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Geographical Variation of Climate Change Awareness in Jordan

Raed Al-Tabini
Environment and Sustainability programs, Academic Director, SIT-Study Abroad, Jordan, Amman
raed.altabini@sit.edu

Abstract
The hypothesis says that there is a difference in the communities' understanding of climate change caused by cultural and educational differences, the surrounding environment and place of residence, and since 40% of Jordan's population is in Amman, this research aims to understand regional differences (especially urban and rural differences) in perceptions of climate change in Jordan. This study includes a literature review looking at the current impact of climate change on the world as well as the impact on Jordan specifically. The data was collected through a questionnaire of 135 people and there was a difference between people living in Amman and the southern Badia region where people living in Badia see climate change as a greater threat and a more pressing issue than people living in Amman. This research contributes quantitative data on the climate change perspective of Jordanians in rural and urban areas, as well as their views on current Jordanian environmental initiatives aimed at combating climate change. The study found that there are differences between rural and urban perceptions and understanding of climate change in Jordan.
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Introduction

Jordan is widely considered one of the most water scarce countries in the world, with some studies ranking it as high as the third most water scarce (Al-Tabini and Al-Khalidi 2022, Verisk Maplecroft, 2011). Jordan has long been susceptible to drought, but over the past half century, droughts have increased in both frequency and gravity. Studies indicate that the increase in drought severity is paralleled by the ever-intensifying global phenomenon of climate change, and that drought is predicted to worsen even more in the coming decades, as the impacts of climate change become increasingly salient (EU Science Hub, 2020)(Al-Qinna et al., 2008).

In addition to drought, many urban areas in Jordan are experiencing harmful levels of pollution. In Amman the capital, particulate matter (PM) is approximately three and a half times the World Health Organizations ambient air quality guidelines (WHO, 2016; WHO, 2018), (Meteublue, 2022). These pollutants are primarily from the energy sector, consisting of transportation, manufacturing, etc; emissions from this sector also accounts for 73 percent of all greenhouse gas emissions in Jordan (UNDP, 2014).

Climate change in Jordan effects both rural communities and urban society, but in different ways. As droughts increase in occurrence and harshness with climate change, rural communities will progressively feel the impacts on their livelihoods. Nevertheless, in cities, pollution is an ever increasingly harmful issue, especially where there is poor public transportation infrastructure, as is the case in Amman. In order to decrease the impacts of climate change, it is helpful for people to have a thorough background and comprehension of the issue. Knowledge and understanding of climate change by the general public may increase the likelihood of driving individual mitigation and adaptation efforts, and inform national policy decisions (UNDP 2019; Al-Tabini and Madison 2022).

This research explores urban and rural understandings and perspectives of climate change in Jordan to determine if there is a disparity in viewpoints between populations in different locations.

Study Area

This study looks specifically at residents of Amman and the Southern region of Jordan which is considered as Badia region. Amman was selected as the urban area of focus because it is the largest city in the country and has a large diversity of residents. The ever-growing capital city of Amman is home to over four million residents, a large number of whom are Syrian refugees (DoS, 2019). The Southern region was chosen because climate change has already significantly impacted water resources in this area and will continue to do so well into the future. Additionally, in this area, livelihoods are heavily dependent on the natural environment.

The Badia covers approximately 80 percent of the total area of Jordan, and is divided into three sections: Northern Badia, Middle Badia, and Southern Badia. Figure 1 shows these regions as well as the two sites of interest for my study. The study aims at understanding how people in Jordan perceive climate change and to answer the study question: how Jordanians in in urban and rural areas perceive climate change, and if there is a difference in perception of climate change does it depend on regional location?

Figure 1: Jordanian Badia (Abuamoud,2014)

Research Parameters

This study seeks to understand whether geographic location (spatial distance from those areas where climate changes are greatest, Urban-Rural distance) influences Jordanian perceptions of climate change, and if so, how? the researcher hypothesizes that those who live in Amman and generally do not depend on the natural environment for a living will tend to perceive climate change more abstractly and less urgently than those living in the rural Southern Badia region, where more people make their living off of the natural environment.

