

Urban Residents' Perception and Behaviour of Climate Change in Tianjin, China

by

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Abstract

Engaging the public in climate action is necessary to support China's goal to achieve its ambitious carbon reduction commitment to address the climate crisis. By conducting an online survey, this research sampled Tianjin urban residents to investigate their climate change perceptions and pro-environmental behaviours. It used a nonprobability sampling design, combined nonproportional quota sampling with snowball sampling, and collected 130 valid responses. The questionnaire investigated Tianjin urban residents' perception of the climate issue, their preferred and trusted information source, and daily pro-environmental household practices. Moreover, it explored crucial factors influencing individuals' knowledge, beliefs, concerns, and engagement in climate action (willingness to pay). The results showed that, on average, respondents' knowledge of climate change was still at a medium level. Meanwhile, respondents expressed a high level of belief about it and its anthropogenic nature and generally held a moderately high level of concern with an increasing trend. People acquired relative information rationally via multiple channels; the government was the most trusted source for learning more information. Respondents carried out various pro-environmental practices in daily life and reported a desire to support environmental protection via household actions, while results indicated their indecisive attitude towards willingness to pay for mitigation.

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Introduction

The severity and the trend of climate change in the past few years "emphasize the urgency of immediate and more ambitious action to address climate risks. Half measures are no longer an option (as cited in IPCC, 2022a, p. 2)." Ambitious targets, such as China's commitment to carbon neutrality by 2060 (The Xinhua News Agency, 2020), require fundamental changes in energy usage and individual's lifestyles. Public participation is an indispensable part of this change because around half of the energy used directly or indirectly comes from consumer activities (Feng et al., 2011; Nejat et al., 2015). Encouraging the public to adjust their lifestyles and consumer behaviours plays a critical role in CO₂ emission reduction. To encourage the public to take action, raising their perception of climate change is crucial because awareness (Fu et al., 2020) and concern (Nauges & Wheeler, 2017) are important influences on people's mitigation behaviour. Before advocating initiatives, the government should understand the status quo of the public's understanding of this issue.

There have been extensive studies on the public perceptions of climate change in recent years, yet most of them were centrally conducted in Anglophone countries (e.g., Capstick et al., 2015; Lorenzoni & Pidgeon, 2006; McCright & Dunlap, 2011). Since China's cultural background and political environment are unlike their counterparts in Anglophone countries, valuable conclusions and suggestions in those researches may not typify China. Moreover, due to the remarkable inconsistency of development rates and

progress, people's cognitive level, and landscape features as well as sensitivity to climate change across different regions of the country, accurate local-scale data on public perception of the climate issue may prove more beneficial. In China, urban areas have greater energy consumption than rural areas, and it is accelerating at a fast speed. Thus, focusing on engaging urban residents to take climate action is a crucial step. People's understanding of climate change can affect their daily choices, their attitude toward mitigation policies, and can influence the efficiency of implementing policies. Therefore, investigating Chinese urban residents' perceptions of climate change is essential for China to achieve carbon goals and address climate risk.

In this research, I conducted an online survey in a middle-size coastal city, Tianjin, China. I harnessed an extensively used Chinese social media platform, WeChat, to recruit Tianjin urban residents as participants. I explored the current status of urban residents' perceptions of climate change, information sources, and pro-environmental habits and practice. The localized information derived from the results could support future policy-making and climate change communication.

The objectives of this research were the following:

- 1) to investigate Tianjin urban residents' perceptions, belief, and concerns about climate change;
- 2) to identify which information source might be effective in broadcasting climate change;

3) to assess the extent to which urban residents have undertaken household pro-environmental behaviours in their daily life, their intentions, and willingness to pay for climate change mitigations, and

4) to identify which factors significantly predict individuals' knowledge, belief, concern and willingness to pay towards climate issue.

This first chapter elaborates on this research field's background and China's context to paint an overall picture and review the pertinent literature essential for each sub-theme of the survey instrument. Chapter 2 presents the research methodology, including the survey procedure, participant screening, variables, and statistical analysis. Chapter 3 displays the results of this research. The fourth chapter discusses the results, research delimitations, and limitations. The fifth and final chapter describes the conclusions and recommendations revealed by this research.

Literature Review

Research Background

Climate change, caused by the accumulation of greenhouse gases in the atmosphere, threatens unclear the natural ecosystem and human society (IPCC, 2022b). The rising global surface temperature and more frequent extreme weather events caused by climate change have raised global concerns for many years. Disasters, such as the 2019 Australian bushfires (Ge & Lin, 2021) and 2020 floods in central China (Zhong, 2020), posed enormous social and economic challenges to the disaster-stricken people.

According to the Intergovernmental Panel on Climate Change's (IPCC) report, human activities emitting global greenhouse gas emissions are the main reason for climate change ((IPCC, 2022b), so it is our responsibility to reverse this trend. Despite global governments' determination to mitigate emissions, annual CO₂ emissions reached 36.3 billion tones in 2021, the highest ever level, and are still growing (International Energy Agency, 2022).

China has been the world's largest energy consumer and GHGs emitter for many years, accounting for around 30% of global emissions (Wang & Zhou, 2020). Along with the trend of the international focus on climate change, China had put the climate issue as a central topic in policy making (Wang & Zhou, 2020; Zhou & Sun, 2020). The 13th Five-Year Plan (2016–2020) highlighted "a combined goal of environmental protection and addressing climate change nationwide," aiming to achieve "an ecological

civilization" (Wang & Zhou, 2020, p. 12 of 18). Moreover, China is increasingly committed to fighting climate change with other nations. China outlined a target of peaking its emissions by 2030 at COP21 (Yang & Stoddart, 2021) and set an ambitious goal of carbon neutrality by 2060 in 2020 during a virtual United Nations General Assembly (The Xinhua News Agency, 2020).

China's ambitious targets requires sound policies and expeditious measures to promote fundamental shifts in energy consumption across the country (Poortinga et al., 2019). In the past few years, China vigorously promoted the development of renewable energy and launched rigid adjustments to industrial structure, and these efforts have achieved unexpected progress (Ge & Lin, 2021; Zhou & Sun, 2020). However, relying solely on technology innovation or regulating emission-intensive industries is insufficient; raising public awareness, facilitating the change of their inner realm, and engaging them are also crucial measures for climate action.

China's central government should pay more attention to the collective action of the public to achieve" broader social change and shared responsibility (Lorenzoni & Pidgeon, 2006, p.85). Individuals play a crucial role in reducing CO₂ emissions because they play a role in influencing the decision-making in government, business, or community. Most importantly, people's daily activities and consumption choices contribute to a large portion of energy consumption (Dietz et al., 2020; Wolf & Moser, 2011). Since household energy consumption has raised attention worldwide, many

countries have taken the step to encourage public participation (Wolf & Moser, 2011). For example, to meet the goal of a 34% reduction by 2020, the UK listed "home and communities" as one aspect to achieve the goal and emphasized individual engagement (Department of Energy and Climate Change, 2009). In China, studies showed that the majority of the Chinese public supports the government in taking action to address climate change (Kim & Wolinsky-Nahmias, 2014; Wang & Zhou, 2020; Zhou & Sun, 2020), and they also acknowledged that changing lifestyle was necessary mitigation (Wang & Zhou, 2020; Wei et al., 2014). Unfortunately, China relatively lacked public participation (Chen et al., 2017), and the situation seems still now. Wei et al. (2014) reported that the respondents were not quite aware of the climate measures launched by the government, based on the survey conducted among officials in the Centre for Disease Control and Prevention (CDC) in Shanxi province. As China is well known for carrying out top-down governance, this phenomenon might be because of China's "authoritarian environmentalism model where a non-participatory approach bypasses public ignorance, conflicts of interest, and other factors that slow or hinder climate action" (Yang & Stoddart, 2021, p. 147). Nevertheless, Yang & Stoddart (2021) argue that successful outcomes were generally based on cooperation among multiple stakeholders rather than solely relying on a powerful state apparatus. Failure to value public awareness and participation in this pro-environmental transition would inevitably be problematic, as the policy implementation might be misunderstood or neglected (Lorenzoni & Pidgeon,

2006). Thus, it is vital and urgent for China to make relevant policies and strategies to mobilize individual engagement. Individuals' perception of the climate issue significantly influences their level of support for the policy and behavioural change in addressing the problem (Lorenzoni & Pidgeon, 2006; Poortinga et al., 2019; Wang & Zhou, 2020); and exploring their perceptions is the foundation before making and implementing policies to facilitate their participation (Ballew et al., 2019; Wang & Zhou, 2020; Wei et al., 2014).

Studies focusing on public attitudes toward climate change (or global warming) have been undertaken across different continents, especially in anglophone countries like UK and US, since the 1980s (Capstick et al., 2015; Nisbet & Myers, 2007; Wolf & Moser, 2011). This growing body of literature ranges from local small-group interviews to international-scale surveys regularly over long timescales polls (e.g., Capstick et al., 2015; Poortinga et al., 2019; Wolf & Moser, 2011). These researches provided valuable insights for current research, even though the results universally showed that public perception substantially varies between regions, cities, and nations; and even the belief about it fluctuates over time (e.g., Ge & Lin, 2021; Howe et al., 2015; Lee et al., 2015). Influencing factors, including personal experience related to extreme weather events (e.g., flood and typhoon), political orientation, world views, cultural background, media coverage, social norm, and demographic factors (e.g., age and sex), have a significant impact on public opinion on climate change (Capstick et al., 2015; Ge & Lin, 2021; Howe et al., 2015; Poortinga et al., 2019; Wang & Zhou, 2020). Poortinga et al. (2019)

argued that "even if the direction of the associations were to a large extent consistent, the sizes of the effects were not (p. 33)." Moreover, a meta-analysis of the literature showed that participants' responses were significantly affected by the research methods and wording of surveys (Hornsey et al., 2016). All of these variables suggest that researchers and policymakers keep in mind that findings from one research or one region may not be generalized to different nations or cultural contexts (Capstick et al., 2015; Poortinga et al., 2019). Thus, it is valuable to undertake microscale and more accurate investigations at a localized level or a population sub-group to draw conclusions for local decision-makers.

In China, as of today, in-depth studies on public perceptions of climate change are still limited both at the national or local levels; and it is worthwhile to carry out up-to-date studies based on a smaller/local scale. The reasons can be summarized as follows. 1) Although China has experienced remarkable economic growth in the past decades, it is important to note that the development rate and progress are highly inconsistent across the country. 2) The vast landscape means different regions must deal with different kinds of climate change impacts, like coastal erosion for coastal cities and drought for inland regions. They also have different levels of vulnerability and resilience in facing those impacts. 3) Related studies are easily outdated due to the rapidly changing climate issue and social context. 4) One-size-fits-all policy is usually inefficient because it can only access limited goals or smaller sizes of audiences than intended (Wolf & Moser, 2011).

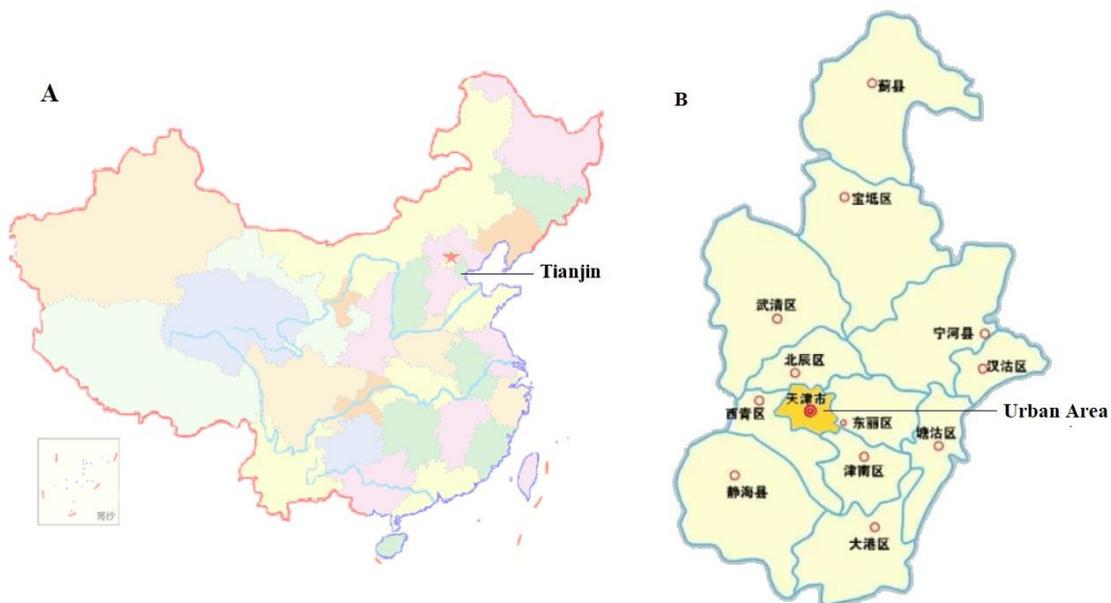
So localized initiatives according to local features work better. Therefore, it is reasonable to speculate that public perceptions of climate change and responses to mitigation policies greatly vary nationwide, even though China has a cultural background of obedience and instinctively attempting to be homogeneous. In summary, the latest data of local residents' understanding of climate issues would be invaluable information.

Focusing on engaging urban residents and helping to adjust their modern lifestyle and household practices is the ideal first step to motivating public participation. A study showed that Chinese households' direct and indirect energy consumption accounted for 30% of total carbon dioxide emissions (Wei et al., 2007). And differences between urban and rural areas were significant in terms of energy consumption (Feng et al., 2011). High-income groups mainly cluster in the urban area, while researches showed that income strongly correlated with energy consumption for residents and households (Feng et al., 2011; Pachauri, 2004; Reinders et al., 2003). The high-income people had a more diverse choice in life and prefer high-level commodities, which are more energy-intensive (Feng et al., 2011). The energy consumption pattern of the urban areas is much higher than that of the rural areas, so the urban lifestyle has more impact on CO₂ emission (Feng et al., 2011). Since China has developed rapidly in recent years, it has experienced rapid and intensive urbanization. The ratio of rural to urban populations in China decreased from 1.66 in 2001 to 0.57 in 2020 (Feng et al., 2011; State Statistical Bureau, 2021). The overwhelming trend of migrant workers coming to and settling in the urban areas and

consequently adopting a modern lifestyle leads to urban areas' energy consumption and CO₂ emissions growth faster. Urban households' direct energy usage is increasing fast as residents use more electrical appliances and air conditioning (Feng et al., 2011). More than that, data revealed that indirect energy consumption in urban areas was twice those of direct actions (Feng et al., 2011). Indirect consumption mainly relates to consumer

Figure 1

The location of Tianjin and its urban area.



