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Disappearing Act(ions): College Perceptions of Climate Change and its Impacts on Tourism

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Introduction

Travel is an escape, a way for people to leave behind their daily lives and their problems, at least for a little while. But what happens when problems start following travelers, or when the destination itself has problems? Will tourists try to help, will they try to ignore it, or will they flock to those places before things change forever? Climate change is an inescapable problem, with the potential to have negative environmental and social consequences worldwide. Many places around the world are already changing and feeling irreversible impacts (Arnedal & Hoff, 2011). Temperature changes and impacts to natural attractions may alter how attractive popular destinations are to tourists (Ghilardi-Lopes et al., 2015; Hamilton et al., 2005).

New temperature patterns result in geographic shifts of tourism, as travelers begin to seek locations in higher latitudes to escape extreme heat (Scott et al., 2012). Specific impacts of climate change such as melting snow and glaciers, sea level rise, and biodiversity loss also influence tourist decisions to visit certain locations. The European Alps may experience a loss of up to 55 snow days per year if current warming trends continue, significantly shortening the ski season and resulting in a decline in winter sport tourism (Tranos & Davoudi, 2014). Sea level rise threatens Caribbean coastlines with beach erosion and the destruction of tourism infrastructure (Scott et al. 2012). Wildlife may adopt new behaviors as they adapt to climate-related changes and may also be driven to extinction, a consequence with impacts for wildlife-based tourism in African national parks and reserves (Agnew & Viner, 2001).

Last-Chance Tourism

Desire to travel to a specific place is linked to the attributes of that location (Gössling et al., 2012), so change prompts questions on how perceptions of these places and of climate change factor into tourists' decision-making processes and behavioral intentions. It is possible that travel to these places will decline as tourists realize the impacts that are occurring there. It is equally possible that travel will increase, as tourists rush to those locations to experience their features before they change completely.

There is a substantial body of literature on this topic already, something that Lemelin et al. (2010) refer to as "last-chance tourism." This tourism reflects a new trend where tourists travel to threatened or vulnerable places to see them before they disappear. Such visitation includes seeking places with a disappearing cultural or social heritage, but is primarily focused on those places where nature and natural attributes are changing in irreversible ways (Lemelin et al., 2010). The tourism industry claims that last-chance tourism increases awareness of the

problems at specific locations, but this has not been observed (Eijgelaar et al., 2010). Moreover, tourism itself strains natural resources, so this new pattern of visitation introduces an interesting paradox: increasing tourism strains an already struggling environment, thus motivating even more people to visit. Clearly there is a link between tourist perceptions of a degraded environment and a desire to travel to see the remaining resources, but the question remains if tourists have an awareness of the additional degradation they are causing, and if such knowledge would deter them (Lemelin et al., 2010; Gössling et al., 2012).

Impacts of Travel and Tourism

Previous studies note that tourists underestimate their contributions to climate change and do not believe that tourism has a negative environmental impact (Ghilardi-Lopes et al., 2015; Eijgelaar et al., 2010; Becken, 2007). Most of the negative impacts incurred by tourists are a result of travel, specifically aviation, emissions. Currently, aviation is responsible for 8% of global emissions, and this source is not regulated under either the Kyoto Protocol or the Paris Agreement (Lenzen et al., 2018; Becken, 2007). Owing to lack of regulation and the growth of tourism as an economic sector, aviation emissions are projected to increase to be 30% of global emissions by the year 2050 (Hamilton et al., 2005). Aviation emissions account for 40% of the global carbon footprint of tourism (Hall et al., 2013), but carbon is also prevalent in other tourism activities, such as transportation on the ground and what is embodied in goods and services (Lenzen et al., 2018). Tourism -- and consequently emissions -- grows as the global economy grows, and this sector currently accounts for 7% of global gross domestic product (GDP), and is expected to grow by 4% every year (Lenzen et al., 2018). Such continual growth is touted as a means of development for developing countries, yet the sustainability of economic growth premised on tourism is questionable (Hall et al., 2013). Not only is tourism more carbon-

intensive than other sectors (Lenzen et al., 2018), but countries that are the most economically dependent on tourism are also the most vulnerable to climate change (Hall et al., 2013, Scott et al., 2012). If resources that are attracting tourists disappear, it could spell disaster for developing economies.

Some locations are aware of the consequences of climate change, and their heightened environmental awareness has given rise to ecotourism programs (Chiu et al., 2014). This type of tourism does not strain natural resources and is considered to be an environmentally responsible method of travel (Chiu et al., 2014; Eijgelaar et al., 2010). Even though ecotourism may be less resource-intensive than traditional travel methods, it is still unable to account for the carbon emitted in traveling to a location (Eijgelaar et al., 2010). Even with this paradox, ecotourism is still promoted, and tourists are encouraged to participate in those programs to minimize their impacts (Han et al., 2016). The best way for travelers to reduce their impacts, however, is through limiting aviation emissions or by paying to offset them (Han et al., 2016).

Climate Change Awareness and Tourist Decisions

Tourists may not fully realize the extent to which they contribute to climate change and may affect the resources of a destination. Thus, perceptions and awareness of climate change impacts may be important in altering tourism decisions, because of their potential to create environmentally responsible behavior. Awareness, however, does not necessarily lead to environmental behaviors, and knowledge of personal contribution to impacts may not deter travelers (Han et al., 2016). Past studies suggest that even the most aware and concerned tourists are not likely to modify their travel behaviors (Hall et al., 2013; Eijgelaar et al., 2010; Becken, 2007). Tourists value their freedom to travel and will not limit their flights, and although some are willing to pay extra to offset aviation emissions, there is no guarantee they will actually do so

(Becken, 2007; Scott, 2012). Awareness of climate change and concern over impacts also does not likely play a role in tourist decisions to participate in ecotourism programs at their destinations or act in other environmentally responsible ways (Han et al., 2016).