Literature Review

Over the last century, desertification and increased aridity have become two tandem threats to these ecosystems that exist along the periphery of barren lands. It was estimated that over one fifth of the Middle East and North Africa (MENA) was at risk of desertification, according to a 2009 United Nations report (Al Zu'bi 2022). A more recent study by the Intergovernmental Panel on Climate Change concluded that this figure may be much higher, as the combined effects of climate change and the overexploitation of drylands could cause desertification in upwards of 70% of the region (Shukla et al. 2019). The volume of current literature in the field of climate change in Jordan is small, but the interest in climate change in Jordan is constantly growing. However, there are no previous studies that compare the view of the population in cities and rural areas regarding the importance of awareness of climate change.

According to a recent study Al-Tabini and Madison (2022), in 2020, a research survey was conducted to ascertain local opinions on the topic of climate change and its impacts from within arid communities. Over the course of a year, the survey included 165 participant households, each of which was interviewed in person to assess their perceptions of this phenomenon. The study's participants were Bedouin families, who lived within Jordan's arid region (the Badia). The following criteria were measured through both quantitative and qualitative methods: the degree to which residents believed in the phenomenon of climate change, the degree to which they noticed the physical effects of climate change, as well as the most significant economic and social effects it appeared to have on their lives.

The study concluded that there is a significant generation gap in the awareness and understanding of climate change; wherein, older generations had lived experience and oral history to shape their view of a changing climate and young generations had limited knowledge based solely on in-school discussions and misinformation through social-media outlets. Additionally, the study uncovered several direct manifestations of climate change, including: low rainfall rates, delayed rainfall, high temperatures, and the occurrence of many waves of drought and, occasionally, sudden floods due to destabilized soil and heavy rain. Furthermore, participants mentioned a number of environmental degradations, many of which were a result of human error, such as: tree cutting, uprooting, early grazing, and overgrazing, all which have resulted in the extinction and disappearance of many different species of plants, particularly medicinal or pastoral ones

In their 2015 paper entitled, "Personal Experience and the 'Psychological Distance' of Climate Change: An Integrative Review," Rachel McDonald, Hui Yi Chai, and Ben Newell explain the application of construal-level theory of psychological distance to perceptions of climate change. Here, the authors articulate that despite the mounting evidence that human activity is deeply tied to global climate change, climate change continues to be treated as a distant phenomenon (McDonald *et al*., 2015, p. 110). The authors argue that so long as climate change is viewed as psychologically distant, individuals will continue to misconstrue the very real threats

presented to the world by climate change.

This study specifically examines how geographic location in Jordan impacts the ways in which Jordanians perceive climate change. While the focus of this research is on geographical differences in Jordanian perceptions of climate change, any such study must begin with an understanding of the current and predicted impacts of climate change generally as well as its specific impacts in Jordan.

The 2014 Climate Change Synthesis Report put forth by the Intergovernmental Panel on Climate Change (IPCC) provides a detailed summary of observed climatic changes and their causes, future climate change risks and impacts, and the incorporation of adaptation and mitigation measures in curbing the effects of climate change. This report helps situate this study on perceptions of climate change in Jordan within the context of global climate change. The sections on observed and future climate change are among the most relevant for this research. The report states that warming of the climate system is indisputable — since 1850, there has been a steady warming trend, and the last three decades alone have been increasingly warmer than any other decade since 1850. This warming tendency has resulted in a multitude of issues, including the melting of ice sheets, the rising of the sea level, and the increase in extreme weather events. However, the report notes that this change is not a natural phenomenon. It is instead a product of anthropogenic greenhouse gas emissions, driven mainly by the combination of both economic growth and population growth since pre-industrial times. The rise in greenhouse gas emissions has resulted in extreme weather events, from floods to droughts to wildfires. These weather disasters increase people's vulnerability and threaten food security and livelihoods (IPCC, 2014).

The IPCC report further explains that as greenhouse gases continue to be released into the atmosphere, so too will the Earth continue to warm, leading to even more detrimental changes for the entire climate system. Vulnerability and risk to climate change is unevenly distributed around the world, but primarily impacts those who are poorer and less educated. In addition to providing general explanations of the effects of climate change, the IPCC details the impacts on urban and rural areas, which is pertinent to this study. Urban areas are projected to experience an increase in risk due to heat stress, storms, flooding, drought, landslides, air pollution, and water scarcity. Rural areas, on the other hand, are expected to experience major impacts on water availability and supply, food security, infrastructure, and agriculture (IPCC, 2014).