Note. (A) The map of China shows the location of Tianjin municipality. From [Photograph of China map], (<https://www.25352.com/ditu/>). (B) This map displays the shape of Tianjin municipality and its urban area in the centre. From [Photograph of Tianjin map], (<http://www.soutu123.com/png/2561407.html>).

behaviour, like purchasing clothing or recreational service. And a large portion of these purchases is redundant and unnecessary, which means the consumption behaviour of

urban residents has notable room to modify without negatively affecting people's basic living needs.

This online survey was undertaken in a middle-size coastal city, Tianjin (Figure 1). Tianjin is located along the west coast of the Bohai Gulf and is 100 kilometers away from Beijing. It covers a total terrestrial area of 11966 km², with an urban area of 183 km² (Tianjin Bureau of Statistics, 2019). The urban area contains six districts: Heping, Hexi, Hedong, Hebei, Nankai, and Hongqiao. It is at the mid-range level in China in population size and economics. Unlike other typical coastal cities that have to face the risk of coastal erosion and typhoon, by now, Tianjin's urban area is more influenced by rainstorm waterlogging, high-temperature risk and air pollution risk of climate change (Sining, & Jun, 2021). Moreover, rising sea levels challenge the urban drainage system in a rainstorm; and flood generated millions of dollars in losses (Yu, 2015). The urban heat island effect caused by the higher population density and less greening in the city makes the high-temperature risk even worse (Sining, & Jun, 2021). Analysis shows that Tianjin's annual mean temperature increase from 1959 to 2017 was 2.05°C (Si et al., 2021). Citizens generally find warm days are coming early, and hot weather days have been more frequent in summer year by year. Apart from that, this area has experienced extreme weather and climate events in recent years. These phenomena have aroused broad concern among the public (Sining, & Jun, 2021).

Knowledge

Developed countries, especially Anglophone countries, started surveys since the 1980s in the field of public knowledge about climate change or global warming and had extensive studies. Capstick et al. (2015) conducted a meta-analysis of the literature from different national polls and summarized that the public's awareness rose steadily and rapidly from the 1980s to the early 1990s. However, after that, the public's opinion and concern started to vary and fluctuate (Capstick et al., 2015). From the late-2000s, skepticism (discussed in the following sections) came to the fore; and people's belief about the climate issue showed a process of falling and then rising back (Capstick et al., 2015). Until 2017, the public's understanding of climate change has stabilized at a similar level to where it was decades ago (Ballew et al., 2019; Capstick et al., 2015). For example, the regularly undertaken survey projects cooperated by Yale and George Mason University focusing on Americans found that the ratio of Americans who thought climate change was happening went from 71% (2008) to 59% (2010) and then finally bounced back in 2017 (71%) (Ballew et al., 2019). The latest ratio reported in April 2022 is 72% (Leiserowitz et al., 2022).

Chinese public awareness has shown great progress in the past two decades, and studies on public perception of climate change have also been enriched. However, previous studies indicated that the Chinese public still does not have a comprehensive understanding of climate change (Wolf & Moser, 2011). In the 2000s, international

survey agencies, like Gallup, undertook a comprehensive survey on climate change globally, including China, revealed that 62% of Chinese participants know something or a great deal about climate change (Pugliese & Ray, 2009). This indicated that more than 30% of the respondents still do not know about this issue, let alone people living in remote rural areas who might have no chance to access this survey. However, according to the latest national survey held by the Chinese government in 2017, 94.4% of the 4,250 respondents believe climate change is happening (Wang & Zhou, 202). In addition, local governments and institutions started to conduct more specific research at different levels or focus on sub-groups of the public. For example, Wei et al. (2014) conducted a survey in 2013 among health professionals in all of the professional departments in Centres for Disease Control and Prevention (CDC) in Shanxi Province, China, whose responsibilities were to provide leadership and monitor and protect the health of the local population. The results showed that the majority of the respondents believed the occurrence of climate change (66%), happening in their local region (69%), and the following negative effects (57%) (Wei et al., 2014), though, as public professionals, the ratio should have been higher. Another survey in 2014 focused on residents' cognition in Xiamen city, a fast-developing coastal city, for the local municipal government to develop adaptation strategies (Lin et al., 2021). Lin et al. (2021) reported that "residents' knowledge on climate change and its risk was still at a relatively low level on average", and the participants barely identified sea level rise as one of the consequences (p.1). Since more

frequent and disastrous weather events related to climate change in the past two years attracted worldwide attention, Chinese public awareness might have changed, which shows the necessity of further research.

Nevertheless, the awareness of climate change is also multifaceted because the phenomenon is complex, involves multidisciplinary knowledge, and is difficult for laypeople to conceptualize (Dietz et al., 2020; Lorenzoni & Pidgeon, 2006; Wang & Zhou, 2020). And geographic regions may face various kinds of threats (Wei et al., 2014). Consequently, individuals have different personal experiences, aspects of knowledge, and worldviews toward climate change. For example, even though the public in developed countries generally understand burning fossil fuel and CO₂ in the atmosphere as the main cause and rising sea level and droughts as the possible negative outcomes, a large portion of the people hold the confusion of ozone depletion association with climate change as the cause or one of the consequences (Capstick et al., 2015; Tvinnereim et al., 2017; Wolf & Moser, 2011). This means a simple, self-assessed scale may fail to sufficiently reflect the underlying awareness (Kaiser & Fuhrer, 2003; Tobler et al., 2012). Shi et al. (2016) suggested that "it is worthwhile for researchers to carefully develop and test domain-specific knowledge scales" as a more accurate scale leads to more informative predictions and better contributes to the other discussion like attitude-behaviour gap (p. 762). Therefore, demonstrating a diversified choice of causes or consequences, even with confusing choices in a multiple-choice survey, is better than

merely asking the participants, " Are you aware of the causes (or consequences) of climate change?"

The factors influencing knowledge are diverse, including demographic factors (e.g., gender, age, income, education level), personal experience, civic engagement, place of residence, et cetera (e.g., Lee et al., 2015; Poortinga et al., 2019; Wang & Zhou, 2020). These factors did not show consistent evidence in previous studies (Wolf & Moser, 2011). For example, several studies revealed that gender was a noticeable predictor (McCright & Dunlap, 2011; Poortinga et al., 2019; Zhou & Sun, 2020), whereas there were other surveys that showed no significant difference between males and females (Lin et al., 2021). Similarly, personal experience related to extreme weather is a powerful influence factor, but its effect might appear more on people who live in vulnerable areas (Ballew et al., 2019). Based on previous findings, it is important to note that educational level is the most frequently top-ranked predictor of climate change awareness worldwide (Lee et al., 2015). Surveys conducted in Chinese are generally consistent; for instance, research on Xiamen residents found that education level positively and significantly affects the public's climate change cognition (Lin et al., 2021).

Belief & Skepticism

The public belief about climate change worldwide varies from place to place and between demographic groups. The controversies include its reality, severity, anthropogenic nature of it, and the effects of mitigation actions (Capstick et al., 2015;

Lorenzoni & Hulme, 2009; Poortinga et al., 2019). In general, opinion polls showed that awareness was widely increasing up to the mid-2000s, whereas, after that, public doubts about the seriousness and anthropogenic component of climate change appeared and proliferated in the United States, Western Europe, and Australia (Capstick et al., 2015). The European Social Survey Round 8 (2016) revealed that an overwhelming majority of Europeans believe in climate change, while the trend skepticism rate ranged from 2.3% to 16.5%, and attribution skepticism from 4.0% to 15.4% in different European nations (Poortinga et al., 2019). A regularly undertaken survey project showed Americans believed that climate change is mostly human-caused did not change much in the past decade, with 57% (2008), 48% (2010), 56% (2017), and 56% (2022) (Ballew et al., 2019, Leiserowitz et al., 2022). Researchers also revealed that white men, the older age group, and those with less formal education tend to have trend or attribution skeptical views (Poortinga et al., 2019). In China, a survey conducted in Beijing showed 85% of respondents somewhat or strongly acknowledge its anthropogenic nature; and 22% agreed with the combination of two causes (natural causes and human activities) (Yu et al., 2013). A latest national survey reported a strong belief that climate change is happening (94.4%) and medium level of belief that it is caused mostly by human activities (66.0%) (China Center for Climate Change Communication, 2017).

The contributing factors of climate belief include political context, economy, weather conditions, misleading media coverage, et cetera (Capstick et al., 2015;

Poortinga et al., 2019; Scruggs & Benegal, 2012), and the economic factor is the most crucial among them (Scruggs & Benegal, 2012). Painter and Ashe (2012) suggested that skepticism mainly emerged in Anglophone countries. It arose with the shift in the political context in the United States, in which conservative republicans and right-leaning newspapers propagate uncontested skeptical sources for their political purpose (Capstick et al., 2015; Poortinga et al., 2019). In addition, Capstick et al. (2015) argued that changing meteorological conditions, especially longer-term temperature anomalies, have a robust effect on public perceptions, though whether the effects are fleeting or long-lived remains unclear. The public tends to believe that climate change began after a sustained period of anomalous warm weather, while colder weather had the opposite effect (Donner & McDaniels, 2013). Moreover, literature analyzing the correlation between extreme weather like floods and hurricanes and public perception has not shown a clear result on the population level (Capstick et al., 2015). Other factors, like media coverage, which portray a skeptical view, tend to push the public toward a wrong direction (Malka et al., 2009). Finally, economic condition is another crucial factor. By evaluating over 30 years of public opinion data (European nations and the US) on climate change from different professional investigation agencies, Scruggs & Benegal (2012) claimed that, among these main factors, the economic crisis had the most profound impact on public beliefs. And the key indicator was the unemployment rate, which leads to an increase in skeptical opinion (Scruggs & Benegal, 2012). They estimated that "a one-point increase in the

unemployment rate in the respondent's state makes that person only 87.3% as likely to agree that warming is occurring" (p.511).

Therefore, in today's context of the tail end of a global COVID-19 pandemic, which negatively affects the economy and causes unemployment (in China), combined with frequently happened extreme weather events around the world in the past few years, like wildfires and floods, it is worthwhile to examine the level of climate belief in China.

Concern

People are concerned about climate change as it may negatively affect the natural world, human society, or their personal life. Investigating the public's concern or risk perception is important because it influences their policy preferences, adaptation, and mitigation engagement (Lee et al., 2015; Wei et al., 2014). Haden et al. (2012) argued that mitigation and adaptation are largely motivated by psychological concerns. In addition, understanding the public's concern shifting facilitates future tailored climate communication strategies.

Public concern related to climate change has fluctuated over the past decades. From the 1980s to 1990s, public concern rose steadily and reached levels comparable to the early 2010s', from 43% of Americans considering climate change as either a very or somewhat serious problem to 75% by 1989 (Capstick et al., 2015). From the mid-1990 to the mid-2000s, international and intranational variation and fluctuation appeared with an overall growth of public concern (Capstick et al., 2015). From the latter part of the 2000s

to the early 2010s, there are clear majorities in many countries that hold high levels of concern, albeit survey studies often show the proliferation of skepticism about climate change (Capstick et al., 2015). Chinese people have become more concerned in recent years (Wang & Zhou, 2020), and a study showed a majority of the respondents consider climate change is a severe issue (around 70%) (Ge & Lin, 2021). A survey in the Centres for Disease Control and Prevention (CDC) in China shows professionals in this department are concerned about climate change, relating to causing extreme weather (52.9%), negatively affecting agricultural production (50.0%), impacting human health (45.5%) et cetera (Wei et al., 2014).

Previous studies have shown that people across the world tended to misperceive or underestimate climate change and view it as a risk that threatens the natural world, distant populations, and future generations (e.g., Leiserowitz, 2006; Mildemberger et al., 2019; O'Neill & Nicholson-Cole, 2009); and, this phenomenon did not change much in the past two decades, while the negative impact and extreme weather were becoming more severe and frequent. For instance, in 2017, only 50% of American respondents considered climate change would impact them personally, but 71% thought this issue would harm people in developing countries (Leiserowitz et al., 2017). The most recent survey conducted in April 2022 reported that even though 43% of Americans reported that they had experienced the impact of global warming, only 52%, 51%, and 47% of them believe their community, family, and themselves will be harmed (Leiserowitz et al.,

2022). Similarly, meanwhile, 72%, 72%, and 69% of them thought future generations, the natural world, and developing countries would be harmed (Leiserowitz et al., 2022). It may be attributed to people's cognitive dissonance. It is a psychological discomfort when people encounter two contradictory concepts simultaneously between their cognitions and behaviours and seek ways to relieve the tension (Festinger, 1962). People tend to select the information or opinions according to their expectations with a bias to moderate their risk perception (Gsothbauer & van den Bergh, 2013). Some individuals ignore new information related to climate change and believe in their initial beliefs (Patt and Schröter 2008). This tendency could also be seen in the Chinese public-- respondents thought climate change would impact future generations (78%), plant and animal species (71.7%), people in China (51.4%), and themselves (31.1%) (China Center for Climate Change Communication, 2017).

The crucial factors influencing people's concern about climate change are their knowledge and beliefs about it. In America, belief about the human cause of climate change was one of the strong predictors of climate change risk perceptions; and research showed a similar result regarding this belief as a predictor in China (Lee et al., 2015). On the other hand, Shi et al. (2016) claimed that "knowledge is indeed an important driver of concern about climate change--even when we control for human values," especially the cause of climate change; and knowledge about the consequences linked to higher levels of concern in most of the countries (p.759). However, he also emphasized that not all

dimensions of knowledge were robust predictors, like knowledge of physical characteristics of climate change having an indeterminate effect on the concern.

