may seem to be a short-term adaptive strategy, as the viewing of apple flower continues and get established in the future, it might become a new culture that people enjoy during the national holidays in the region. Local residents' attitudes and efforts to find new and alternative local resources (such as apple trees) for attracting tourists to cope with environmental change would be important factors to increase the adaptive capacity and resilience of the community (Simson et al., 2008).

As the climate change continues and flower timing fluctuates, future Japanese cherry blossom festivals might become more localized with smaller number of visitors and economic income.

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