In her report, "The High Stakes of Climate Adaptation in the Middle East and North Africa [MENA]," Jeannie Sowers, examines the impacts of climate change in the MENA region through the lens of political science, focusing particularly on the relationship between the Arab Spring and regime responses to climate change. Sowers explains that while the MENA area has always struggled with drought and temperature extremes, climate change exacerbates these events — summers come earlier and last longer, temperatures are rising, annual rainfall is decreasing, flash floods are more common and lead to erosion, and long droughts are destroying even the most resilient of life in the region, such as goats, sheep, and olive trees. Sowers goes on to say that droughts often do not gain the same media attention nor garner as much international aid as events like hurricanes or floods, but they are often just as destructive — their effects are felt for years after the case. Sowers's observations about lack of attention to climate change in urban areas pertains to Jordan; it is evident throughout Amman that public and private corporations are more focused on financing these types of luxury developments than on improving infrastructure. Sowers concludes that as the impacts of climate change escalate, states should be tolerant of public critique because failure to do so will make it more difficult to effectively address adaptation. This reiterates the idea that local knowledge and perceptions of climate change inform vulnerability to future climate change.

As frail lands deteriorate due to climate change, they lose their 'productive capacity,' reducing agricultural and pastoral output as well as livable land (CEIP 2022). This problem is not just a regional issue, as arid lands cover nearly 46.2% of the terrestrial globe, and yearly just under 30 million acres of land succumb to desertification (IPCC 2022). Furthermore, with the drive toward urbanization, increasing population sizes, and the prevalence of indoor sanitation, demands on water and energy have reached an all time high (World Bank 2015). Urbanization has also placed "more pressure on … natural resources … further accelerating the desertification process" and introducing "difficulties in procuring … raw materials for … urban industries" (Al Tabini and Madison 2022). According to the World Atlas of Desertification, 35% of cities globally with populations in excess of 300,000 people are in dry lands; it is forecasted that this number will increase to 80% in the near future, 2041-2070 (WAD 2019). This presents a higher likelihood of the 'heat island effect', wherein urban environments trap heat causing extreme heat stress and weather events (WAD 2019).

Though the body of literature on the influence of climate change on Jordan's environment is limited, one article that stands out within this field is Mohammed Al-Qinna, Nezar Hammouri, Mutewekil Obeidat, and Fayez Ahmad's, "Drought Analysis in Jordan Under Current and Future Climates," in which the authors examine the current impacts of climate change on water availability in Jordan and utilize models to project future periods of drought. Based on data collected from weather stations across the country over 35 years, Al-Qinna et al. determine that drought occurrence has become more routine and drought severity has increased. The authors examine meteorological, vegetative, and agricultural droughts. They note that both meteorological droughts as

well as vegetative droughts differ significantly spatially and temporally (year and month). The general trend that Al-Qinna et al. observe is that, while droughts are fairly irregular, national droughts now tend to occur at the beginning of the rainy season (January, February, and March). Meanwhile, larger amounts of rainfall tend to occur nationally during October, November, and January than did previously. The authors write, "Both drought and wet periods are becoming more extreme with time but lasting for shorter life spans," (Al-Qinna *et al*., 2011, p. 438). Use of global climate models (GCMs) to predict future conditions (2010-2040) suggest that on average Jordan will experience a 10.5 percent decrease in rainfall, affecting the northern and southern deserted areas the most severely. In addition, droughts are predicted to become more regular, occurring in three to four year drought cycles. This article concludes that water pressures posed to Jordan by climate change have already intensified and will continue to intensify with the continuation of global warming (Al-Qinna *et al.*, 2011).

Numan Shehadeh and Sabah Ananbeh affirm the conclusion of Al-Qinna *et al.* in their paper "The Impact of Climate Change Upon Winter Rainfall." Seventy percent of rainfall in Jordan occurs between November and March, but again varies from year to year and month to month (Shehadeh & Ananbeh, 2013, p.73). When rain or snow does come, it is concentrated in intense storms that lead to erosion and flooding. According to the authors' models, winter rainfall will decrease in all six locations analyzed. This reduction will be particularly pronounced in northern and central Jordan (Shehadeh & Ananbeh, 2013).