These studies together suggest an intriguing point: climate change awareness may not influence general travel decisions, but those who are knowledgeable of specific impacts on specific places may be likely to travel more, regardless of their personal contributions to the ecological decline. Gössling et al. (2012) sums up the phenomenon quite well, stating that tourists are willing to accept environmental change and that the degraded conditions of their chosen destinations could become the new normal. General tourist demand for travel is unlikely to change, and may actually increase in the near future, although there may be geographic shifts in destinations, and tourists may opt for locations with uncertain futures (Gössling et al., 2012).

Study Objectives

In this study, we intend to evaluate the knowledge of college students of places that are 'disappearing' due to climate change and determine if awareness affects their intention to travel to such threatened places. We want to assess whether or not the trends indicated in the previous research (Gössling et al., 2012; Lemelin et al., 2010; Han et al., 2016; Eijgelaar et al., 2010; Becken, 2007) also apply to college students, a demographic that has been overlooked in the existing literature likely owing to their lack of financial independence and ability to travel on their own. We also want to raise awareness within this demographic of the impacts of climate change impacts in various places around the world. If college students indicate a desire to travel to environmentally-threatened places, we hope that our fact sheet may help them understand the impact of their travel in such locations. We also hope to present them with options and alternatives to traditional travel methods that would mitigate their personal impact. We frame

our research around the following questions: a) who within the college community is more likely to adopt environmentally responsible travel behaviors, and b) does awareness of climate change impacts alter tourism? We hypothesize that after being presented with information about places that are 'disappearing' or are being negatively impacted by climate change, college students will still be inclined to travel to those places, owing to the 'last-chance' tourism theory (Lemelin et al., 2010). Further, we hypothesize that if travel continues, students will participate in ecotourism or pursue other environmentally responsible behaviors to lessen their environmental impact in order to preserve the locations for continued tourism.

Methods and Research Design

Survey Design

We used a survey designed with the intent of gauging Gettysburg College student awareness of climate change impacts. It consists of 15 total questions to evaluate student perceptions of climate change in general as well as their willingness to travel and participate in environmentally responsible behaviors after reading a fact sheet on places threatened by climate change. Four demographic questions were also included to capture general information about our survey participants, and as a means for later comparing responses to groups.

Our survey was based primarily on five-point Likert scale questions ranging from "strongly agree" to "strongly disagree" and we also included a few open-ended questions so that the participants could clarify their responses or include additional comments (Appendix A). To start the survey, respondents were first asked to select a location from a predetermined list of ten places to which they would like to travel that are considered to be vulnerable to or disappearing from the effects of climate change. We selected those ten places (Seychelles; Tokyo, Japan;

Great Barrier Reef; Austrian Alps; Mt. Kilimanjaro; Amazon Rainforest; Kalahari Desert, Namibia; Chicago, Illinois, United States; Siberia, Russia; and Venice, Italy) based on their differing geographic locations, climates, and negative impacts caused by climate change (Arnedal & Hoff, 2011), as a means of demonstrating the global nature of climate change. Respondents were then asked using the Likert scale to evaluate how threatened they thought each location is. These questions were designed to get our participants thinking about climate change, and are not included in our analysis. We then posed another series of questions asking the participants to evaluate their level of knowledge on different climate change impacts (melting ice, ocean acidification, sea level rise, biodiversity loss, and desertification). Each of the impacts included in that ranking are effects currently occurring in at least one of the ten threatened places already mentioned.

We also included questions to determine climate change perceptions and concern that were taken from the Yale Program on Climate Change Communication (YPCCC) and their Six Americas Super Short Survey (SASSY) (YPCCC, 2016). These four questions were designed by the YPCCC to help understand the varying levels of concern over climate change across the American public, and to categorize these different levels into clear groups of people who share similar beliefs (YPCCC, 2016). We included the questions from the YPCCC as a means to evaluate how the Gettysburg College community perceives climate change and to use that knowledge to inform their responses to other questions on our survey, The inclusion of the YPCCC questions allows for a comparison between climate change views of a specific population subset with the American public at large.

Following the YPCCC questions, we included a brief fact sheet with statistics and information on climate change impacts for each of the ten places included earlier (Appendix B).

This instrument was designed to educate our respondents and raise awareness of the diversity of impacts in every region of the world. We also included some facts about the negative impacts of tourism with regard to climate change and emissions. Following the fact sheet, we asked whether or not the new knowledge presented in the fact sheet changed the willingness of each respondent to travel, and also included additional Likert scale questions to evaluate the desire to engage in environmentally responsible travel behaviors.

Survey Administration

We received an 'Exempt' status from the Gettysburg College Institutional Review Board (IRB) to conduct our research on students. With this permission, we created our survey and fact sheet in Google Forms to distribute to the campus community. The survey was emailed to various student groups and organizations on campus of which we are a part, and was also posted on Facebook pages for each of the four class years. We targeted different demographic groups through our methods of online distribution to incorporate all perspectives, and to reduce skewness of our data toward one demographic. Participation in the survey was anonymous, completely voluntary, and there was no compensation for participating.

Data Analysis

Google Forms automatically compiles summary statistics for the responses for each question on the survey. We used these statistics to summarize the responses for each question. In addition, we used the group scoring feature on the YPCCC SASSY website to determine to which of the 'Six Americas' categories each respondent belonged (YPCCC, 2016). We compared the percent of respondents in each category from our survey with the national percentages from the YPCCC. With this data, we completed other statistical analyses using non-

parametric tests.

We performed a Mann-Whitney U test to evaluate any significant difference between the responses of different majors regarding their willingness to travel and participate in other environmentally responsible travel behaviors. The respondents were split into two groups for the variable 'major': Environmental Studies (ES) and non-ES majors.

We used a Kruskal-Wallis H test to test for the same relationship as with the Mann-Whitney U test, but with variables with more than two groups. We looked at the differences within the groups based on pertinence to a YPCCC category and class year. 'Class year' was broken into groups based on the respondent's graduation year, either 2019, 2020, 2021, or 2022. These variables were compared with the dependents of willingness to travel and participate in other environmentally responsible behaviors.

Lastly, we used a Wilcoxon signed-ranks test to compare respondent knowledge of each of the five climate change impacts included in the survey with knowledge of each of the other four impacts. This test was intended to gauge how aware the campus community is of certain climate change impacts in comparison to their awareness of other impacts.