Another factor of climate change concern is anomalous weather, including temperature anomalies and extreme weather. Public concern fluctuates based on the weather, particularly local temperature changes and persistent hot weather (Egan & Mullin, 2012). For instance, one study found that Americans and Australians tended to be more concerned about abnormal temperature days (Li et al. 2011); a meta-analysis found that concern increases by 1.2% with a one centigrade rise. And lasting hot weather has a more substantial effect (Sugerman et al. 2021). Bruine de Bruin & Dugan (2022) believed the reason for concern fluctuation derived from the weather was that laypeople tended to conflate the concept of climate and weather. In addition, he found that climate change and extreme weather concerns formed differently, and people who experienced severe weather events held both climate change concerns and stronger severe weather concerns. Similarly, Konisky et al. (2016) argued that there was a "modest, but discernible positive relationship" between the climate change concern and extreme weather experiences, though the concern was only accompanied by recent events, and the events last a long period have little effect (p. 533).

Demographic factors, including gender, age, and education, also predict people's climate change concerns, but the direction and extent of the impact are different in different regions. A study analyzed the survey across 22 European countries and Israel in

2016 summarized: 1) education was a significant predictor of concern (respondents with a higher level of education were more concerned); 2) age effect was generally stronger in Northern European countries, in which older respondents were more likely to be less concerned; 3) woman tended to more concerned than men (Poortinga et al., 2019). The result that the effect direction of education, age, and gender showed a consistent pattern with other research (Shi et al., 2016), while studies in China show ambiguous results. Studies were consistent with education as a key predictor in China, meaning education level has a positive correlation with climate change concerns (Lee et al., 2015; Pugliese & Ray, 2009; Xiao et al., 2013). Regarding gender, some studies showed women are more concerned than men (Wei et al., 2014; Yang et al., 2021), while others reported the opposite to the case (Shields & Zeng 2012; Xiao & Hong, 2012). These phenomena might be because of the substantial economic and educational gap between men and women in China (Shields & Zeng 2012). Similarly, Wang (2017) found that older people were more concerned. In contrast, Schwirplies's (2018) research in the same year, based on 1430 respondents, reported that older Chinese tend to be climate change deniers. Therefore, the correlation between climate change concerns and demographic factors of the Chinese public warrant further investigation.

Information Source

Numerous sources of information, such as traditional media, social media, the internet, daily interpersonal discourse, et cetera, advance the effectiveness and efficiency

of climate change communication. Those not only enhance public climate change beliefs but also support related actions. Therefore, investigating the public's preferred and trusted information source is crucial to adjust the communication strategy to affect public opinion on a large scale and to engage laypeople in policy-making. There are substantial studies, mostly based on developed western societies, exploring the opportunities and challenges brought by media, while those have an inevitable geographical bias as China has a different political and cultural context, in which the central government controls media. Thus, research results based on Chinese people will be more applicable concerning the public's information source.

Even though recent studies show that traditional mass media, like television and newspaper, are still public's main sources of climate change communication in China (Wang & Zhou, 2020; Wei et al., 2014), social media plays an increasingly important role in shaping public climate change perception and engaging them in facilitating environmental advocacy and motivating related action (Seegerberg & Bennett, 2011; Yang & Stoddart, 2021). Given laypeople's greater reliance on social media, repetitive media coverage of the climate issue on it can remind people of the correct information and affect their opinion (Ballew et al., 2019; Scruggs & Benegal, 2012; Wei et al., 2014). Moreover, social media could also help the Chinese involved in policy-making via environmental discourse and advocacy. By analyzing climate communication between the pre-and post-Paris periods on a premier social media platform in China, named

Weibo, Yang & Stoddart (2021) found "a popularization trend of the climate change discourse as shown by the diversification of participants and frames in public discussions" (p. 156), and "positive translation of online public opinion to environmental policies" (p. 148). These results echoed other research that social media enables space for the environmental movement and a green public sphere in China (Liu, 2011; Sima, 2011).

In addition, the Internet is another main source of climate change information. A survey showed that 85.4% of the participants acquired knowledge of climate change on the Internet, which is the most common source (Wei et al., 2014). (It should be noted that the survey did not add social media into the options of this question, so maybe respondents considered the option that the Internet encompasses social media in this study.) And it had a significant association with educational level and gender, which means higher education level respondents (89.0%) and women (88.9%) were more likely to get climate change information through the Internet (Wei et al., 2014).

Another notable source is the discourse with family and friends in our daily lives because it reshapes our opinion on environmental issues and even influences environmental politics and industries' environmental performance (Cox & Pezzullo, 2019). In America, Geiger et al. (2017) found a positive relationship between discussing climate change and people's efficacy beliefs about addressing the problem. Likewise, Ballew et al. (2019) claimed that "social discourse about global warming was associated with positive attitudes and engagement with the issue," and reported that 36% of

Americans said they discussed global warming with their family and friends in 2017 (p. 9). However, until now, I did not find relevant literature on this topic in the Chinese academia. In conclusion, since, in China, only a handful of studies are working on the public's preferred and trusted source to acquire climate change information and some aspects do not even get much attention, there is a need for more investigation in this area.

Pro-environmental Behaviour

Kollmuss and Agyeman (2002) claimed that engaging in environmental behaviour demands cost, including time, effort and money, so people may be reluctant to engage in costly and inconvenient practices like cutting down on driving or flying in their daily life. That means, for the people aware of or even concerned about climate change, there is still a disparity between the perception and taking action--the widely-reported attitude-behaviour gap (e.g., Kollmuss and Agyeman, 2002; Lorenzoni et al., 2007). The reason is complicated, including different barriers; and they often overlap to reinforce the constraints to engagement (Lorenzoni et al., 2007). Accordingly, understanding how demographic factors and perceptions of climate change, like different aspects of knowledge and concern, motivate the public to take action and engage in the implemented policy is of great significance. Knowledge, especially the knowledge of the causes of anthropogenic climate change, is considered useful in motivating action (Wolf & Moser, 2011). Apart from that, for the people who carry out climate-friendly

behaviours, the intentions may vary; and examining their intentions can promote climate change communication strategy and facilitate policy formulation and implementation.

Understanding local resident's preferred and underway pro-environmental behaviours is needed before motivating them to adopt climate actions, especially the high-consequence and more efficient ones. The public could change their daily consumer behaviours and household consumption patterns to protect the climate, including home weatherization, transportation, food choice, energy efficient electrical appliances, et cetera (Dietz et al., 2020). There are considerable differences among these actions regarding energy consumption and GHG emissions, and some have a greater impact. For example, fuel-efficient driving habits have 20 times more impact than routine practices like changing laundry temperatures (Dietz et al., 2020). In China, urban households' energy consumption and CO₂ emissions are growing at a fast speed (Feng et al., 2011). Even though most Chinese have started to realize the importance of carbon emission reduction and expressed willingness to change to protect the climate, they are not sure about the efficiency and level of impact of the solutions and the practices they could engage (Wang & Zhou, 2020). Therefore, exploring current residents' climate-friendly behaviour preferences is necessary to guide them to practice the high-consequence and more efficient ones. Studies found that Chinese respondents sometimes purposely recycle (55.5%) and reduce the consumption of household energy (73.1%) (Wang & Zhou, 2020). The China4C's 2012 survey showed respondents often turn off electronic products

(37.1%) and lights (50.5%) when not in use (Wang & Zhou, 2020). However, related research is limited, particularly at the local scale.

Examining public intention for pro-environmental behaviour is also important because the intention is generally for reasons unconnected to the environment. Even though the public is concerned about climate change, laypeople, in practice, have to balance their daily lives with the future environmental threat (Lorenzoni & Pidgeon, 2006). Stern (2000) found that most people adopted environmental actions for financial and health reasons. Other studies also reported that habit and economic reasons were salient motivations in the public's energy conservation (Clark et al., 2003; Poortinga et al., 2004). For example, 81% of the English public regularly cut down their household energy usage to save money, while only 15% for environmental reasons; and people who reduce car usage were for exercise (59%) or to save money (25%) (Department for Environment, Food & Rural Affairs, 2002). Additionally, researchers found that while US people expressed a great willingness to practice energy conservation in their households, they were resistant to changing driving habits (Bord et al., 2000).

It's also vital to examine the public's willingness to pay and its influencing factors in regard to climate change, as people mostly care about the cost when implementing concrete actions. According to international surveys, Chinese respondents expressed a relatively high willingness to pay for environmental-friendly activities and products (Wang & Zhou, 2020). A domestic survey conducted in 2017 showed that 73.7% of the

respondents were willing to pay more for climate-friendly products (Wang & Zhou, 2020). And Winden et al., 2018 reported that "Chinese adult's and college students' willingness to pay is over two times larger than that of their US counterparts" (p. 7 of 18). Studies showed that many factors would impact Chinese people's attitudes about the rising cost, including gender, age, family income, and the perception of climate change, but some results are inconsistent (Ge & Lin, 2021; Yu et al., 2013). Ge & Lin (2021) reported that women, lower household income respondents, older respondents were more sensitive to the rising cost, while another survey revealed that "women (were) more willing than men to sacrifice some individual benefit to address climate change" (Wei et al., 2014, p.304).

Individuals' biophilia beliefs correlate with their perception of climate change and engagement in climate action. The concept of biophilia refers to a human's natural affinity to connect with nature and other living beings (Wilson, 1984). The relation between biophilia or connection to nature and fostering people's environmental knowledge, concern, and pro-environmental behavior engagement has been discussed in-depth in the field of sustainability (e.g., Ives et al., 2018; Whitburn et al., 2020). For instance, meta-analyses suggest that individuals who felt more connected to nature reported a greater self-reported engagement in pro-environmental behaviour (Whitburn et al., 2020). However, unlike other important factors, such as demographic factors and economic status, how biophilia affects the public's climate change perception and climate

action adaptation has received scant empirical attention to date. It is reasonable to speculate that affinity to connect with nature or physical interactions with it can shape people's environmental knowledge of and attitudes towards the climate issue and, consequently, encourage them to take action. This research attempted to explore whether individuals' willingness to access nature was correlated with or predicted their perception of climate change.

Research Methodology

Survey Sample

This online survey was undertaken between December 2021 to March 2022 in Tianjin; and the target population was residents who had lived in Tianjin urban area for more than one year and were also aged between 18 to 65.

According to the Tianjin Statistical Yearbook 2021 conducted by the government, the permanent population in the urban area was around 4 million (Tianjin Bureau of Statistics, 2021). The ratio of males to females was 1: 1.05, but the age ratio was not disclosed to the public. The education status of the population aged six and over was primary school or under 27.9%, junior middle school 32.8%, senior middle school 12.6%, college 11.1%, undergraduate 13.9%, graduate 1.6% (Tianjin Bureau of Statistics, 2020). This meant the number of residents who had postsecondary education was an around 26.6%, which was much higher than the national level of 15.5% (National Bureau of Statistics, 2021). This is expected as Tianjin is a big modernized city.

Considering the high mobility in the city, residents living and working in the urban area for more than one year would be defined as urban dwellers for the purposes of this research. Since it was hard to ask children's parents' consent in an online survey, only those over 18 years old were chosen to participate.

One part of this survey inquired about environmentally friendly habits in personal lifestyles. Due to the traditional culture of big families in China, in most cases, senior

citizens live with their children and thus adapt to their children's living habits. This middle-aged group plays a key role in their home as they typically bear primary responsibility for housework. Therefore, residents over 65 were not invited to this survey. Moreover, the residents aged from 18 to 65 are generally the main force to lead the perspective on a social issue in a family as well as the whole society, so they are the appropriate group for this research.

Research Design

The questionnaire was designed to investigate Tianjin urban residents' perception of climate change and their preference for environmentally friendly lifestyles. To design a series of clear, logical, and unambiguous questions, I studied and referenced questions in professional surveys like European Social Survey (ESS), the International Social Survey Program (ISSP), and Gallup. Question stem wording is vital to avoid leading, offending, or confusing the respondents, and the response choices were carefully chosen to align with the variables and capture the valid data (O'Leary, 2017). Moreover, as previously stated, some participants might be undereducated, so the language and layout of the questionnaire needed to be easy to understand.

Since this survey was conducted in a city in mainland China, the questionnaire shown to participants was in Mandarin. I designed both the English version and Mandarin version for this research. Even though the English version would not be used in the survey process, it was still crucial because 1) I could mirror some questions in a certain

aspect which had been previously studied, so that the results could be more comparable to the results of previous studies; 2) it could provide the opportunity to communicate with the supervisor, committee members, and other readers; 3) it could be used for ethical review. Therefore, after finishing the English version questionnaire, the Mandarin version was precisely translated from it. Appendix 2 details the questionnaire.

The terms "climate change" and "global warming" were displayed together for participants throughout the questionnaire. Unlike some countries, such as the UK, which have campaigned for climate change education for the public more than once since 1990 (Whitmarsh, 2009), China has yet to inform the whole society about this issue systematically. As a Chinese and sensitive environmentalist, I found the issue of "global warming" broadly and frequently discussed among the general public in the late 1990s. At the same time, the term "climate change" was barely seen in mass media in the past decade. Whitmarsh (2009) believed, in the UK, "climate change" was preferred in academia and politics, while the media tended to keep using "global warming." This pattern might fit China as well. I assumed that many lay people had not had a chance to update their terminology and only knew "global warming." Therefore, the questionnaire described this issue by using "global warming/climate change (全球变暖/气候变化)," which has been used by other studies before (e.g., Poortinga et al., 2006).

The questionnaire had six sections: demographic section, knowledge section, belief & skepticism section, concern section, information source section, and pro-

environmental behaviour section. Questions were closed-ended; and some of which imitate the 5-points Likert scale. It is worth noting that after respondents finished the demographic section, the first question in the knowledge section determined which sections respondents need to answer next. The question was, "Which of the following statements applies to you? (choose only one answer) (Note: if you want to choose C or D, please readily ignore the option of A and B), " with the options "A. I have heard of Global Warming," "B. I understand Global Warming," "C. I have heard of Climate Change," "D. I understand Climate Change," and "E. None of these above." The respondents who chose E, which meant they had not heard of "Global Warming" or "Climate Change", only need to answer two questions in the pro-environmental behaviour section for the rest. It was because people might still adopt an environmentally friendly lifestyle for other reasons. The research framework of this survey is shown in Figure 2.