Deepthi Rajsekhar and Steven Gorelick provide new analysis on water scarcity due to climate change in Jordan by adding the influence of transboundary flow to the existing discussion. This is detailed in "Increasing Drought in Jordan: Climate Change and Cascading Syrian Land-Use Impacts on Reducing Transboundary Flow." Here, they assert that land-use changes amplify the effects of climate change-induced drought. While precipitation is the number one source of water for the country, transboundary flow from Syria must also be considered. Thus, conditions of drought in Syria will have an impact on Jordanian water supply, and, with climate change, Syrian streamflow will likely decrease (Al-Tabini *et al.* 2022, Rajsekhar and Gorelick, 2017).

While it is useful to place this research within a comprehensive background of climate change and its impact in Jordan, it is equally important to understand perceptions of climate change in Jordan, as this is likely to ultimately influence Jordan's vulnerability to climate change. Currently, there is extremely limited literature available on this topic. However, a 2014 report released by the UNDP entitled, "Jordan's Third National Communication on Climate Change" contains a section specifically on public awareness of climate change. This section is based on a longer report entitled, available only in Arabic, titled "Survey Results Report for the Level of Knowledge and Awareness of Climate Change in Jordan." For this study, 362 questionnaires were distributed among four governorates (Irbid, Karak, Zarqa and Amman) to represent the north, center and south of the Kingdom. The survey included community groups within these governorates represented by researchers, academics, university students, public and private sectors, NGOs, press and media. The survey found that approximately 78 percent of individuals believe there has been a change in the climate during the past years. In addition, around 67 percent stated that this change in the climate was "negative and annoying to them," (United Nations Development Programme, 2014, p. 223) Furthermore, about 73 percent stated that climate change was due to anthropogenic activities like industrial activities, the energy sector and transportation. The results of the questionnaire also show that about 75 percent of people believe that the impacts of climate change at the national level will primarily manifest in the form of rising temperatures, and 65 percent stated that climate change will have a negative impact on levels of precipitation. Half of those surveyed also said that they would be interested in being involved in actions to combat climate change, and over half said that they would be willing to pay more for more climate friendly products and services. While this data is valuable as it is drawn from a large sample size, it is important to note that this sample involved predominantly educated individuals, with about 70 percent holding a bachelor's degree (United Nations Development Programme, 2014). Moreover, this study is meant to be a representative sample of the entire country, it does not aim to make any conclusions about how regional location plays into environmental attitudes, understandings, and action. The chief point of "Jordan's Third National Communication on Climate Change" report, though, is that perceptions and knowledge of climate change inform adaptive capacity, which then informs vulnerability. These relationships can be seen in Figure 2 below.

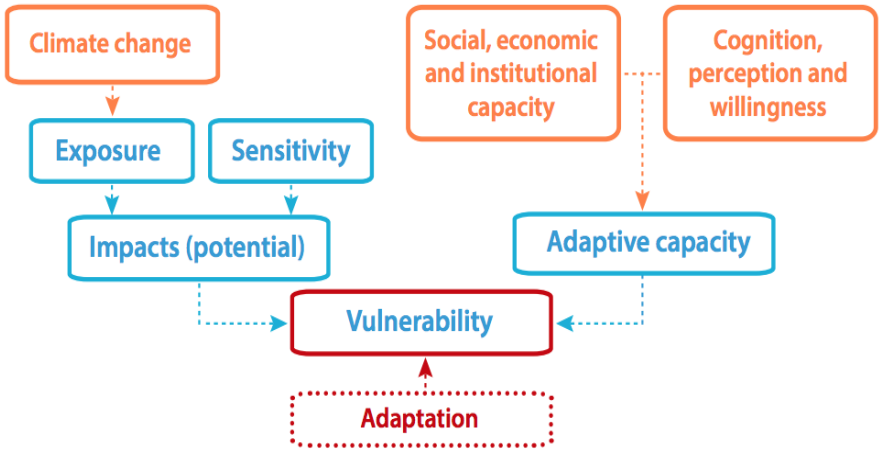

Figure 2: The Vulnerability Conceptual Framework (United Nations Development Programme, 2014)

Methodology

To determine if any differences exist in perceptions of climate change in Amman compared to the Southern Badia region, two types of data collection methods were used: surveys and interviews. Between April 1st and April 4th, approximately 100 surveys were distributed at the University of Jordan across nine schools. The purpose of circulating the questionnaire across schools was to prevent any bias in results. Of those surveys that were distributed, 89 were completed and returned. In addition to these 89 surveys, on April 8th, 46 surveys were also handed out and collected at Al Hussein Bin Talal University in Wadi Musa. Due to logistical reasons, only students from the Petra College of Tourism and Archeology were surveyed. The independent variables used in this study were gender, age, university, place of residence (Amman or outside of Amman), and academic year. The data collected from these surveys were entered into SPSS statistical software was used to analyze the results. Frequency statistics were compiled and one-way analysis of variance (ANOVA) tests were performed to check for difference. The significance level, α, was set at 0.05.