Results

The survey responses (n=104) showed a decrease in willingness to travel after reading the fact sheet (Fig.1) (Appendix C). We assumed that 100% of respondents would travel before beginning the survey, and at the end 72.1% of respondents stated they would still travel to the location they first selected. Only 2.9% stated that they would no longer travel, with the rest commenting that they would maybe still travel. Regarding engagement in environmentally responsible behaviors, 51% agreed that they would participate in ecotourism (Fig. 2), and 67.3% agreed they would be willing to pay an additional $50 or more to offset environmental damages

caused by their travel (Fig. 3).

The results of our YPCCC survey differ from the national YPCCC averages (Fig. 4). Our survey respondents only occupied three of the six 'Americas' laid out by the YPCCC: the categories of alarmed (78.8%), concerned (17.3%), and cautious (3.8%). None of our respondents occupied the categories of disengaged, doubtful, or dismissive, which correspond with lower levels of or no concern regarding climate change.

There is a significant difference between the responses of ES and non-ES majors regarding willingness to travel ($p=0.008$) after reading the provided fact sheet (Table 1). Both groups of majors indicated that they would still be willing to travel given the new information, but there is a proportional difference in the responses of each group. Approximately 92% of ES majors responded that they would still travel, while only 65.4% of non-ES majors responded that they would still travel (Fig. 5). There is no significant difference between majors regarding the two environmentally responsible behaviors (Table 1).

A significant difference is observed between the responses of those in the different YPCCC categories and their willingness to pay extra to offset environmental damages caused by their travel ($p=0.049$) (Table 2). Looking at the distribution of responses, those respondents who fall into the "cautious" category were more likely to pay less than $50 to offset their damages, while those who are "alarmed" had a distribution leaning toward higher monetary values (Fig. 6). YPCCC category did not have a significant relationship with willingness to travel or willingness to participate in ecotourism, and class year had no significant differences regarding any of our test variables (Table 2).

There are significant differences ($p<0.05$) between respondent knowledge of climate change impacts for six of the ten comparisons (Table 3). Respondents were significantly more

aware of sea level rise, melting ice, and biodiversity loss than ocean acidification and desertification. Even though ocean acidification and desertification were the least known impacts of climate change, a majority of respondents indicated that they knew at least a little (Likert scale responses 1-3) about each of the impacts. Sea level rise was most well-known by the respondents, with 70.2% indicating some degree of knowledge, and 67.3% indicated some degree of knowledge about melting ice and biodiversity loss (Fig. 7).

Discussion

Changes in Travel Behaviors

Our survey results indicate that after raising awareness of climate change impacts on tourist destinations through use of a fact sheet, a majority of respondents are still willing to travel to threatened locations. We initially assumed that all of our respondents would be willing to travel to their chosen location, so even though there is a decline in the number of respondents who would be willing to travel, our results suggest that awareness of impacts does not alter the travel decisions of college students. This finding agrees with previous research that found that awareness of the issue does not lead to environmentally responsible behavior (Han et al., 2016), and it also suggests that although college students may be aware of and alarmed by climate change, they may not fully comprehend the risks and impacts in other places (Leiserowitz, 2005).

Unwillingness to change travel behaviors is further supported by the last-chance tourism theory, where many respondents expressed a desire to continue to travel to threatened places in order to see them before they disappear (Lemelin et al., 2010). The majority of comments from respondents explaining their decision to travel or not revolved around the idea posed by last-

chance tourism: a desire to see the location before it is too late, before it is gone, so that it can still be enjoyed. Clearly, the future impacts of climate change on those locations provided motivation to travel, instead of acting as a deterrent. Other comments were more optimistic in their rationale behind continued travel, with a desire to gain knowledge about the realization of those impacts and to understand what is actually occurring in those places to raise awareness of the issues. This motive is commendable and may be used to increase tourist risk perceptions as a means of deterring travel (Leiserowitz, 2005), but there is little evidence that simply visiting a place allows tourists to become aware of the issues, or that the tourist would actually call attention to the issues (Ghilardi-Lopes et al., 2015; Han et al., 2016; Eijgelaar et al., 2010).

Ecotourism is one form of travel that is supposed to inform tourists of environmental issues in the location by exposing them to natural experiences while teaching about conservation and involving them in a program focused on understanding the linkages between tourism and nature (Weaver, 2001). Theoretically, choosing ecotourism is an option for those who will continue to travel in order to learn about environmental issues at a location, yet only a slim majority of our respondents said that they would be willing to participate in an ecotourism program. There is little evidence in the literature that environmental concern is related to ecotourism participation (Sharpley, 2006), suggesting -- as with willingness to travel -- that awareness does not influence travel behaviors.

The notion that awareness does not influence travel behaviors also seems to be evident regarding willingness to pay extra to offset carbon emissions from travel. While a majority of respondents indicated they would be willing to pay at least $50 to offset damages from travel, we have no way of gauging whether or not they would act on this intention. Previous studies note that an intention to pay extra is different than a manifested action, and suggest that simply

because tourists may be willing to do so, does not mean that they will actually act on their intention (Becken, 2007; Hall et al., 2013; Scott et al., 2012). Travelers support emission mitigation policies aimed at airlines, and while they would prefer that ticket prices do not increase as a result, demand would still stay the same (Gössling et al., 2012; Becken, 2007). Thus, respondents who are willing to pay more may be considering that aspect of 'paying more,' rather than taking it upon themselves to offset carbon.

Travel Behaviors and Major

There is a significant difference between ES majors and non-ES majors regarding willingness to travel. While both groups were distributed so the majority of respondents want to travel after completing the survey, it is interesting that proportionally more ES majors did not change their intent to travel, given their familiarity with environmental issues and knowledge of the impacts humans can have on the natural world. This relates to a point made by Hall et al. (2013) that tourists with high levels of environmental concern and awareness may not change their travel behaviors. This notion likely explains the lack of statistical difference between groups with respect to willingness to pay to offset their damages and to participate in ecotourism programs. Additionally, the continued desire of ES majors to travel is influenced by a desire to visit threatened locations in order to better understand the changes and damages that are occurring there, as mentioned in some respondent comments on the survey.