Demographic Section

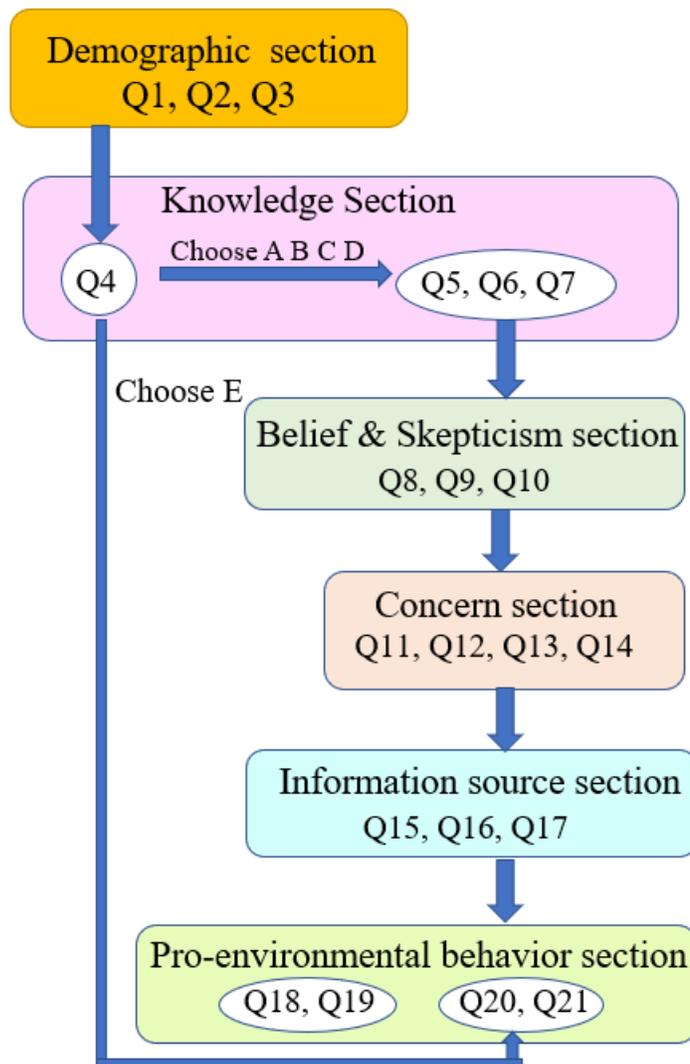
The residents' demographic characteristics were investigated in this section, including age, sex, and education level. Depending on the education status of the population in Tianjin Bureau of Statistics, I divided residents' education levels into six levels which were equal to or lower than primary school, middle school, high school, college, bachelor's degree, and equal to or higher than a master degree.

Knowledge Section

As stated above, the first question in this section would decide whether the participant answered this part or not. They would skip the rest of this section, if they had not heard about global warming or climate change. For those who had heard about these

Figure 2

The Framework of the Questionnaire.



concepts, there were three other questions involving the causes, consequences and harmful events of it in China in the past two years. The question of causes provided six detailed options with direct causes like "increasing the concentration of CO₂ in the atmosphere" and indirect causes like "deforestation." It also provided the "None of these above/Do not know" choice. Similar to the cause question, the question of the consequences had 12 choices. In addition, both the cause and consequences question provided a confusing choice, "ozone hole," which was reported by previous researches that the public always confused this with the cause or consequences of climate change (e.g., Capstick et al., 2015). The last question in this section inquired about respondents' awareness of harmful events of it. Sometimes people may know abnormal precipitation or fog happened but have no idea that these events are related to global warming/climate change. Thus, the question asked, "Do you know someplace in your country that has experienced serious harm from global warming/climate change in the past two years?"

The rules of assigning scores for results in this section are clarified as follows (seen in Appendix 2). It is important to note that the score of each choice was not shown on the questionnaire to the respondents. For the awareness of the terminology question, the choice of "I have heard of Global Warming" was rated one point; "I understand Global Warming" was rated two points; "I have heard of Climate Change" was rated three points; "I understand Climate Change" was rated four points; and "None of these above" earned zero points. The knowledge of this issue is extensive; only three questions

of cause, consequence and related events were far from representing the respondent's level of understanding. Thus, this question was designed to compensate for this deficiency to some extent. The scoring principle of it based on two guidelines: 1) had the respondents self-assess their level of understanding of the issue; 2) individuals be aware of the updated term "climate change" were more likely to know the latest research progress and political trends than people who only knowing "global warming." In cause and consequence questions, respondents could choose as many choices as they wanted. Every correct answer was rated at one point; the confusion choice was rated minus one point; the "None of these above/Do not know" rated zero points. The "Yes" answer for the fourth question earned one point, while "No" made zero. The total points of these four questions formed the respondent's knowledge score.

Beliefs & Skepticism Section

This section had three questions to assess respondents' belief by asking 1) the facts of global warming/climate change; 2) whether the world's climate was changing; 3) and its anthropogenic nature. People's attitude towards it was described in each choice, rated with incremental scores, like the Likert scale. The choices of attitude towards belief in its anthropogenic and authenticity got higher scores. In question 10 (seen in Appendix 2), the answer "Entirely by natural processes" and "Do not know" were both rated zero. The total points of these three questions would be the respondent's believe level.

Concern Section

Participants' concern about climate change was investigated in this section. The first three questions were: 1) to what extent respondents worried about this issue; 2) whether they worried more or less than 5 years before; 3) and how likely they think they (and their family) would be negatively affected in their lifetime. The extent of how people's concerns about it is described in each choice, rated with incremental scores, like the Likert scale. The scoring rules for these three questions were the same as beliefs & skepticism section. The fourth question asked which part of the world might be seriously negatively affected in the future and allowed respondents to choose more than one option with each rated one point. The total points of the four questions would describe the respondent's concern level.

Information Source Section

In this section, participants would pick from which information sources they got their information about global warming/climate change, which sources they preferred for more information, and which ones they trusted more. The respondents could choose more than one option for each question. The options were the same for the three questions. They tried to cover all kinds of sources, including the related government department, friends or family, professionals, newspapers/television/radio, internet, social media, a famous person you like, local religious leaders, do not know, and none of these above.

Pro-environmental Behaviour Section

This section had four questions and were divided into two parts. The first two questions, including willingness to access nature and desire to pay for tackling GHG emissions, were for the respondents who knew about global warming/climate change. And the choices in these two questions rated with incremental scores for further analyze. The questions involving their eco-friendly lifestyle and the intentions were for every respondent because people who were unaware of this issue might adopt an environmentally friendly lifestyle for other reasons. For these two questions, respondents could choose more than one option.

Pilot Study

The first phase of this research was a pilot study. In a social science context, a pilot is a small run undertaken in preparation for a major study (O'Leary, 2017). In this case, I invited a small group of people in China to inspect and feel whether the Mandarin version of the survey was clear and logical and whether the wording and layout were plain and easy to understand.

This small-scale test was meaningful because some respondents suggested that the Likert scale was not easy to understand for undereducated people, especially when they were mixed with typical multiple choice. People who saw the Likert scale for the first time may get confused all of a sudden and then lose patience and randomly pick one

answer. Thus, all the Likert scale questions were converted to multiple-choice, using words to describe the extent.

After modifications and adjustments to the wording of the questionnaire, the final survey was distributed.

Data Collection

This survey was conducted online, employing an app named "问卷星" (<https://www.wjx.cn/>). The survey link was distributed to residents through a social media platform named "Wechat," a widely used app in China. The survey was open for response from December 2021 to March 2022.

This research uses nonproportional quota sampling combining snowball sampling, two types of nonprobability sample designs (Daniel, 2011). Nonproportional quota sampling means the number of participants in each quota category is based on a specific criterion rather than their proportions of the target population (Daniel, 2011). This research sought to reach every social-demographic category, like different levels of education, meet the statistical needs but not in accord with the proportions of Tianjin urban population. In snowball sampling, participants were invited encouraged to invite additional respondents from the target population (Daniel, 2011). Combining these two sampling methods ensured more valid responses and proper sample size of each category for analysis.

According to the sampling method, the survey process has two phases. In the beginning, the questionnaire link was posted on the online group of a local reading club named YueDu, using a convenience sampling method to recruit participants. This club was the biggest reading club in the city with more than 1000 members, of which around 200 were active members. The purpose of this research and the qualification of the potential participants were stated to all group members. All qualified members were welcome to participate. Though members were from all walks of life, the majority were educated and had the character of lifelong learning. This tended to over-represent white-collar workers and the young and skewed the results. In order to get a broader range of responses and correct this bias, in the second phase, snowball sampling was employed. Reading club members were encouraged to distribute the questionnaire to colleagues in their workplace in line with specific characteristics which meet the requirement of stratification features in the quota. For example, in the final stage, responses from primary school graduates or lower residents were limited. Thus, members were encouraged to find this group of people in their workplace and distribute the questionnaire. They were only given one quota control once for easy screening. This process continued till the end to make the sample size of each quota satisfy the basic requirements of analyses. In some necessary circumstances, the participant who recruited new qualified participants was offered one CAD dollar (equal to five RMB) as a reward.

Data Analysis

After collecting all the data, Excel was used as the primary data sorting tool and SPSS 26 was used for statistical analysis. Descriptive and frequency statistics of each section will be presented to show a general understanding of the results. After that, further analyses were conducted to show the underlying relation between variables.

For accurate analysis and model development, the variable determination was crucial because the statistical analysis is based on the nature and amount of a subgroup of the variables. Some questions in this questionnaire were assigned a score to each choice so that the multiple-choice can convert to interval data set. The corresponding scores of each option were shown in Appendix 2. Moreover, the results of questions imitating the 5 points Likert scale were also considered interval data (Lavrakas, 2008). Based on the small sample size, the Shapiro-Wilk test was performed to verify the normality of the data set of each variable for choosing an appropriate statistical method. Due to the variety of the data, the *t*-test, Mann-Whitney U test, Spearman correlation, and chi-square test were performed on variables to provide additional explanation.

And then, for the plausible and significant correlated variables, multiple linear regression and binary logistic regression were used to examine the relative influence of the independent variables on the dependent variables. Based on previous results, some independent variables were correlated in a few regression models, so I performed collinearity diagnoses to check the multicollinearity. The result of collinearity diagnosis,

namely variance inflation factor (VIF), less than or equal to 5 indicates that multicollinearity is not an issue (Knapp, 2018). Thus, the VIFs in my regression models, which were all less than 3.5, showed that multicollinearity didn't exist.

Results

Descriptive Statistics

Demographic Information

A total of 161 survey responses were collected during the data collection period. After data screening, 130 were valid. 31 participants were removed for several reasons: 1) they answered the survey in less than 2 minutes; 2) IP information showed they were not located in the Tianjin urban area; and 3) they answered continuous "A" for the latter half of the survey. Since the survey tool was an online software, requiring participants to answer all the questions before submitting, the responses had no missing data. Of the valid 130 responses, 96 were obtained from direct online approach, while 34 responses came from snowball sampling method.

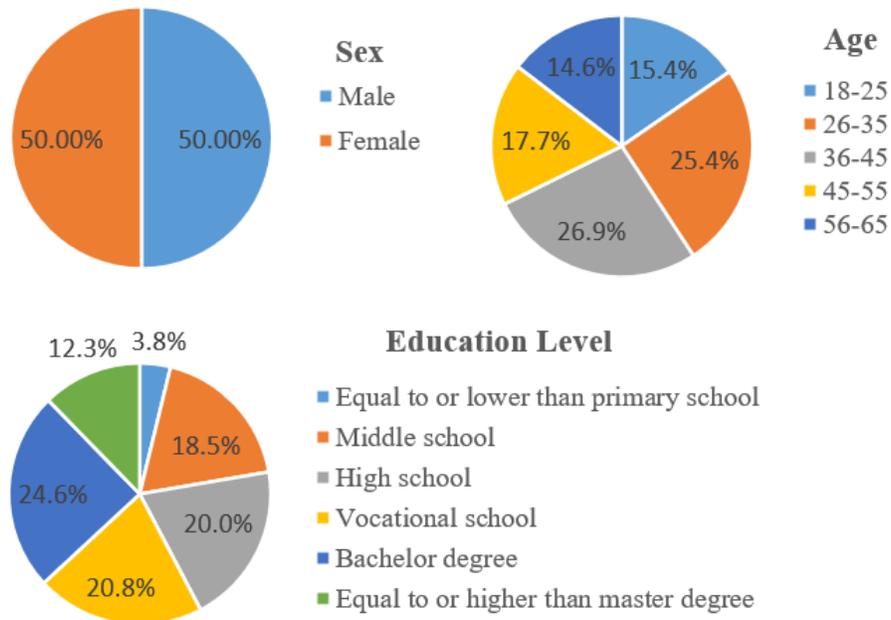
The socio-demographic characteristics of the respondents ($n = 130$) are presented in Figure 3. As can be seen, 50.0% of the respondents were male; and the other half were female. Regarding age, 26.9% of the respondents were between 36 and 45 years old, followed by respondents of 26–35 and 46–55 years old, whose percentages are 25.4% and 17.7 %, respectively.

The respondents within the study area showed the following educational attainment: 24.6% completed a bachelor degree; 20.8% were vocational school or college graduates; and 20.0% graduated from high school. Aside from making sure each category

had enough sample size to meet statistical requirements, it was assumed that these 130 respondents offered a random sample.

Figure 3

The Sociodemographic Characteristics of the Respondents (N = 130).



Knowledge Section

The knowledge section was the first section of the main questionnaire, consisting of four questions to attain a holistic assessment of respondents' knowledge about climate change (see Appendix 2). In the beginning, the respondents were asked if they had heard of or know about climate change or global warming. If the participant chose "None of these above", he/she would skip the sections around belief & skepticism, concern, and information source. At last, 11 participants chose it; and the sample size of the rest of the

questions in the knowledge section and the other sections was 119. It meant 91.5% of the respondents knew about climate change or global warming. The results also showed that 36.1% were aware of the updated terminology, climate change (see Table 1).

Table 1

The Results of Question 4 (N = 130).