In addition to these questionnaires, nine interviews were conducted — four in the Southern Badia region and five in Amman. Interview participants in the Southern Badia. Interview participants were all between the ages of 35 and 75 with varying levels of education. Some had never attended school, others had received masters degrees, still others had received levels of education somewhere in between.

All interviews were fully structured, consisting of the same questions. Interviews lasted approximately 30 minutes each.

Findings

This section is broken down into two subsections, one on survey results and the other on interview outcomes.

Survey Results

The following tables 1 – 9 show the frequency of the responses to the nine survey questions. As indicated in Table 1, 85.8 percent of the 135 survey participants believe climate change is occurring as opposed to only 4.5 percent who do not believe climate change is occurring. In addition, 9.7 percent of the sample population believe that climate change may occur in the future.

Table 1: "In my opinion, climate change…"

	Count	Percent
Is Occurring	115	85.8
Is Not Occurring	6	4.5
Will Occur in the Future	13	9.7

Table 2 show that approximately two-thirds of participants understand climate change to be caused by humans whereas one-third understand climate change to be a natural phenomenon.

Table 2: Attitude towards climate change

	Count	Percent
Climate Change is a Natural Phenomenon	44	33.1
Climate Change is Caused by Humans	89	66.9

Table 3 show that 52.3 percent of people surveyed either agree or strongly agree that climate change is an urgent threat to the Earth. Additionally, 29.1 percent of respondents neither agree nor disagree that it is an urgent threat to the Earth, leaving only 18.7 percent of individuals who disagree or strongly disagree that climate change is an urgent threat to the Earth.

Table 3: Climate change is an urgent threat to the Earth

	Count	Percent
Strongly Disagree	10	7.5
Disagree	15	11.2
Neither Agree nor Disagree	39	29.1
Agree	23	17.2
Strongly Agree	47	35.1

As can be seen in Table 4, 50 percent of those surveyed either agree or strongly agree that climate change is currently affecting Jordan.

Table 4: Climate change is currently affecting Jordan

	Count	Percent
Strongly Disagree	15	11.2
Disagree	16	11.9
Neither Agree nor Disagree	36	26.9
Agree	32	23.9
Strongly Agree	35	26.1

Table 5 illustrate that almost a third of respondents neither agree nor disagree that climate change is impacting their life directly, whereas approximately 50 percent of respondents believe it is impacting their life directly.

Table 5: “Climate change is directly impacting my family”

	Count	Percent
Strongly Disagree	13	9.8
Disagree	22	16.5
Neither Agree nor Disagree	37	27.8
Agree	32	24.1
Strongly Agree	29	21.8

Table 6 present a similar distribution of responses as Table 5 and Graph 5, but with more respondents answering that they disagree and fewer respondents answering that they strongly agree.

Table 6: “Climate change is directly impacting my family”

	Count	Percent
Strongly Disagree	11	8.4
Disagree	17	13.0
Neither Agree nor Disagree	38	29.0
Agree	29	22.1
Strongly Agree	15	27.5

For question seven, participants were asked which one of three issues — drought, pollution, and waste disposal — do they see as the biggest environmental issue in Jordan. Table 7 show the spread of these results, indicating that the largest number of participants view pollution as the most significant environmental issue, followed closely by drought, and then waste disposal.

Table 7: The biggest environmental issue facing Jordan is…

	Count	Percent
Drought	46	35.4
Pollution	57	43.8
Waste Disposal	27	20.8

The final four tables 8 – 9 speak to how Jordanians understand and view environmental policy and initiatives put forth by the government. The tables and graphs indicate that there is relatively little knowledge of such initiatives, and there is also low satisfaction with these initiatives.