Travel Behaviors and YPCCC Category

Our YPCCC results differ from the national results of the YPCCC survey. Only the three groups that are most worried about climate change are represented in our results, while the groups that are less worried are not present. The majority of students that completed our survey

were identified as “alarmed” based on their responses. In contrast, for the national YPCCC results, 29% of people were considered alarmed (YPCCC, 2016).

In our comparison between YPCCC category and willingness to travel or participate in environmentally responsible behaviors, those in the “cautious” category were significantly less likely to pay extra than those in the “alarmed” category. This finding is corroborated by the descriptions of the six Americas by the YPCCC. Cautious people are the least likely to take action through economic means, while alarmed and concerned people are more likely to pay higher amounts (Leiserowitz et al., 2009). The lack of significant difference between YPCCC categories for willingness to travel and willingness to participate in an ecotourism program indicates that concern over climate change is not a factor in these decisions. These findings match with previous literature dispelling a connection between concern and environmentally responsible behaviors (Hall et al., 2013; Han et al., 2016; Scott, 2011; Sharpley, 2006).

Travel Behaviors and Class Year

There is no significant difference between any of the class years regarding travel behaviors. This finding suggests that class year does not matter when it comes to considering travel decisions, likely because the students are close in age with few distinctions between them. Existing literature has examined differences between elementary school and secondary school students collectively, but has not distinguished between individual grades at each schooling level (Wachholz et al., 2014). Similarly, college students have been viewed as a whole, although they are divided based on their enrollment in upper or lower level classes (Wachholz et al., 2014). For the present study, older students may be enrolled in lower level classes, and younger students in upper level classes, thus diminishing the impact of class year on awareness and concern, and potentially travel behaviors.

Knowledge of Climate Change Impacts

In examining respondent knowledge of climate change impacts, sea level rise, melting ice, and biodiversity loss were demonstrated to be the most well-known. These results match with literature that shows individuals are more likely to be aware of melting ice, sea level rise, and impacts on nonhuman nature (Leiserowitz, 2005). Those effects tend to be the most represented in popular media and have the highest associated risk perceptions, so it is unsurprising that students would also be most knowledgeable about those impacts. Student knowledge of these impacts stems from their education, indicating that students have received or are gaining similar climate change education.

Study Implications

Awareness of and concern for climate change impacts does not appear to greatly influence travel behaviors of tourists who are visiting ecologically-threatened locations. Instead, awareness of locations that are 'disappearing' are more likely to prompt people to visit those locations in order to experience them before the change completely. This finding among college students fits well with the last-chance tourism theory proposed by Lemelin et al. (2010), and suggests that the 'new wave' of tourists are likely to behave in a similar manner to those who are already able to travel freely, regardless of their amount of concern for a location. Those with high levels of concern for climate change may be more willing to act in environmentally responsible ways, as indicated by the relationship between YPCCC category and willingness to pay extra, although it is unknown whether the respondents would actually engage in their intended behavior.

Mandated carbon offsets or a carbon tax on airlines may be one of the most effective ways to address the growing impact of global tourism on climate change and subsequently on

vulnerable locations, because of the incentive to reduce emissions (Becken, 2007). Costs of compliance could be passed to the traveler in the form of higher airfare, and both the present study and other research indicate that travelers would be willing to pay slightly elevated costs (Becken, 2007; Scott et al., 2012). Increasing and improving ecotourism programs is also a potential way to minimize impacts of travel because of the awareness such programs raise, and also because of their intent to conserve and be respectful of the natural resources in a location (Chiu et al., 2014; Weaver, 2001).

To protect threatened places, visitors need to be cognizant of their impacts, not just on the location but also through their contributions to global emissions. Tourists may claim that they want to continue to travel to such places to know how to protect those locations in the future, but there is no indication in the literature that awareness actually equates to environmentally responsible behaviors. While lessening tourism to these places may seem like the best method for protecting them, many economies depend on tourism to a large extent (Tranos and Davoudi, 2014; Scott et al., 2012), and a decline in tourism leads to an economic decline. These declines, however, are likely imminent because if the resource base and natural attractions at a location disappear due to climate change, so will tourism and the consequent economic benefits. This is a complex cycle originally created by climate change, so ultimately, to stop the disappearing act, the causes of climate change must be addressed.

Study Limitations

Some limitations are present within our study. We assumed that all respondents would be willing to travel to their selected destination before taking the survey, so any changes in willingness to travel would seem to indicate a decline in willingness. Responses to the YPCCC questions may have been influenced because they were placed after the questions to gauge

knowledge of climate change impacts. This could have altered participant responses because they were already exposed to the idea that climate change impacts are occurring. Additionally, not everyone who took the survey was aware of the definition of ecotourism, or they may have had differing interpretations, which could have affected the outcome of responses for that question. Self-selection bias is also present within our survey. It was not distributed randomly, but instead was completed by individuals that chose to take the survey at their own discretion. Lastly, our demographics data are skewed and are not an accurate reflection of the Gettysburg College student body, especially regarding gender and class year.

Conclusion

Climate change is a global problem that is having myriad effects on people, places, and industries. Current travel patterns are not sustainable, as the tourism industry contributes to greenhouse gas emissions impacting climate change. These effects can worsen the impacts that many destinations are already feeling because of climate change, and may increase their vulnerability. Our study shows that college students, who are the next generation of travelers, are willing to travel to places that are at risk of 'disappearing' despite being aware of the problems these destinations face. Increased awareness and concern do not appear to influence travel behaviors, and since the study only measured intent, it cannot determine how respondents would actually behave. Even though awareness may not translate to environmentally responsible travel behaviors, a better understanding of the realized impacts of climate change and how individuals further contribute may inspire the public to take action against climate change, and to stop destinations from disappearing.

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Tables and Figures

Table 1: Mann-Whitney U test results for differences between majors. Significant results ($p<0.05$) are marked with a (*).