Question (choose only one answer)	Choices	Number	Percent
4. Which of the following statements is the most applicable to you? (Note: if you want to choose C or D, please readily ignore the option of A and B)	I have heard of Global Warming	54	41.5%
	I understand Global Warming	18	13.8%
	I have heard of Climate Change	31	23.8%
	I understand Climate Change	16	12.3%
	None of these above	11	8.5%

The second question of this section asked participants the causative factors, allowing them to choose one or more answers because several direct and indirect causes were listed, mixing with a confounding choice. Table 2 displays the details of the question and the results. As shown, 77 (64.7%) and 35 (29.4%) participants had an awareness of the effect of the concentration of CO₂ and CH₄ in the atmosphere. Moreover, 67 (56.3%) participants acknowledged that burning fossil fuel was one of the causes, and 62(52.1%) participants picked deforestation. Unfortunately, there were still 49 (41.2%) participants confused that the ozone hole was one of the causes.

Table 2 also shows the details of the consequence question with 12 choices. The results indicate that the choice of frequent extreme weather was more popular than

getting warmer, 81 (68.1%) and 75 (63.0%) respectively, followed by rising sea level for 64 (53.8%). As well, almost half of the respondents understood that flood (47.1%) and drought (46.2%) were possible consequences. That being said, the Chinese public appear to no longer narrowly consider climate change or global warming as merely getting warmer. They could relate some other abnormal weather events to this issue. However, as

Table 2

The Results of Question 5 and 6 (N = 119).

Questions (choose one or more answers)	Choices	Number	Percent
5. In your opinion, what is/are the cause(s) of global warming/climate change?	Increasing concentration of CO ₂ in the atmosphere	77	64.7%
	Increasing concentration of CH ₄ in the atmosphere	35	29.4%
	Burning coal and gas	67	56.3%
	Ozone hole	49	41.2%
	Deforestation	62	52.1%
	None of these above/Do not know	9	7.6%
	6. In your opinion, which one or more of these phenomena is/ are the consequence of global warming/climate change?	Getting warmer	75
Extreme weather events more frequent. (e.g., storms)		81	68.1%
Floods		56	47.1%
Drought		55	46.2%
Smog		45	37.8%
Changing habitats		48	40.3%
Species extinction		48	40.3%
Grain production reduction		41	34.5%
Wildfire		50	42.0%
Rising sea level		64	53.8%
Ozone hole		45	37.8%
None of these above/Do not know		4	3.4%

expected, a certain number of participants (37.8%) still considered the ozone hole one of the outcomes.

The final question of this section inquired whether the participant was aware of serious harm events related to climate change or global warming that happened in any region in China during the past two years. A slight majority of the respondents who were aware of this issue answered "Yes" (65 picked, 54.6%). This portion declined to 50% if respondents were counted who did not know this issue.

Beliefs & Skepticism Section

In this section, participants were asked three questions to assess their beliefs about climate change. The detailed results of this section could be found in Table 3. As can be seen, preliminary analysis revealed that a solid majority of the participants (85.6%) considered climate change or global warming as accurate, with 66.3% for definitely real and 19.3% for probably real. 91.6% of the participants reported they could feel the climate was changing; and 68.1% were pretty sure about it. In terms of the anthropogenic climate change issue, more than half (52.9%) of the respondents believed that it was caused mainly by human activity, followed by 29.4% who thought it was caused about equally by natural processes and human activity.

Table 3*The Results of Question 8, 9, and 10 (N = 119).*

Questions (choose only one answer for each question)	Choices	Number	Percent
8. To what extent do you think you think global warming/climate change is real?	Definitely real	79	66.3%
	Probably real	23	19.3%
	Neutral	15	12.6%
	Probably not real	1	0.8%
	Definitely happening not real	1	0.8%
9. Do you think the world's climate is changing?	Definitely changing	81	68.1%
	Probably changing	28	23.5%
	Neutral	8	6.7%
	Probably not changing	1	0.8%
	Definitely not changing	1	0.8%
10. Do you think that global warming/climate change is caused by natural processes, human activity, or both?	Entirely by human activity	7	5.8%
	Mainly by human activity	63	52.9%
	About equally by natural processes and human activity	35	29.4%
	Mainly by natural processes	9	7.5%
	Entirely by natural processes	2	1.7%
	Do not know	3	2.5%

Concern Section

The concern section consisted of four questions, designed to explore how respondents rate their risk regarding global warming/climate change. Table 4 displayed the detail of the first three questions and the results. When asked about the level of worry, a majority (74.8%) expressed that they worried about this issue, with 23.5% declaring that they were really worried. Compared to five years ago, more than half (58.8%) of the respondents reported they were more worried, followed by 36.1% kept the same extent. Only 5.1% of respondents were less worried about it. With respect to the possibility of

themselves (or their family) being negatively affected by global warming/climate change, 31.9% considered it very likely and 36.1% somewhat likely. Only 13.4% selected not too likely and 1.7% for not at all likely.

Table 4

The Results of Question 11, 12, and 13 (N = 119).

Questions (choose only one answer for each question)	Choices	Number	Percent
11. How worried are you about global warming/climate change?	Very worried	28	23.5%
	Somewhat worried	61	51.3%
	Neutral	18	15.1%
	Not really worried.	9	7.6%
	Not worried at all	1	0.8%
12. Are you more worried about global warming/climate change than you were five years ago?	Do not know	2	1.7%
	Definitely more worried	34	28.6%
	Probably more worried	35	29.4%
	Same as before	44	37.0%
	Probably less worried	4	3.4%
13. How likely are you (or your family) to be personally seriously affected by the global warming/climate change in your life time?	Definitely less worried	2	1.7%
	Very likely	38	31.9%
	Somewhat likely	43	36.1%
	Neutral	20	16.8%
	Not too likely	16	13.4%
	Not at all likely	2	1.7%

This section's last question allowed participants to choose more than one choice, as shown in Table 5. From the results, it was found that "future generations" was the most popular choice, chosen 90 times. Likewise, "non-human nature" was the second most popular, 56 times picked. "Other countries or regions in the world" and "your local community or your city" had been chosen to the similar frequencies (40 and 41).

Table 5*The Results of Question 14 (N = 119).*

Question	14. Which of the following do you think will be seriously negatively affected by global warming/climate change in the future?	Number	Percent
Choices	Non-human nature	56	47.1%
	Other countries or regions in the world	40	33.6%
	Your local community or your city	41	34.4%
	Future generations	90	75.6%
	None of the above will be seriously negatively affected.	3	2.5%

Information Source Section

This section was designed to explore participants' information sources on climate change to provide suggestions for future communication. As shown in Table 6, participants got related information mainly from "Newspapers, television or radio" and "The internet" with 85 and 81 responses, followed by government (48), social media (39) and friends or family (27). For the preferred sources to get information, the most popular option was "Related department of government" with 74 times picked, followed by "Newspapers, television or radio" (66), "The internet" (59), and "Professional, such as teacher and scientist" (52). In terms of the most trusted information source, participants' favorite was "Related department of government," with 80 responses, which means 67.2% of the participants had chosen this ($n = 119$). The next favorites were "Newspapers, television or radio" (56) and "Professional, such as teacher and scientist" (53). In this matter, only 17 participants chose "The internet."

Table 6*The Results of Question 15, 16, and 17 (N = 119).*

Choices	Questions (choose one or more answers)					
	15. Until now, what sources did you get the information of global warming/climate change?		16. If you wanted to get information about global warming/climate change, what sources would you go to?		17. Which information source do you trust most to provide information of global warming/climate change?	
Related department of government	48	40.3%	74	62.2%	80	67.2%
Friends or family	27	22.7%	17	14.3%	7	5.9%
Professional, such as teacher and scientist	38	31.9%	52	43.7%	53	44.5%
Newspapers, television or radio	85	71.4%	66	55.5%	56	47.1%
The internet	81	68.1%	59	49.6%	17	14.3%
Social media	39	32.8%	30	25.2%	13	8.4%
A famous person you like	10	8.4%	4	3.4%	6	5.0%
Local religious leaders	0	0.0%	0	0.0%	0	0.0%
Don't know	3	2.5%	1	0.8%	4	3.4%
None of these above	1	0.8%	0	0.0%	1	0.8%

Pro-environmental Behaviour Section

The behaviour section consisted of four questions to briefly explore participants' living habits related to pro-environmental behaviour and motivation. At the beginning, to what extent participants like to access nature was measured on a 5-point Likert scale. A majority (84.9%) of the participants reported they like being outside in nature (64.7% like

extremely and 20.2% somewhat like). 12.6% chose neither like nor dislike. When asked whether they were willing to pay carbon tax or another type of expense to support the reduction of greenhouse emissions, less than half (46.2%) chose "Yes," 26.0% for "No," and 27.7% for "Do not know."

The last two questions of this questionnaire went to every participant no matter whether he/she knew global warming/climate change or not. Table 7 displayed the questions and the results. Majority of the participants in this survey reported that they practiced diverse pro-environmental behaviours in their daily life, with the main reason of high environmental awareness (92 picked). Furthermore, cutting costs and family traditions were also important motivations, with 72 and 76 picked.

Table 7

The Results of Question 20, 21 (N = 130).

Questions (choose one or more answers)	Choices	Number	Percent
20. In your daily life, what habits do you adopt?	Switch off lights when leaving a room	115	88.5%
	Pay attention to energy-saving logo when buying appliance and choose the energy-efficient ones	75	57.7%
	Avoid buying unnecessary goods	78	60.0%
	Choose bicycle or public transportation (like subway and bus) rather than drive a car	70	53.8%
	Use the air conditioning when really needed	83	63.8%
	Intend to avoid using disposable items (like plastic bags and paper)	62	47.7%
21. What are the reason(s) why you practice these habits?	To cut costs	72	55.4%
	To protect the environment	92	70.8%
	Family Traditions	76	58.5%
	None of the above	15	11.5%

Statistical Inference

Total Score for the Knowledge, Belief & Skepticism, and Concern Sections and the Normality

By assigning a score to each choice of questions (see Appendix 2), the total score of the knowledge, believe, and concern sections could be summarized and analyzed as interval variables. Some of these questions were multiple choices, while others were the imitating 5-point Likert. For some crucial ones, the score of the single question would also be used as a variable. The Shapiro-Wilk test was performed to check the data's normality in order to pick the applicable statistical method. Table 8 displays all the results of the data's normality test involved in this thesis.

The knowledge section's total score ranged from 0 to 19. The respondents who got the highest score tended to know well about climate change, picked all the correct answers for cause and consequence questions, and specifically did not confuse the issues of ozone depletion with climate change. The lowest score 0 meant the respondent were not aware of the word global warming or climate change. The data set's lower quartile, median, and the upper quartile were 5, 8, and 11. The total score for belief & skepticism section ranged from 0 to 12. Higher scores indicate the participants are more certain about anthropogenic climate change, which means the skepticism level was low. Its lower quartile, median, and the upper quartile were 9, 10 and 11. The total score for concern

section ranged from 0 to 16, with a higher value indicating more concern about climate change. The lower quartile, median, and the upper quartile were 8, 10 and 13.

Table 8

The Normality Results of Shapiro-Wilk Test in This Thesis.

Data of variable	N	Statistic	Sig (<i>p</i>)
Knowledge level	130	0.971	.007
Belief level	119	0.805	.000
Concern level	119	.976	.031
Belief about its anthropogenic nature	119	.817	.000
Willingness to access nature	119	.665	.000
Male group of knowledge level	65	.973	.157
Female group of knowledge level	65	.969	.097
Male group of belief level	60	.836	.000
Female group of belief level	59	.753	.000
Male group of concern level	60	.974	.224
Female group of concern level	59	.964	.078
Male group of belief about its anthropogenic nature	60	.856	.000
Female group of belief about its anthropogenic nature	59	.716	.000
Knowing events in the last two years group of belief level	65	.729	.000
Not knowing events in the last two years group of belief level	54	.872	.000
Knowing events in the last two years group of concern level	65	.967	.083
Not knowing events in the last two years group of concern level	54	.963	.098
Willingness to pay group of knowledge level	55	.967	.137
Reluctant to pay group of knowledge level	31	.969	.491
Willingness to pay group of belief level	55	.625	.000
Reluctant to pay group of belief level	31	.878	.002
Willingness to pay group of concern level	55	.961	.070
Reluctant to pay group of concern level	31	.952	.182
Willingness to pay group of willingness to access nature	55	.481	.000
Reluctant to pay group of willingness to access nature	31	.672	.000
Willingness to pay group of belief about its anthropogenic nature	55	.715	.000
Reluctant to pay group of belief about its anthropogenic nature	31	.767	.000
Knowing "global warming" group of knowledge score	72	.961	.026
Knowing "climate change" group of knowledge score	47	.929	.007
Knowing "global warming" group of belief level	72	.789	.000
Knowing "climate change" group of belief level	47	.850	.000
Knowing "global warming" group of concern level	72	.952	.008
Knowing "climate change" group of concern level	47	.975	.400

Knowing "global warming" group of belief about its anthropogenic nature	72	.754	.000
Knowing "climate change" group of belief about its anthropogenic nature	47	.890	.000

Note. The knowledge level indicated the total score of the knowledge section, which summarized the results of four questions. In comparison, the knowledge score referred to the score that only included the last three questions in the knowledge section.

According to Salkind (2007), the cut-off score of the Shapiro-Wilk test is $p = 0.05$, which means that a Sig value higher than 0.05 indicates normality.

The results of collinearity diagnostics (VIF) were pre-checked using linear regression on SPSS.

Primary Analysis

Based on the character of the variables, *t*-test, Mann-Whitney U test, Spearman correlation analyses, and chi-square test were employed to examine the difference or relation between variables. The variables included demographic factors (sex, age and education), knowledge level, belief level, concern level, belief about its anthropogenic nature (the third question in belief & skepticism section), knowing someplace in China seriously harmed by this issue in the past two years (the fourth question in the knowledge section), and willingness to pay (the second question in the pro-environmental behaviour section).