Table 8: Knowledge of Jordanian government's environmental initiatives

	Count	Percent
No knowledge	52	38.5
Little knowledge	34	25.2
Some knowledge	24	17.8
Considerable knowledge	7	5.2
A lot of knowledge	18	13.3

Table 9: Satisfaction with Government's Initiatives related to climate change

	Count	Percent
Unsatisfied	44	32.6
Mostly unsatisfied	28	20.7
Partially satisfied	32	23.7
Mostly satisfied	15	11.1
Satisfied	16	11.9

The SPSS analysis of the survey yielded a number of statistically significant outcomes; these results are presented in the subsequent tables. One-way ANOVA tests were used to determine if there were significant differences in the responses to questions based on the five variables: gender, age, university, location of residence (Amman or outside of Amman), and academic year. Of the nine questions that were asked, four resulted in statistically significant outcomes. All statistically significant outcomes were for either the variable "place of residence" or the variable "university."

Tables 10 and 10-1 show the SPSS results for question two on attitude towards climate change (natural or anthropogenic). Numerical values were given to the two choices — "natural phenomenon" is denoted with a value of one and "caused by humans" with a value of two. The mean value for Amman is 1.74 whereas the mean value for outside of Amman is 1.57. The ANOVA shows that this difference is statistically significant, suggesting that those living in Amman are more likely to see climate change as anthropogenic than those living outside of Amman.

Table 10: ANOVA Results for "Attitude toward climate change "natural vs anthropogenic"

F- Statistic	Significance
4.307	0.040

Table 10-1: Descriptive Results for "Attitude towards climate change (natural v. anthropogenic)"

	Count	Mean Response
Amman	80	1.7375
Outside of Amman	53	1.5660

Numerical values were also assigned to possible responses to question three, which asks about the extent to which participants see climate change as an urgent threat to the Earth; one corresponds to strongly disagree and five corresponds to strongly agree. As displayed in tables 11 and 11-1, the mean value for Amman is 3.44 whereas the mean value for outside of Amman is 3.87. The ANOVA results indicate that this difference is statistically significant, signifying that those living outside of Amman are more likely to see climate change as an urgent threat to the Earth than those living in Amman.

Table 11. ANOVA Results for "Attitude toward climate change "is an urgent threat to the earth

F- Statistic	Significance
3.801	0.053

Table 11-1: Descriptive Results for "Climate change is an urgent threat to the Earth"

	Count	Mean Response
Amman	80	3.4375
Outside of Amman	54	3.8704

The results from Question 4, which asks about the extent to which participants believe climate change is currently affecting Jordan, also produced a statistically significant difference, as can be seen in tables 12 and 12-1. Again, numerical values were assigned to the possible responses, one being strongly disagree and five being strongly agree. Participants from the University of Jordan in Amman had a mean response of 3.26 while participants from Al-Hussein Bin Talal University in the governorate of Ma'an had a mean response of 3.73. Students from Al-Hussein Bin Talal University tend to believe that climate change is impacting Jordan a greater amount than students from from University of Jordan.

Table 12. ANOVA Results for "Attitude toward climate change "is currently affecting Jordan

F- Statistic	Significance
4.084	0.045

Table 12-1: Descriptive Results for "Climate change is currently affecting Jordan"

	Count	Mean Response
University of Jordan	89	3.2584
Al-Hussein Bin Talal University	45	3.7333

The last question that produced a statistically significant difference was question eight, which asked participants to rank their knowledge of the Jordanian government's environmental initiatives (one being no knowledge and five being a lot of knowledge). The mean response value for students from University of Jordan was 2.06, while the mean response value for students from Al-Hussein Bin Talal University was 2.76. This notable difference signifies that students in who attend school in the Southern Badia generally have more knowledge on the Jordanian government's environmental initiatives.

Table 13. ANOVA Results for "Knowledge of Jordanian Government's environmental initiatives

F- Statistic	Significance
8.377	0.004

Table 13-1: Descriptive Results for "Knowledge of Jordanian government's environmental initiatives"

	Count	Mean Response
University of Jordan	89	2.0562
Al-Hussein Bin Talal University	46	2.7609

Discussion

The results of the surveys and interviews suggest that there are differences between rural and urban perceptions and understandings of climate change in Jordan. While most participants either were familiar with the term climate change or understood the notion, when delving deeper into what this term implies, certain regional variations became apparent. Survey results indicate that there is a difference in knowledge of the causes of climate change. Most Ammanis surveyed recognize climate change as an anthropogenic phenomenon, whereas in the Southern Badia, about half of those surveyed recognize it as anthropogenic, while the other half attribute it to nature. These survey results were further validated by the interviews. One interviewee in the Southern Badia attributed climate change to "man's deed… and the bad use of resources" (Interview with D, 4/8/2018), but the

others attributed it to weather, *Allah*, or were simply unsure of the cause. Of the Ammanis interviewed two of the three who said climate change was occurring attributed it to human activities.