	Willingness to Travel	**Pay Extra**	**Participate in Ecotourism**
Major	0.008*	0.948	0.184

Table 2: Kruskal-Wallis H test results for differences between YPCCC category and class year. Significant results ($p<0.05$) are marked with a (*).

	Willingness to Travel	**Pay Extra**	**Participate in Ecotourism**
YPCCC Category	0.339	0.049*	0.354
Class Year	0.603	0.533	0.737

Table 3: Wilcoxon Signed-Ranks test results for differences between knowledge of climate change impacts. Significant results ($p<0.05$) are marked with a (*).

	Ocean Acidification	Sea Level Rise	Biodiversity Loss	Desertification
Melting Ice	0.000*	0.188	0.605	0.003*
Ocean Acidification		0.000*	0.001*	0.879
Sea Level Rise			0.595	0.001*
Biodiversity Loss				0.001*

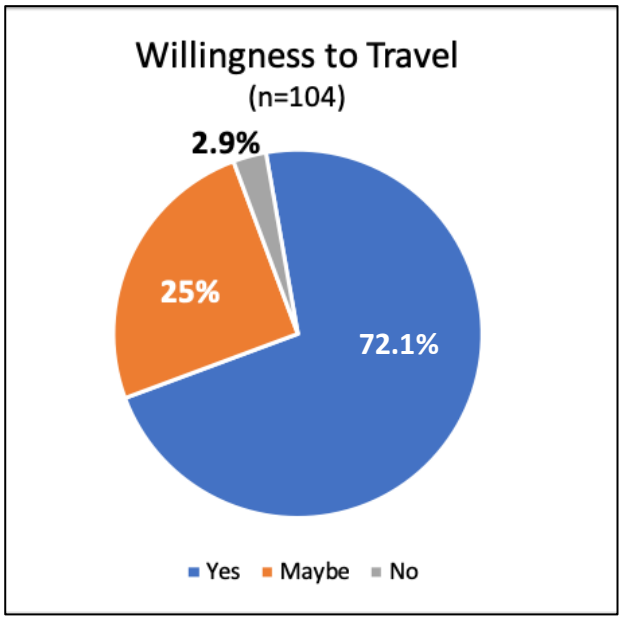

Figure 1: Percent of respondents who are still willing to travel after reading the fact sheet on climate change impacts.

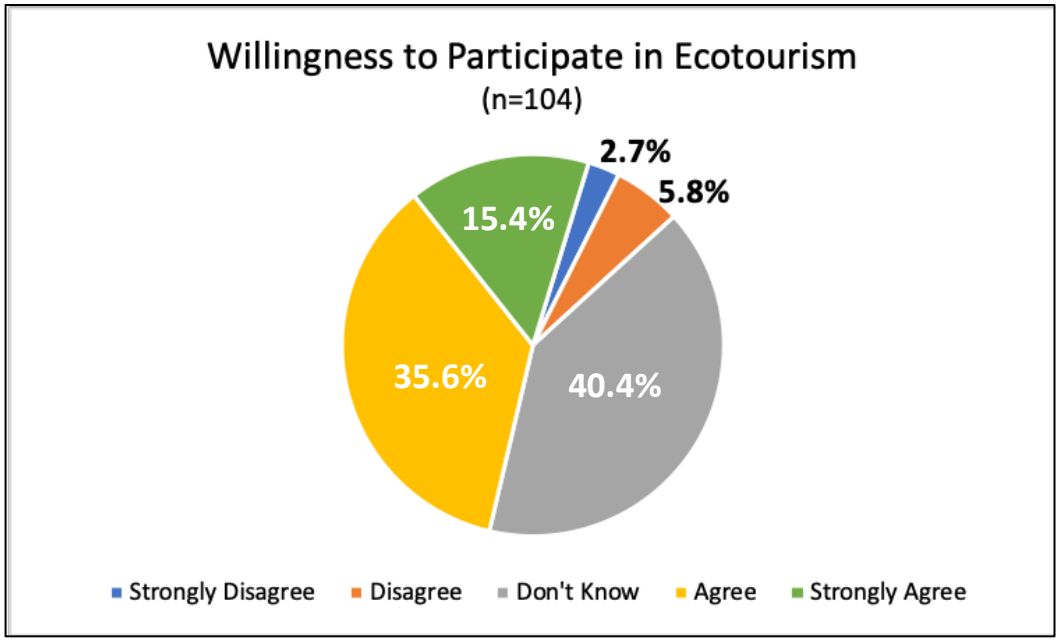

Figure 2: Percent of respondents who are willing to participate in ecotourism programs.

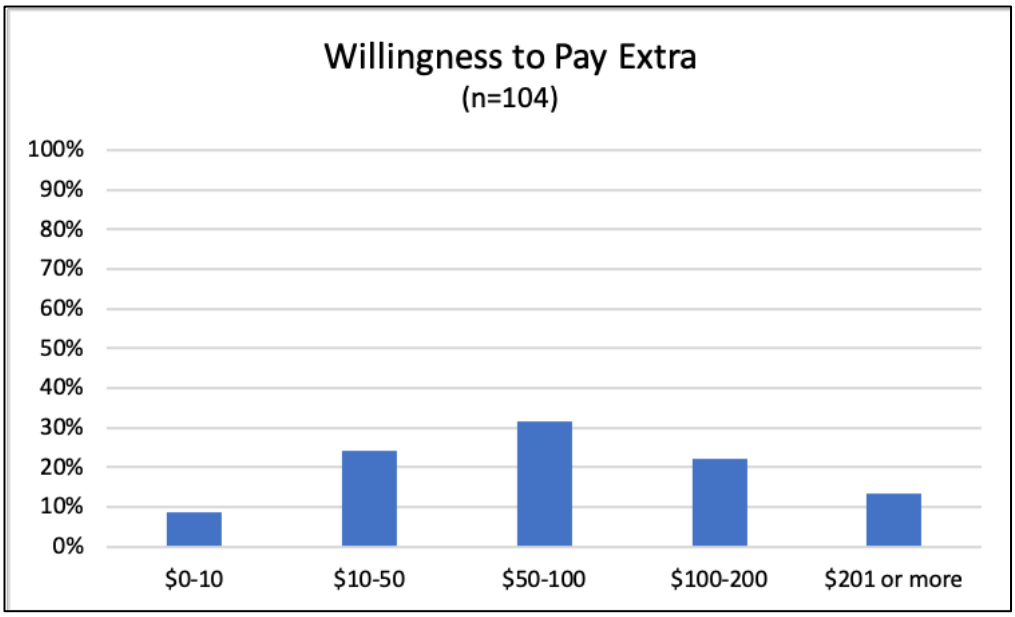

Figure 3: Percent of respondents willing to pay extra to offset damages from their travel.