The results revealed that there was no significant difference between male and female respondents in regard of knowledge level (*t*-test, $n = 130$, $p = .338$), belief level (Mann-Whitney U test, $n = 119$, $p = .257$), belief about its anthropogenic nature (Mann-Whitney U test, $n = 119$, $p = .120$), and concern level (*t*-test, $n = 119$, $p = .137$). After

being analysed by Spearman correlation separately, no significant relations were found among age groups and knowledge level ($n = 130, p = .491$), belief level ($n = 119, p = .809$), belief about its anthropogenic nature ($n = 119, p = .711$), and concern level ($n = 119, p = .541$). The Spearman correlation analyses showed that educational level positively and significantly correlated with knowledge level ($n = 130, r = .332, p < .001$), and belief level ($n = 119, r = .193, p = .036$). The educational level had no significant relation with belief about its anthropogenic nature ($n = 119, p = .052$) and concern level ($n = 119, p = .664$), though, given the p -value (0.052), higher educated people were inclined to have confident of its anthropogenic nature.

The chi-square test was performed to analyses how demographic factors influenced respondents' willingness to pay with three option groups. The results showed no significant relations between willingness to pay and sex ($\chi^2 (2, N = 119) = .072, p = .964$), age ($\chi^2 (8, N = 119) = 5.089, p = .748$) and education ($\chi^2 (10, N = 119) = 11.666, p = .308$). Considering only two groups of willingness to pay question (picked "Yes" and "No") would be involved in the regression model later, another chi-square test was run to test the relations. The results were similar with the three groups test—no significant relations between willingness to pay and sex ($\chi^2 (1, N = 86) = .050, p = .822$), age ($\chi^2 (4, N = 86) = 2.809, p = .590$) and education ($\chi^2 (5, N = 86) = 3.533, p = .618$).

The correlations between variables in the knowledge, belief, belief about its anthropogenic nature, and concern sections were further tested before performing

regression analysis. Spearman correlation analyses results revealed that respondents' knowledge had positive and significant association with belief level ($n = 119, r = .286, p = .002$), concern level ($n = 119, r = .305, p = .001$), and belief about its anthropogenic nature ($n = 119, r = .211, p = .021$). Belief level ($n = 119, r = .405, p < .001$) and belief about its anthropogenic nature ($n = 119, r = 0.359, p < .001$) had positive and significant relation with concern level.

Analyses were performed to identify whether knowing someplace in China seriously harmed by this issue in the past two years affected respondents' belief and concern level. The *t*-test and Mann-Whitney U test were used to analyze depending on the normality results of the Shapiro-Wilk test on each group. The Mann-Whitney U test results indicated respondents who knew ($Mdn_Y = 11$) were more belief about it than those who didn't ($Mdn_N = 9$), $U = 1183.5, p = .001$. The *t*-test results indicated respondents who knew ($n = 65, M = 11.25, SD = 2.93$) were more concerned about it than those who did not ($n = 54, M = 9.37, SD = 2.88$), $t(117) = 3.501, p = .001$.

The question of willingness to pay had three choices, "Yes," "No," and "Do not know." The responses related to "Yes" and "No" was involved and analyzed in binary logistic regression. Before that, the *t*-test, Mann-Whitney U and chi-square tests were performed to explore the relations between explanatory variables and willingness to pay. The chi-square test results revealed no significant relationship between willingness to pay and whether knowing negative events happened in the past two years in China, ($\chi^2(1, N =$

86) = 1.061, $p = .303$). The t test revealed that no significant relations between willingness to pay and knowledge level ($n = 86$, $p = .986$), while individuals who were willing to pay ($n = 55$, $M = 11.80$, $SD = 2.75$) hold higher concern level than who did not ($n = 31$, $M = 9.61$, $SD = 2.54$), $t(84) = 3.637$, $p < .001$. Mann-Whitney U test showed no significant relations between willingness to pay and willingness to access nature ($U = 722.5$, $p = .126$), while significant relations existed with belief level ($U = 459.5$, $p < .001$, $Mdn_Y = 11$, $Mdn_N = 10$) and belief about its anthropogenic nature ($U = 573.0$, $p = .004$, $Mdn_Y = 3$, $Mdn_N = 2$).

Mann-Whitney U test was performed for the first question in the knowledge section to investigate whether knowing different terminology associated with people's knowledge score (the score only included the last three questions in the knowledge section), belief level, concern level, and specifically the belief about its anthropogenic nature. Respondents who chose "heard of Global Warming" and "understand Global Warming" were combined into one group ($n = 72$), while ones who chose climate change options were into another ($n = 47$). The results revealed that knowing different terms did not affect peoples' knowledge regarding causality, consequence and relative events, $U = 1678.0$, $p = .939$, and belief level, $U = 1470.5$, $p = .206$. Compared to the respondents who knew "climate change," the respondents who knew "global warming" were more concerned about it, $U = 1177.0$, $p = .005$, $Mdn_{GM} = 11$, $Mdn_{CC} = 9$; and felt certain about its anthropogenic nature, $U = 1346.0$, $p = .038$, $Mdn_{GM} = 3$, $Mdn_{CC} = 2$.

This paragraph presented the results about how people's willingness to access nature (the first question in pro-environmental behaviour section), also known as biophilia, affects their knowledge, belief, concern level, belief about its anthropogenic nature, and willingness to pay. Spearman correlation analyses were performed separately on the variables. The results showed that respondents' willingness to access nature had no significant relation with their knowledge level ($n = 119, p = .097$). On the contrary, positive and significant relations were found between willingness to access nature and belief level ($n = 119, r = 0.330, p < .001$), concern level ($n = 119, r = .388, p < .001$), and belief about its anthropogenic nature ($n = 119, r = .329, p < .001$).

Regression Analysis

After the first step of the analysis that examined the correlation of the variables, five regression models were run to analyze the impact of variables on respondents' knowledge level, belief about its anthropogenic nature, belief level, concern level, and willingness to pay. The principle of choosing independent variables were :1) variables may logically have a causal relationship, and 2) the independent and dependent variables already correlated according to the previous analysis. In each regression model, no collinearity was found in collinearity diagnostics (see VIF data in Table 9 & 10).

The first linear regression model showed education positively and significantly predicted respondent's knowledge level ($p < .001$; Table 10).

As stated above, knowledge and willingness to access nature individually correlated with belief about its anthropogenic nature. Taking these two as independent variables and the belief as dependent variable, the linear regression results indicated that knowledge did not affect respondents' belief about its anthropogenic nature ($p = .104$). However, willingness to access nature positively and significantly predicted it ($p = .001$; Table 10).

A multiple linear regression model was performed to test which variable predicts respondent's belief level, using education, knowledge, knowing of disaster events, and willingness to access nature as independent variables. The results revealed that willingness to access nature ($p = .001$) significantly predicted respondent's belief level, while education ($p = .228$), knowledge ($p = .126$), and knowing of disaster events ($p = .174$) were not significant (Table 10).

Another multiple linear regression model was used to analyze the impact of knowledge, belief level, willingness to access nature, belief about its anthropogenic nature, and knowing of disaster events on respondents' concern level. The results revealed that only respondent's willingness to access nature positively and significantly predicted their concern level ($p = .018$), while knowledge ($p = .098$), belief level ($p = .066$), belief about its anthropogenic nature ($p = .940$), and knowing of disaster events ($p = .131$) were not significant (Table 10).

A binary logistic regression model was performed to identify which variable predicted the respondent's willingness to pay. According to the primary analysis results, the independent variables included belief level, concern level, and belief about its anthropogenic nature, which all correlated with the dependent variable. The regression results revealed that respondents' concern level significantly affected their willingness to pay ($p = .013$), while belief level ($p = .158$) and belief about its anthropogenic nature ($p = .935$) were not significant (Table 9).

Table 9

The Results of Multilevel Binary Logistic Regression (N = 86).

Independent variables	VIF	B	p	OR	95% CI OR	
					LL	UL
Constant		-5.297	.003	.005		
Belief level	2.738	.340	.158	1.405	.876	2.254
Belief (its anthropogenic nature)	2.592	-0.040	.935	.961	.366	2.522
Concern level	1.157	.246	.013	1.279	1.052	1.555

Note. The results of collinearity diagnostics (VIF) were pre-checked using linear regression on SPSS.

Table 10*Four Linear Regression Models Results.*

Dependent variable	Independent variables	Coefficients					R ²	<i>p</i>	
		<i>B</i>	SE <i>B</i>	β	<i>t</i>	<i>p</i>			VIF
Knowledge level (N =130)	Constant	3.828	1.091		3.509	.001		.108	.000
	Education	1.059	.269	.329	3.943	.000			
Belief (its anthropogenic nature) (N =119)	Constant	1.160	.332		3.494	.001		.128	.000
	Knowledge level	.031	.019	.144	1.6391	.104	1.031		
	Willingness to access nature	.306	.089	.303	3.435	.001	1.031		
Belief level (N =119)	Constant	5.623	0.858		6.551	.000		.198	.000
	Education	.160	.132	.108	1.212	.228	1.129		
	Knowledge level	.073	.048	.144	1.539	.126	1.251		
	Knowing of disaster events	.522	.381	.127	1.367	.174	1.221		
	Willingness to access nature	.694	.205	.294	3.393	.001	1.066		
	Constant	2.726	1.414		1.928	.056			
Knowledge level	.111	.067	.148	1.667	.098	1.215			
Belief level	.400	.215	.270	1.858	.066	3.277			
Belief (its anthropogenic nature)	-0.037	.490	-0.011	-0.076	.940	3.109			
Willingness to access nature	.733	.304	.210	2.409	.018	1.172			
	Knowing of disaster events	.824	.542	.135	1.521	.131	1.223		

Note. The *F* statistic of these regression models: Knowledge level, $F(1, 128) = 15.548$; Belief (its anthropogenic nature), $F(3, 115) = 6.420$; Belief level, $F(4, 114) = 7.026$; Concern level, $F(5, 113) = 8.344$.

Discussion

Delimitations and Limitations of the research

In the beginning, this research planned to conduct a face-to-face survey rather than an online survey, to ensure the validity and reliability of this research.

Unfortunately, during the COVID period, in-person surveying was irresponsible for the participants; and it could not pass the ethical review for that reason. Thus, I converted to an online survey, which inevitably excluded those who do not have or master smartphones or computers, generally, the undereducated group. Moreover, the reading club rarely had this demographic. As mentioned before, for example, 27.9% of residents were primarily school graduates or under, and 32.8% had junior middle school level in Tianjin (Tianjin Bureau of Statistics, 2020). In order to correct this bias, in the second phase of this survey, the snowball sampling stage, participants were encouraged to recruit people in their workplace and send them the survey link.

The exact proportions of the age category of the Tianjin urban population were not available in the Tianjin Statistical Yearbook 2020 or 2021; and it was relatively unpractical to do the proportional quota sampling in an online survey. Thus, this research employed nonproportional quota sampling. However, this means the survey could not fully represent the population of Tianjin urban residents. It could only, to a certain extent, show some Tianjin urban residents' perception of climate change as well as the relations among variables.

In the whole process, the basic rule was that participants could not be relatives or close friends to avoid the cluster effect.

As a general quantitative survey, this research might suffer from different types of response bias despite I tried to avoid leading questions and make the survey short (less than 4 minutes). Firstly, the respondents tended to agree with the statements or subtext in the questions and choices, a phenomenon known as acquiescence bias (Ray, 1990).

Particularly, the long checklist in the knowledge section for the causes and the consequences presented to the respondents might generate higher knowledge points, as the study found that people could pick quantitative survey options that they would not name in a qualitative approach (Whitmarsh, 2009). This tendency might also appear in other sections involving their attitude. One respondent, who also is an acquaintance, told me that it "leads to a different direction from what I believed; and I defaulted to it because I did not pay much attention (问卷好像引导了不同的方向, 所以答得就有点仓促)" after she completed the questionnaire. Followed by further questioning, she said that "I tend to think it is the climate variability of the earth (我倾向于认为是地球周期); ... humans have limited impact on it (我是认为人类活动对气候影响有限); ...there is no consensus in academia about human's impact (科学界没有统一)." Secondly, the respondents might answer questions to make them look good or conform to acceptable norms. For example, in the motivation of pro-environmental behaviours question, more picks showed up for protecting the environment (92 picked, 70.8%) than cutting costs (72

picked, 55.4%). However, way fewer respondents expressed willingness to pay to support the reduction of greenhouse emissions. This might be because, for the pro-environmental behaviour that could both save money and protect the environment, conservation of the environment is their preferred motive, while, regarding the tangible and costly action, they revealed their true intent. Overall, these biases might impact the outcomes of the study.

Scales were developed to measure respondents' attitudes because scaling can assign numerical values to abstract concepts. It is usually a semantic differential scale with 5 or 7 choices between two dichotomous positions (Clow & James, 2014). Choosing the phrases or words for those choices is crucial to reflect their attitude accurately. However, upon completion of my research, some imprecise wording was found in the survey questions following the investigation. Of course, researchers learn themselves through the course of their research and my competency in my second language also improved throughout the process. I would like to note the following in the interests of explaining further research thoughts.

For questions 11 and 13, the "Neutral" in the middle of the options for each question might have misled the respondents. In question 11, some respondents might confuse the option "Neutral", considering it as a wording between "little worried" and "looking forward to" rather than between "worried" and "not worried." Similar to question 11, in question 13, respondents might think "neutral" isn't a neutral category

among "very likely, somewhat likely, not too likely, not at all likely." This imprecise wording might have led to unclear communication from respondents and lead to unreliable results, especially when the results were assigned different scores to be analyzed.

After becoming aware of this potential problem, I randomly further interviewed ten research respondents. Most of them (7) did not find inadequacies in the options even after I hinted to them about the variations of "neutral." They thought that it was just an option between the other two opposing parties, and individuals who disagreed with the other two could choose it. The other three named the inaccurate neutral category. They said, "the 'neutral' in question 11 should be 'do not care'", " 'neutral' is odd among likelihood option," and "why there is a 'neutral' here, you should delete it and only have four options." Yet, they also indicated that they did not think about these nuances that much when filling out the questionnaire.

Discussion of the results

While public perception of climate change has been investigated for decades in developed countries, this field is still in the beginning stage in China. This study tried to fill the gap and shed light on Tianjin urban residents' understanding of climate change and the correlation between different aspects of their understanding and pro-environmental behaviours. The preceding section sought to discuss the results of this research associated with previous literature.