When examining the urgency of climate change to the world and its impact in Jordan, survey participants from outside of Amman, predominantly from the Southern Badia region, or who attended school in the Southern Badia region tended to view climate change more urgently and believe that its impact in Jordan was greater than participants from Amman or who attended school in Amman. The interview responses provided similar understandings; all those interviewed in the Southern Badia ranked climate change as high priority for both Jordan and the world. The majority of those interviewed in Amman ranked climate change as low or medium priority for the world, and all Ammanis interviewed ranked climate change as a low or medium priority for Jordan. These findings are both consistent with my hypothesis and in line with McDonald *et al.*'s explanation of the relationship between perceptions of climate change and construal-level theory of psychological distance. For those living or attending school in the Southern Badia, the decrease in precipitation and the fluctuation in normal temperatures are extremely evident as these changes present themselves in the reduction of grass, shrubbery and trees, in the impact on animals, and in the economic hardship that it has brought to these communities. However, for those living in Amman or attending school there, these changes are not as apparent — in cities, it is more difficult to see changes in vegetation and if changes are recognized, there are other situations that could be the cause, like construction work or new infrastructure. In addition, more resources may tend to be allocated to Amman, diminishing the sense of urgency around this issue. Those living or attending school in the Southern Badia are what McDonald et al. terms psychologically close (spatially) to climate change, whereas those living or attending school in Amman are psychologically distant (spatially). This suggests that those in Amman are less likely than those in the Southern Badia to take action that aims at tackling climate change. However, this presents a troubling issue, as Amman is home to 40 percent of the Jordanian population. While it is important that individuals living in more rural locations take measures to reduce their impact of climate change, if those in Amman fail to do so, then rural initiatives are not as influential as they could be.

However, the Greater Amman Municipality (GAM) initiatives as well as the C40 and 100 Resilient Cities measures suggest that there is reason to be optimistic. Without public pressure, Ammani leaders are moving forward in addressing climate change. And yet, it is highly likely that increased public pressure would shorten this timeline.

Conclusion

Jordanian perceptions of climate change vary significantly by geographic location. Yet, some understandings and opinions seem to be entirely unrelated to geography. Overall, Jordanians understand that the environment is changing and can articulate how these changes are impacting their country, primarily in the form of drought, extreme temperatures, and flash floods. However, Jordanian perspectives on what causes climate change notably differ depending on whether or not the person lives in an urban or rural location; those in urban Amman recognize climate change as an anthropogenic phenomenon, while those living rurally understand it as a natural occurrence. Although this shows that Ammanis are more scientifically versed in comprehending this global issue, they do not view this phenomenon as threatening to them, unlike those in the Southern Badia. These findings are congruent with construal-level theory of psychological distance, which suggests that those who are psychologically distant — in the case of this study, those from Amman, as their livelihoods are not usually dependent on the natural environment — understand climate change more abstractly and see it as less relevant.

Vulnerable communities in arid environments are facing a desolate and hostile future in which water shortages are common, temperatures are lethal, and vegetation is all but destroyed - to combat this seemingly insurmountable future, effective public engagement is essential. This entails combining modern educational methods and media dissemination with traditional knowledge systems that do not negate generations of local peoples' practical, lived experience.

Across the world, climate change is becoming increasingly dire — superstorms, extreme temperatures, and sea-level rise are just some of the catastrophic impacts. In Jordan, the effects of climate change manifest in severe droughts and sporadic, but acute rain events that lead to flooding and erosion. Thus, it is evident that Jordan is highly vulnerable to climate change. In order to decrease this vulnerability, Jordan must take adaptive and mitigating steps. Studies show that cognition and perception of climate change influence the adaptive capacity of countries, which in turn influence vulnerability (United Nations Development Programme, 2014).

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