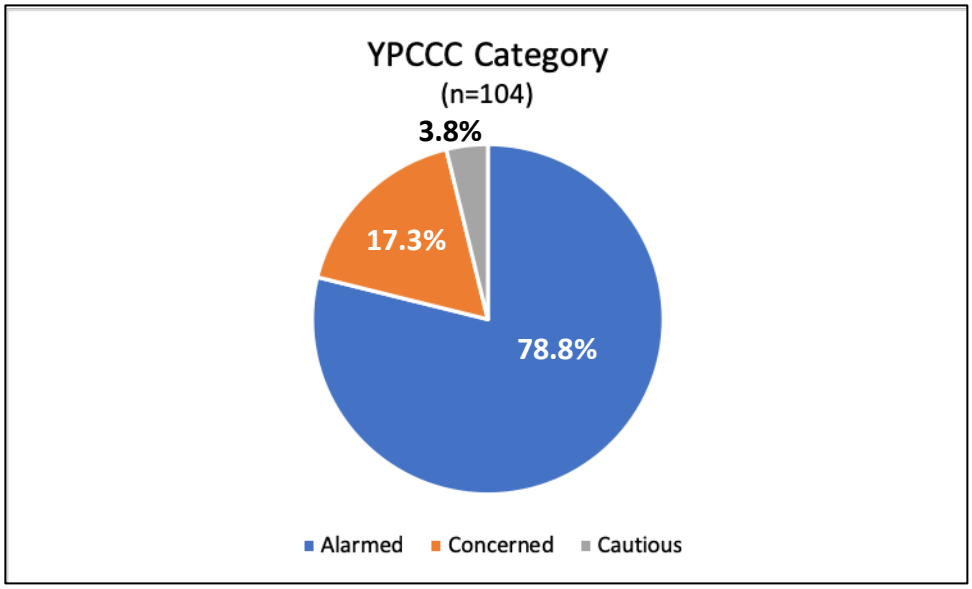

Figure 4: Percent of respondents in each of the YPCCC Six Americas categories. No respondents fit the categories of disengaged, doubtful, or dismissive.

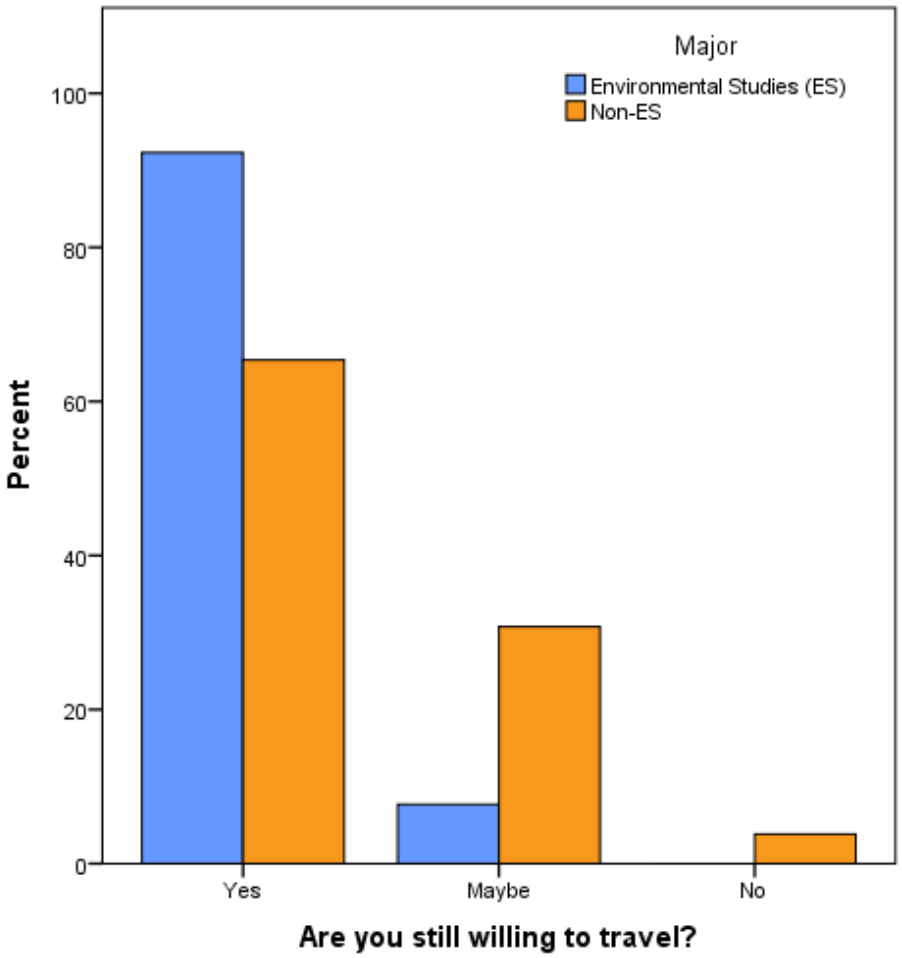

Figure 5: Graph showing the distribution of majors in relation to willingness to travel. There is a statistically significant difference between groups (p=0.008).