At the beginning of the knowledge section, rather than simply asking respondents to what extent they know about climate change, the specific question investigated what proportions of respondents knew the terms global warming, climate change or neither of these. Less than 40% of the respondents had heard the concept of climate change, while about 55% had not had a chance to update their information attaching the terminology of climate change and knew "global warming." This might be because the appearance of "climate change" (气候变化) was not common in daily Chinese mass media in recent years. The result that 91.5% of the respondents to some extent knew the climate issue was consistent with previous national research conducted in China that 93.4% (China Center for Climate Change Communication, 2012) and 92.7% (China Center for Climate Change Communication, 2017) of the respondents knew at least a little about climate change. The research also explored whether knowing different terminology correlated with their knowledge, belief and concern about this issue. The results did not follow the idea that people knowing "climate change", a progressive term, were more informed, convinced or worried. The two groups had the same knowledge level in light of the cause, potential consequences and the related event happening in China. And it was the "global warming" group that was more concerned about it and felt certain about its anthropogenic nature. The results were similar to a previous qualitative study that "global warming" was believed to be human-caused compared to "climate change" and more readily evoked significant concern, which means "terminology affects how the public

understands and evaluates the issue" (Whitmarsh, 2009, p.416). Another possible reason could be that, along with the development of the terminology and the mitigation policies, questioning voices appeared in academia and politics in China as well. For instance, in 2010, one month after the Copenhagen Climate Summit, Zhongli Ding, vice president of the Chinese Academy of Sciences and vice-chairman of the standing committee of the 13th National People's Congress, questioned IPCC's report and argued that the mitigation accord was a trap for China's development (Purported land, 2015). Some economists still advocated the viewpoint of developing countries as victims of economic development in the past few years (Guo, 2021). Thus, it is no surprise that people who kept tracking policy and economic trends knew the term "climate change" but also held an ambiguous attitude. Finally, these results also raised a question worth considering in future research in China: whether it is appropriate to directly ask participants their opinions about "climate change" without knowing they do understand this word.

For respondents who knew about climate change and global warming, only a slight majority acknowledged burning fossil fuel (56.3%) and CO₂ (63.8%) in the atmosphere as the cause of climate change; and around half realized the complexity of this issue's negative consequences. It was not surprising to find that there was still a certain number of people who believed the ozone hole was the reason (41.2%) or consequence (36.1%) of this issue. The confusion has been reported in plenty of studies worldwide (e.g., Wei et al., 2014; Brechin, 2003), despite this error was much diminished

in some developed countries these years (Capstick et al., 2015). Among demographic factors (sex, age, and education) and respondents' willingness to access nature, only educational background correlated and predicted respondents' knowledge level. This result was similar to many previous studies that educational attainment was the top-ranked predictor of climate change awareness worldwide (e.g., Lee et al., 2015; Lin et al., 2021). Individuals who received more formal education tend to have more knowledge about this issue.

The study site, Tianjin, did not experience severe harmful events related to climate change, like hurricanes or floods, in the two years before the survey. Still, several well-known events happened across the country, like abnormal rainstorm. However, half of the respondents could not 'attach' nature disaster that happened in the last two years to the climate issue. This might be because of the lacking news coverage linking the climate issue to these weather events. For example, in July 2021, a record-breaking rainfall caused flood occurred in Henan province, leading to at least 390 deaths (Ministry of Emergency Management of the People's Republic of China, 2022). However, not only official and social media coverage during disasters but also the after-the-fact report did not explicitly inform the public that this extreme weather was related to climate change. The terms "climate change (气候变化)" or "global warming (全球变暖)" did not appear on official or mainstream media coverages and reports (China Youth Daily, 2021, Ministry of Emergency Management of the People's Republic of China,

2022, People's Republic of China, 2022, Zhang, 2021). It's hard to explain this phenomenon in spite of China's political context, where the central government strictly controls all the media, but it is crucial to inform the public about the correlation. Suppose the public cannot identify the happening adverse outcomes. In that case, they may not realize the seriousness and urgency or will not proactively carry out mitigation actions or consider adaptation measures according to their local characteristics. They may still consider climate change as a problem for future generations.

Even though we could not say the respondents were generally knowledgeable about climate change based on the survey results, a solid majority of them had high-level beliefs about its reality and human causation. The clear majority of the respondents who knew this issue believed that climate change was real (86.6%) and had felt the changing of the climate (91.6%). Additionally, respondents generally believed that human activities played a crucial influence on climate change. Almost 60% considered it mainly caused by human activities, and around 30% for equally by natural processes and human activity. These results were close to the China national survey conducted in 2017: 94.4% for happening, 66% for caused "mostly by human activities"; and 19.3% for caused by both reasons (China Center for Climate Change Communication, 2017). This indicated that, same as the general situation in China, trend and attribution skepticism views were not prevalent in Tianjin's urban area.

Respondents were generally worried about climate change and more worried than before, but they still, to some extent, misperceived or underestimated climate change. The majority of the respondents expressed worry about climate change (74.8%), more concern (58.0%) or the same (37.0%) than five years before, and the possibility of being negatively affected (68.0%). However, even though people realized seriously adverse events related to climate change were not impossible in their lifetime, they still tended to believe it would not happen close to them temporally, as suggested by much more picks of "future generations" (75.6%) than "other countries or regions in the world"(33.6%) and "your local community or your city (34.4%)." This trend also can be seen in current Americans' minds. American respondents believed that there was more possibility for future generations to have negative impacts (72% for future generations) than themselves (52% for their community, 51% for their family, and 47% for themselves), even though a large portion (43%) of them had already experienced it (Leiserowitz et al., 2022). A China national survey conducted in 2017 had similar results: respondents considered climate change would impact future generations (78%), people in China (51.4%), and themselves (31.1%) (China Center for Climate Change Communication, 2017). Furthermore, this phenomenon has been reported by many researchers worldwide (e.g., Leiserowitz, 2006; Mildemberger et al., 2019; O'Neill & Nicholson-Cole, 2009). This phenomenon might be due to people's cognitive dissonance, as stated in the literature review chapter. Even when climate-related weather events have become more frequent

globally in the past few years, people tend to ignore this information and stick to their initial judgment (Gsottbauer & van den Bergh, 2013, Patt and Schröter 2008). In this case, individuals might view this issue as a distant problem to alleviate their feelings of being threatened and stressed or the guilt for being irresponsible and not taking action.

Respondents were consistent in getting related information; related government departments were the most preferred and trusted source for more information. Their most trusted sources were government (67.2%), followed by professionals/scientists (44.5%) and traditional media (47.1%), which are also governed by the central government in China. "The Internet" (14.3%) and "social media" (8.4%) falling short in the trusted sources indicated that, in general, participants were cautious about the information on them and understood misleading information might appear. However, the fewer picks of "friends or family" suggested that the climate change issue is not a frequently discussed topic in their daily lives, even though many people were worried about it. This might also imply that respondents could not relate the relative weather events that happened globally or nationally in recent years to climate change.

Less than half of the respondents expressed their willingness to pay, which suggested that, in general, urban residents in Tianjin were still reluctant to pay to support the reduction of greenhouse gas emissions. It differed from the previous results that a solid majority of the respondents expressed willingness to pay in each of the four most developed first-tier cities in China (Ge & Lin, 2021). This might be because people living

in first-tier cities tend to have a better economic situation and do not face financial challenges. The economic factor has been reported to be a crucial influence on pro-environmental behaviour; financially secure people tend to adopt environmentalism (Kollmuss & Agyeman, 2002). Interestingly, on the other hand, the majority of respondents reported that they practiced a series of energy conservation or pro-environmental behaviours in their daily lives, like avoiding buying unnecessary goods or choosing energy-efficient appliances, for the environmental purpose (70.8%), followed by saving money (55.4%) and family habit (58.5%). That is to say, the majority expressed their willingness to protect the environment linked to household energy-saving behaviours, which are also bill-saving practices, but some of them were hesitant about paying for mitigations which may be costly. From these results, we can see an attitude-behaviour gap, which had been reported in substantial studies (e.g., Whitmarsh, 2009; Ballew et al., 2019). For instance, Kollmuss and Agyeman (2002) argued that people engaged in low-cost environmental behaviours but not costly and inconvenient ones. This phenomenon is consistent with "the low-cost hypothesis environmental behaviour" (Diekmann and Preisendörfer, 1998): "environmentally concerned individuals will undertake low-cost actions in order to reduce the cognitive dissonance between their attitudes and rational realization of the environmental impact of their actions but avoid higher-cost actions despite their greater potential as far as environmental protection (Farjam et al., 2019, p. 2)."

Which influencing factors predicting respondents' beliefs, concerns and willingness to pay were explored using regression models. The results revealed that: 1) biophilia was the strongest predictor of individuals' belief about climate change and its anthropogenic nature among demographic factors (age, sex, education), knowledge level, and knowing of disaster events within two years; 2) biophilia significantly affected their concern rather than other factors (demographic factors, knowledge level, the belief about its anthropogenic nature, and knowing of disaster events within two years); 3) individual's concern predicted their willingness to pay at a significant level among all the factors above. The interesting point was that concern was more important than knowledge or belief in influencing people's willingness to pay. It also could be attributed to an attitude-behaviour gap that individuals' actions may not correspond with their systems of beliefs about environmental issues, as stated above (Cox & Pezzullo, 2019). This suggests that concern could help the public to translate their awareness into tangible action, while knowledge or belief might not be strong enough to lead to it. It coincides with Haden et al.'s (2012) argument that mitigation and adaptation are motivated by psychological concerns. As found concern to be the direct influencer, the series of results also indicated that biophilia seems to be a deep leverage point that underlyingly affects people's beliefs, concerns and engagement. This is consistent with the argument that biophilia could "promote environmental stewardship and climate action (Fink, 2016; p. 1 of 21)." Admittedly, the disconnected relationship between humans and the natural world

has been found to be the root cause of today's whole spectrum of global environmental crises (e.g., Folke et al. 2011; Ives et al., 2018). The climate issue is no different than any other environmental problem -- the fundamental problem root is human's disconnection from nature (e.g., Fink, 2016; Ives et al., 2018). Reconnecting to nature through different levels has been studied as a solution to evoke dormant biophilia in current societies, foster environmental literacy, and motivate pro-environmental behaviours (Ives et al., 2018).

Conclusion & Recommendation

The current research was undertaken to investigate Tianjin urban residents' perceptions of climate change, their preferred and trusted information sources, and pro-environmental household practices in daily life. It also tried to identify crucial factors influencing individual knowledge, beliefs, concerns, and engagement in climate action (willingness to pay).

The data revealed that respondents had widespread awareness of the climate issue, but their knowledge was at a medium level. Half of them could not link harmful weather events that happened in the last two years across the country to climate change. Still, respondents who were aware of this issue expressed a high level of belief about it and acknowledged that humans played a critical role in its causation. The results revealed a moderately high level of concern and a rising trend compared to five years before. However, they still tended to think this issue would more negatively affect future generations. In addition, respondents knowing the term "global warming" were more concerned about this issue and believed more strongly in its human-caused nature.

Respondents typically acquired relative information from multiple mass media, including traditional media, the internet, and social media. Their most trusted source for learning more information was the related government department. Respondents generally adopted various pro-environmental practices related to GHG emission reduction or energy-efficiency in their daily lives. Moreover, they expressed a desire to

support environmental protection via household actions. The important motivations for practicing these behaviours also included saving money and family traditions. However, regarding willingness to pay for the reduction of greenhouse emissions, the results indicated their indecisive attitude as a whole.

I tried to identify the crucial factors predicting respondents' knowledge, beliefs, concerns, and willingness to pay. In this research, demographic factors, including sex and age, did not correlate with respondents' knowledge, beliefs, concern, and willingness to pay. Education was an important factor that predicted respondents' knowledge level. The results indicated that, among all the plausible factors, biophilia was the strongest predictor of individual belief about climate change and its anthropogenic nature. Biophilia also predicted their concern level. Their concern predicted willingness to pay. Therefore, individual concern about climate change was the major driver for more costly climate action, and biophilia were the crucial underlying influencers.

Based on the social context of the distinctive Chinese political environment and rapidly changing economy, more empirical study on local and national scales is needed to understand the drivers of the public's behavioural change for climate action to facilitate policy-making and achieve its carbon goals. Due to limited capacity and resources, this research employed convenient sampling approaches and inevitably skewed in favor of the young and educated groups. Future research could conduct in-person surveys to correct this bias and authenticity reveal the public's perception of this issue. As the underlying

association between biophilia and taking costly climate action (willingness to pay) indicated in this research and the limited empirical studies in this field, how people's connection to nature affects their perception of the climate issue and proactive behaviour change warrants further investigation. For urban residents, one of the possible aspects worth focusing on is assessing how green spaces or infrastructures in cities influence individuals to foster voluntary behaviour change and shifting sociological paradigms in fighting climate change. Similar to many previous studies, this study also noticed a gap between public awareness and concern about climate change and people's willingness to participate in costly climate actions. Further research to bridge this attitude-behaviour gap from a psychological perspective will assist in implementing mitigation policies.

Clearly, the government plays a crucial role in tackling climate change and shows sound leadership in the process. The public's faith in the government as an information source on climate issues revealed in this research implied their support for policymaking and communication processes to assist the country's efforts to achieve its ambitious commitments. Thus, to help the public be more informed on this issue, official media, including traditional and social media, should report more accurate and latest information and, especially, link the happening weather events to climate change. The statement of these events could raise the public's risk perception and remind them that it is not a distant threat anymore. According to the result that people's concern predicts their

tangible action, their participation in climate action and policy implementation could consequently be stimulated.

Changing people's paradigms is the crux of the climate issue to achieve a long-lasting climate-friendly lifestyle. In cities, nature-based solutions could be a superb solution to foster biophilia, shift social norms towards pro-environmental behaviours, and adapt to climate risk at the same time. Modern human life's disconnection from nature has been proposed as the critical factor in shaping their values and attitudes towards environmental issues, and calling for reconnecting to nature has been growing louder in academia (Ives et al., 2018; Schultz et al., 2004). Awakening biophilia to promote environmental-friendly behaviours could play deeper leverage point in this social-ecological system. For Chinese urban residents living a fast pace of life, direct interaction with natural environments, like hiking in a natural park, may not be a realistic option. Therefore nature-based solutions in the urban area, like green spaces or infrastructures, can reconnect individuals and societies with nature. It could catalyze the inherent biophilia and promote the sense of proactively protecting the natural environment. Furthermore, for cities like Tianjin, mainly threatened by rainstorm waterlogging and high-temperature risk (Sining & Jun, 2021), nature-based solutions in urban spaces can strengthen city resilience in facing climate risk by better regulating the urban heat island effect and precipitation hazards (Marando et al., 2019; Seddon et al., 2020).