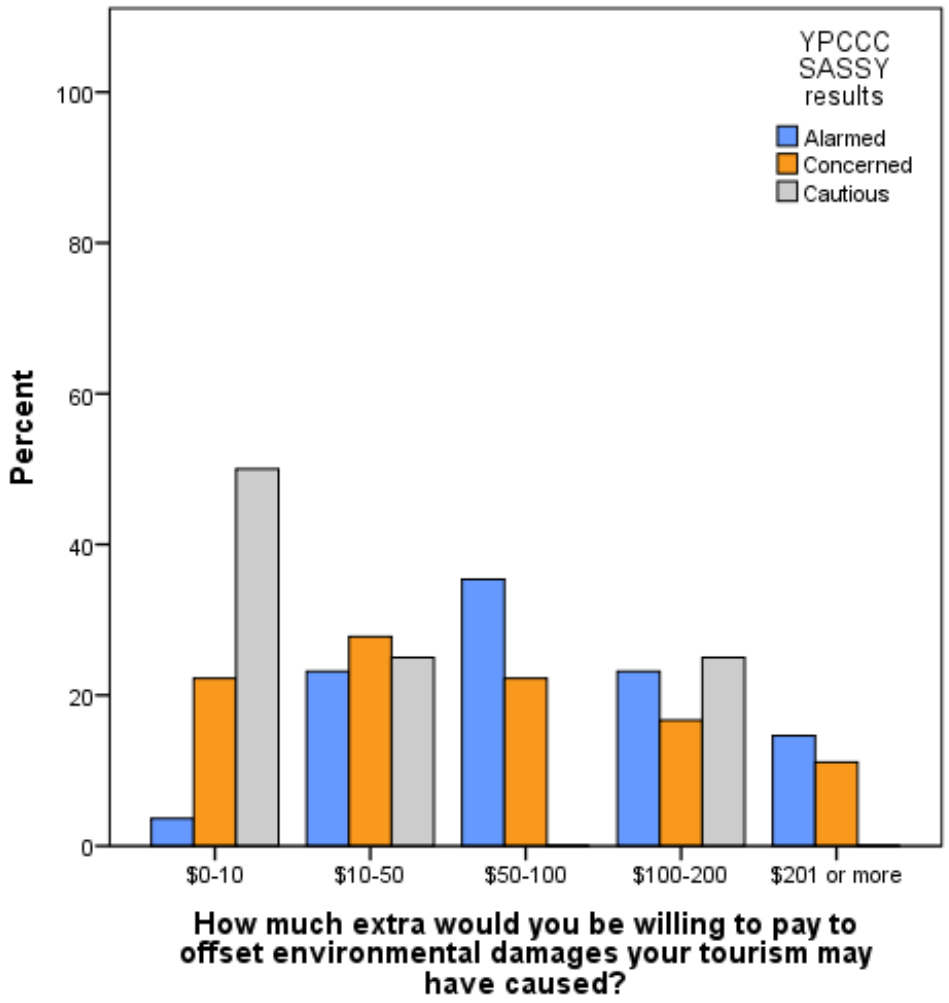

Figure 6: Graph showing the distribution of YPCCC categories in relation to willingness to pay extra. There is a statistically significant difference between groups (p=0.049).

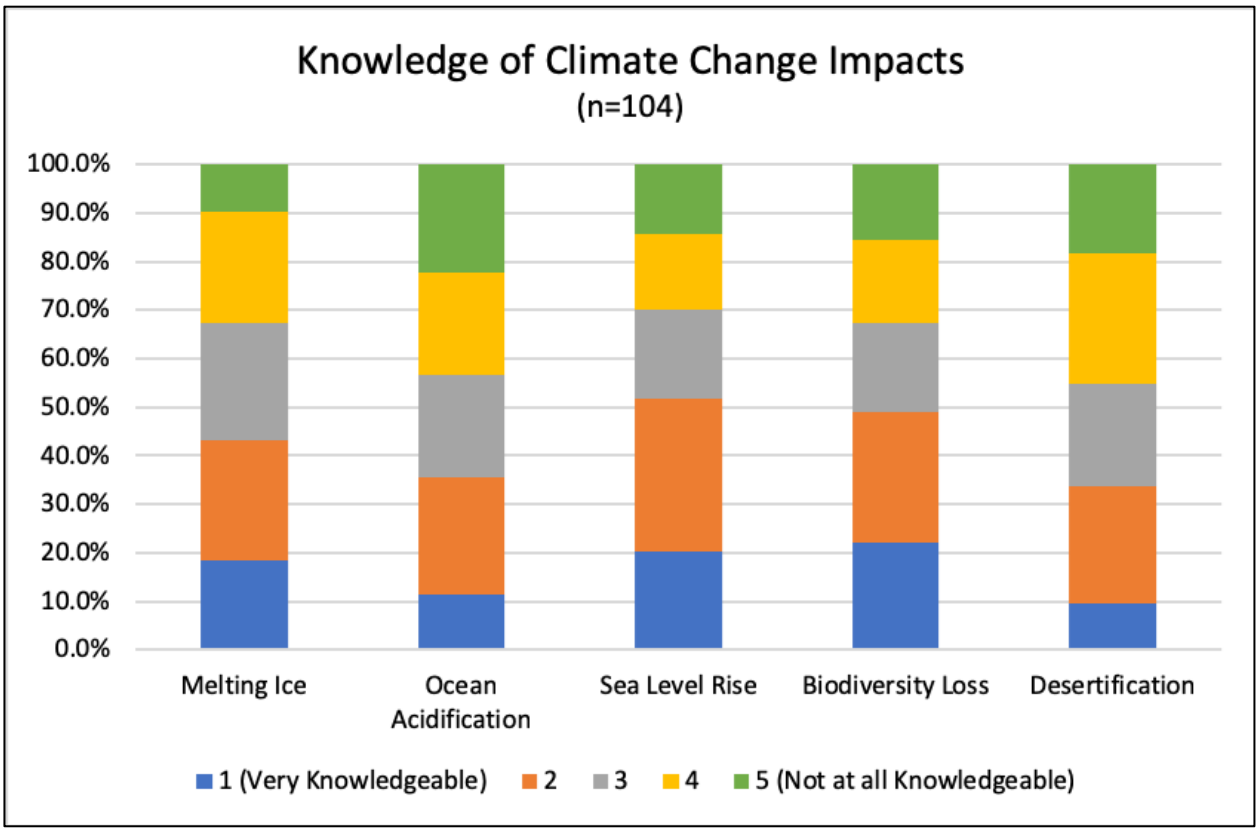

Figure 7: Percent of respondents knowledgeable about different climate change impacts.

Appendix A

ES 400 Survey on Climate Change Perceptions and Tourism

The following is a survey designed to gauge climate change perceptions and their interaction with tourism. This survey is completely anonymous and participation is voluntary. A full description of the survey and consent form can be found at (http://bit.ly/2SToZIX) and we ask that you download a copy for your records. By taking this survey, you agree that you understand the above and consent to participate in this research.

1. Pick a destination from the list of places in Question 2 where you would most like to travel. Write it here: _____.

2. Please select whether you agree or disagree with the following statement for each of the places below: This location is disappearing or threatened by climate change.
   - **a. Seychelles**
     Strongly Disagree Disagree Don't Know Agree Strongly Agree
   - **b. Tokyo, Japan**
     Strongly Disagree Disagree Don't Know Agree Strongly Agree
   - **c. Great Barrier Reef**
     Strongly Disagree Disagree Don't Know Agree Strongly Agree
   - **d. Austrian Alps**
     Strongly Disagree Disagree Don't Know Agree Strongly Agree
   - **e. Mt. Kilimanjaro**
     Strongly Disagree Disagree Don't Know Agree Strongly Agree
   - **f. Amazon Rainforest**
     Strongly Disagree Disagree Don't Know Agree Strongly Agree
   - **g. Kalahari Desert, Namibia**
     Strongly Disagree Disagree Don't Know Agree Strongly Agree
   - **h. Chicago, Illinois, United States**
     Strongly Disagree Disagree Don't Know Agree Strongly Agree
   - **i. Siberia, Russia**
     Strongly Disagree Disagree Don't Know Agree Strongly Agree
   - **j. Venice, Italy**
     Strongly Disagree Disagree Don't Know Agree Strongly Agree

3. Please number the following processes based on how much you know about them. 5=very knowledgeable, 1=not at all knowledgeable. Each number can be used more than once.
    a. Melting ice and glaciers _____
    b. Ocean acidification _____
    c. Sea level rise _____
    d. Biodiversity loss _____
    e. Desertification _____

4. How important is the issue of global warming to you personally?
   Extremely Important Very Important Somewhat Important Not too Important Not at all Important

5. How worried are you about global warming?
   Very Worried Somewhat Worried Not very Worried Not at all Worried

6. How much do you think global warming will harm you personally?
   A Great Deal A Moderate Amount Only a Little Not at All Don't Know

7. How much do you think global warming will harm future generations of people?
   A Great Deal A Moderate Amount Only a Little Not at All Don't Know

8. State how much you agree or disagree with the following statement:
    a. **Tourism contributes to environmental degradation**
       Strongly Disagree Disagree Don't Know Agree Strongly Agree

Fact Sheet -- Please read the following brief facts about each place (attached separately).

6. Taking into consideration what you just read about the listed places, would you still travel to the location you used to answer Q1?
   Yes Unsure No
    a. Why or why not?

7. Did you learn anything new from our fact sheet?
   Yes No
    a. If yes, what?

8. Would you be willing to participate in an ecotourism program in a threatened location?
   Strongly Disagree Disagree Don't Know Agree Strongly Agree

9. How much extra would you be willing to pay to offset environmental damages your tourism may have caused?
   $0-10 $10-50 $50-100 $100-200 $201 or more

10. Would you recommend traveling to a location that is threatened by climate change to someone else?
    Strongly Disagree Disagree Don't Know Agree Strongly Agree

11. Do you have any additional comments? Please write them below.

Demographics (please circle your response):
Class Year: 2019 2020 2021 2022
Political Affiliation: Democrat Independent Republican Other
Gender: Female Male Non-binary
Major (please write): _____

Appendix B

Survey Fact Sheet and Sources

Seychelles[1]

- Coral extinctions around the Seychelles expected by 2040
- The islands are at sea level and are especially susceptible to sea level rise

Tokyo, Japan[2]

- Storms depositing 3 or more inches of rain per hour are 70% more frequent than they were 30 years ago

Great Barrier Reef[3]

- Two major coral bleaching events occurred back to back in 2016 and 2017 due to rising sea temperatures

Coral bleaching in Australia

Austrian Alps[4]

- Alpine glaciers used for skiing will shrink by 80% with a temperature increase of 3ºC
- Warm weather is leading to more avalanches and less snow, destabilizing the ski industry which accounts for 4% of Austrian GNP

Mt. Kilimanjaro, Tanzania[5]

- 86% of the ice cover since 1912 has disappeared from the mountain

Disappearance of glacier on Mt. Kilimanjaro

Amazon Rainforest[4]

- Temperature increase of 3ºC could reduce the rainforest by over 40%, killing trees and many species that live there

Kalahari Desert, Namibia[4]

- Native tribes cannot find fertile land or food sources, owing to desert encroachment and a decrease in the amount of rainfall by 40%

Chicago, Illinois, United States[4]

- Dramatically rising temperatures pose human health problems
- Heavy rainfall has made floods more prevalent and severe, damaging infrastructure

Damaged building infrastructure due to permafrost thawing in Siberia

Siberia, Russia[4]

- Thawing ice underground (permafrost) will cause extensive damage to infrastructure built on top of the ice

Venice, Italy[6,7]

- Venice has 'sank' 5 inches over the last decade, and is likely to be completely underwater by 2100 due to sea level rise

Impacts of Tourism[8]

- Tourism accounts for 8% of total global greenhouse gas emissions
- Aviation is carbon-intensive and there is no plan to limit aircraft emissions
- Economic dependence of some places on tourism makes it hard to limit the industry, but traveler behavior and less-carbon intensive choices can make a difference

Sources

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8. Lenzen, M., Sun, Y., Faturay, F., Ting, Y.P., Geschke, A., & Malik, A. (2018). The carbon footprint of global tourism. *Nature Climate Change, 8*, 522-528.

Appendix C

Raw Survey Data – Attached in separate Excel file