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Appendices

Appendix 1- Informed Consent (English & Mandarin)

Informed Consent

You are invited to participate in an online survey about climate change. The goal of this research is to understand Tianjin urban residents' perception of climate change. The two qualifications to participate in this study are: (1) living in Tianjin urban for more than one year; (2) age range from 18 to 65.

This study is being conducted by Bo Li (phone: +86-13821932085), Master of Arts in Environment and Management program, Royal Road University. You can contact me if you have any questions about the research.

Participation in this study is voluntary, and it will take about five minutes. The questionnaire includes questions about knowledge, concerns, and behavior about climate change. Please note that the questionnaire does not involve personal information, so participants' identity will not be identified directly or indirectly in the result and report of this research. Only demographic factors, including age, sex and education level, of the participants will be collected for analysis, ensuring strict anonymity and confidentiality.

Participating in this study may not benefit you directly, but it will help us learn about Tianjin urban residents' perception of climate change. You may find answering some of the questions upsetting, but we expect that this would not be different from the kinds of things you discuss with family or friends. You have no obligation to participate,

so you may skip any questions you don't want to answer, and you may end the survey at any time. You have the right to withdraw your answers after completing the questionnaire. You have not waived any rights to legal recourse in the event of research-related harm.

This survey is anonymous which means research reports from on-line or mail-in surveys in which there is no personally identifiable information such as the research participant's name, and there is no way to trace the responses back to the research participant. The information you share with us will be kept completely confidential and destroyed once the thesis is accepted.

By completing this survey, you are consenting to participate in this study.

The research results will be published in public outlets, including [thesis/doctoral dissertation] that will be published in RRU's Digital Archive, Pro-Quest and Library and Archives Canada. The results might also be disseminated at public and academic conferences and presentations.

The project has received approval from the Royal Roads University Research Ethics Board and any questions can be addressed to ethicalreview@royalroads.ca. If you have any questions about this study, please contact Professor Ann Dale, my research supervisor, Royal Road University (Ann.Dale@RoyalRoads.ca).

您被邀请参加这项关于气候变化的研究。本研究的目的是了解天津城市居民对于气候变化的认知。这项研究对于参与者有两项要求：1) 居住在天津市区超过 1 年，2) 年龄在 15-65 之间。

这项研究由皇家路大学环境与管理专业学生李博完成。如果您对本实验有任何问题，欢迎联系李博（电话号码 13821932085）。

您的参与是完全自愿的。本调查将耽误您约五分钟的时间。问题是关于气候变暖的知识，担忧，怀疑及相关行为。由于问题中不涉及私人信息，所以您的身份在研究结果和报告中是不能被直接（或间接）识别出来的。只有一些例如年龄，性别，教育程度这样的信息将会被收集，以完成研究分析需要。

参与这项研究可能不能带给您直接的收益，但能够帮助我们了解天津市区居民对于气候变暖的了解程度。你可能会看到一些不愉快的问题，但我们觉得这和您平时和亲人朋友讨论的话题不会有什么差别。您并没有义务参与此次调查，因此您有权跳过任何问题，或随时停止。您有权在回答完问题后撤销您的答案。您有权对本实验中受到的伤害进行寻求法律援助。

本研究是匿名的，这表明通过网络进行的调研不含有能够识别身份的信息例如参与者的姓名，且不能够追踪到参与者。您我们分享的信息将被完全保密并在论文被完全接受后销毁。

在您完成这项调查的时候，我们默认您愿意参加这项调查。

调查的结果可能会发表在皇家路大学硕士博士论文电子档案，ProQuest 及加拿大档案。研究结果也有可能发表在期刊杂志或会议演讲中。

本研究项目已通过皇家路大学的研究伦理委员会审核，如有问题请联系 ethicalreview@royalroads.ca。如果您对于这个研究有任何问题，可以联系 Ann Dale 教授。她是

皇家路大学的老师也是这个研究的指导员。她的邮箱是 Ann.Dale@RoyalRoads.ca，并仅限英文交流。

Appendix 2- Survey Questionnaire (English & Mandarin)

English Version

1. Your gender is :

- A Male
- B Female

2. What is your age?

- A 18-25
- B 26-35
- C 36-45
- D 46-55
- E 56-65

3. What is your highest level of education?

- A Equal to or lower than primary school
- B Middle school
- C High school
- D Vocational school
- E Bachelor degree
- F Equal to or higher than master degree

4. Which of the following statements is the most applicable to you? (choose only one answer) (Note: if you want to choose C or D, please readily ignore the option of A and B)

- A I have heard of Global Warming1
- B I understand Global Warming2
- C I have heard of Climate Change3
- D I understand Climate Change.....4
- E None of these above0

5. In your opinion, what is/are the cause(s) of global warming/climate change? (choose one or more answers)

A Increasing concentration of CO₂ in the atmosphere1
 B Increasing concentration of CH₄ in the atmosphere1
 C Burning coal and gas1
 D Ozone hole-1
 E Deforestation1
 F None of these above/Do not know0

6. In your opinion, which one or more of these phenomenon is/ are the consequence of global warming/climate change? (choose one or more answers)

A Getting warmer1
 B Extreme weather events more frequent. (e.g storms)1
 C Floods1
 D Drought1
 E Smog1
 F Changing habitats1
 G Species extinction.....1
 H Grain production reduction.....1
 I Wildfire.....1
 J Rising sea level.....1
 K Ozone hole.....-1
 L None of these above/Do not know.....0

7. Do you know someplace in your country that has experienced serious harm from global warming/climate change in the past two years? (choose only one answer)

A Yes1
 B No0

8. To what extent do you think you think global warming/climate change is real? (choose only one answer)

A Definitely real4
 B Probably real3
 C Neutral2
 D Probably not real1
 E Definitely not real0

9. Do you think the world's climate is changing? (choose only one answer)

A Definitely changing4
 B Probably changing3
 C Neutral2
 D Probably not changing1
 E Definitely not changing0

10. Do you think that global warming/climate change is caused by natural processes, human activity, or both? (choose only one answer)

A Entirely by human activity.....4
 B Mainly by human activity3
 C About equally by natural processes and human activity.....2
 D Mainly by natural processes1
 E Entirely by natural processes0
 F Do not know.....0

11. How worried are you about global warming/climate change? (choose only one answer)

A Very worried.....4
 B Somewhat worried3
 C Neutral2
 D Overall no worries1
 E Not worried at all.....0
 F Do not know0

12. Are you more worried about global warming/climate change than you were five years ago? (choose one or more answers)

A Definitely more worried.....4
 B Probably more worried3
 C Same as before.....2
 D Probably less worried.....1
 E Definitely less worried.....0

13. How likely are you (or your family) to be personally negatively affected by the global warming/climate change in your life time? (choose only one answer)

A Very likely4

B Somewhat likely3
 C Neutral.....2
 D Not too likely.....1
 E Not at all likely0

14. Which of the following do you think will be seriously negatively affected by global warming/climate change in the future? (choose one or more answers)

A Non-human nature.....1
 B Other countries or regions in the world.....1
 C Your local community or your city.....1
 D Future generations.....1
 E None of the above will be seriously negatively affected.0

15. Until now, what sources did you get the information of global warming/climate change?

- A Related department of government
- B Friends or family
- C Professional, such as teacher and scientist
- D Newspapers, television or radio
- E The internet
- F Social media
- G A famous person you like
- H Local religious leaders
- I Don't know
- E None of these above

16. If you wanted to get information about global warming/climate change, what sources would you go to? (choose one or more answers)

- A Related department of government
- B Friends or family
- C Professional, such as teacher and scientist
- D Newspapers, television or radio
- E The internet
- F Social media
- G A famous person you like
- H Local religious leaders
- I Don't know

E None of these above

17. Which information source do you trust most to provide information of global warming/climate change? (choose one or more answers)

- A Related department of government
- B Friends or family
- C Professional, such as teacher and scientist
- D Newspapers, television or radio
- E The internet
- F Social media
- G A famous person you like
- H Local religious leaders
- I Don't know
- E None of these above

18. "How much, if at all, do you enjoy being outside in nature? (choose only one answer)

- A To a very great extent4
- B To a great extent3
- C To some extent2
- D To a small extent.....1
- E Not at all0

19. Are you willing to pay carbon tax or other type of expenses to support reduction of greenhouse emission? (choose only one answer)

- A Yes
- B No
- C Do not know

20. In your daily life, what habits do you adopt? (choose one or more answers)

- A Switch off lights when leaving a room
- B Pay attention to energy-saving logo when buying appliance and choose the energy-efficient ones
- C Avoid buying unnecessary goods
- D Choose bicycle or public transportation (like subway and bus) rather than drive a car

E Use the air conditioning when really needed

F Intend to avoid using disposable items (like plastic bags and paper)

21. What are the reason(s) why you practice these habits? (choose one or more answers)

A To cut costs

B To protect the environment

C Family Traditions

D None of the above

中文版 (Mandarin Version)

1. 您的性别是：

A 男

B 女

2. 您的年龄是：

A 18-25

B 26-35

C 36-45

D 46-55

E 56-65

3. 您的最高学历是？

A 小学及以下

B 初中

C 高中

D 大专

E 本科

F 研究生及以上

4. 以下哪项最符合您（单选）（备注：如果您想选择 C 或 D 选项，请自动忽略 A 和 B 选项的存在）：

A 我听说过全球变暖

B 我清楚全球变暖这件事

C 我听说过气候变化

D 我清楚气候变化这件事

E 以上都没有

5. 您认为导致全球变暖/气候变化的原因有（可多选）

- A 大气中 CO2 浓度增加
- B 大气中甲烷浓度增加
- C 燃烧石油煤炭
- D 臭氧层空洞
- E 砍伐森林
- F 以上都没有/不知道

6. 您认为以下哪个/些可能是气候变化导致的结果（可多选）

- A 气候变暖
- B 异常天气出现更频繁（如飓风，冰雹）
- C 洪水
- D 干旱
- E 雾霾
- F 物种迁移
- G 物种灭绝
- H 粮食减产
- I 森林火灾
- J 海平面上升
- K 臭氧层空洞
- L 以上都没有/不知道

7. 您是否知道咱们国家在过去的两年内有地区因气候变化/全球变暖而遭受灾难（单选）？

- A 知道
- B 不知道

8. 您认为气候变化/全球变暖是事实吗？（单选）

- A 肯定是事实
- B 可能是事实
- C 中立
- D 可能是骗局
- E 肯定是骗局

9. 您认为世界的气候/气温是否正在变化? (单选)

- A 当然在变化
- B 可能在变化
- C 中立
- D 可能没变化
- E 确定没变化

10. 您认为气候变化/全球变暖是由什么造成的? (单选)

- A 全部是因为人类活动
- B 主要是因为人类活动
- C 大概各占一半
- D 主要是自然现象
- E 全部是自然现象
- F 不知道

11. 您对于气候变化/全球变暖这件事的担心程度是怎样的? (单选)

- A 非常担心
- B 有一点担心
- C 中立
- D 不担心
- E 非常不担心
- F 不知道

12. 比起五年前, 您对于气候变化这个问题是否更担心了? (单选)

- A 确实更担心了
- B 担心程度提高一点
- C 和以前一样
- D 担心程度降低了
- E 远不如原来担心

13. 您觉得在您的人生中, 您本人或者您家人受到气候变化/全球变暖相关灾难影响的可能性是 (单选)

- A 很有可能
- B 有一点可能
- C 中立
- D 可能性很小
- E 完全没可能

14. 您认为以下哪些可能在未来受到全球变暖/气候变化的严重负面影响？（多选）

- A 非人类居住的其他自然区域
- B 其他国家或地区
- C 您所在的城市及社区
- D 未来的人/子孙后代
- E 以上都不会受到严重负面影响

15. 到目前为止，您在哪些渠道看见过气候变化/全球变暖的相关信息？（可多选）

- A 相关政府部门
- B 朋友和家人
- C 专业人士（如老师，科学家）
- D 报纸，电视，广播
- E 网络
- F 社交媒体（如微信朋友圈）
- G 喜欢的知名人士
- H 本地宗教领袖
- I 不知道
- J 以上都没有

16. 如果您想要了解气候变化/全球变暖相关信息，您倾向于从何处了解？（可多选）

- A 相关政府部门
- B 朋友和家人
- C 专业人士（如老师，科学家）
- D 报纸，电视，广播
- E 网络
- F 社交媒体（如微信朋友圈）
- G 喜欢的知名人士
- H 本地宗教领袖
- I 不知道
- J 以上都没有

17. 对于气候变化/全球变暖这个信息，哪个信息来源是您最信任的？（可多选）

- A 相关政府部门
- B 朋友和家人
- C 专业人士（如老师，科学家）
- D 报纸，电视，广播
- E 网络
- F 社交媒体（如微信朋友圈）
- G 喜欢的知名人士
- H 本地宗教领袖
- I 不知道
- J 以上都没有

18. 你是否喜欢亲近自然的的活动？（单选）

- A 非常喜欢
- B 有一点喜欢
- C 一般
- D 不太喜欢
- E 很不喜欢

19. 你愿意支付碳税或其他形式的费用以支持减少温室气体排放的措施吗？（单选）

- A 我愿意
- B 我不愿意
- C 不知道

20. 在您的生活中有以下哪些生活习惯（可多选）

- A 离开屋子的时候随手关灯
- B 购买家用电器时关注节能标识并选择节能产品
- C 减少购买没有必要的物品
- D 选择自行车或公共交通（公交，地铁）而非开车
- E 只在需要的时候才开空调
- F 有意识地减少一次性用品（塑料制品，纸张等）的使用

21. 您有以上习惯的主要原因是（可多选）

- A 节省开支
- B 支持环保
- C 家庭习惯
- D 以上都没有