

Changes in Seasonal Temperature Offers an Opportunity for Climate Policy

Joew Bedon*

Editorial office, Journal of Climatology & Weather Forecasting, United Kingdom

Corresponding Author*

Joew Bedon
Editorial Office
Journal of Climatology and Weather Forecasting
United Kingdom
E-mail: Climatejournal@res.com

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Abstract

Environmental disasters, such as increasing severity and frequency of climatic extremes, can operate as "windows of opportunity," testing residents' mental models and motivating them to engage in reflective processes, questioning their preconceived notions. It is less clear if altering weather patterns, which are frequent in the mid-latitudes, may have a comparable effect and enhance individuals' worries about climate change and readiness to adopt more rigorous climate regulations. In this research, we look at how seasonal temperature changes affect people's perceptions of the severity of climate change and their desire to ameliorate it.

Keywords: Climate change concern • Longitudinal data • Observational weather data • Seasonal temperature

Introduction

Climate change experience and events perceived as climate change impacts have the capacity to affect human understanding, attitudes, and risk assessment of global environmental changes. Enhanced climate mitigation efforts need far-reaching political action, and their effectiveness is heavily dependent on public opinion and pressure. Understanding public opinion on climate change and how it is influenced is therefore critical not only for gaining a clear picture of the status quo, but also for forecasting trends and identifying potential "windows of opportunity" for successful climate change policy implementation and communication. Several writers argue that environmental disasters, such as increased severity and frequency of climate extremes, may operate as "windows of opportunity" by creating uncertainty and confusion, which may push players to participate in reflective processes and confront their pre-conceived notions. Life events that disturb daily patterns may also open up a window in which individual behaviour is more likely to be intentionally reviewed. Such possibilities are typically prompted by unpredictability in external or environmental elements; nevertheless, social complications such as public acceptance and support for planned transformational changes must be addressed. Most prior European research have focused on the influence of severe occurrences on public opinion. As a result, we do not yet know if less dramatic temperature increases that affect almost everyone might influence public views on climate change and climate mitigation. The primary goal of

this study was to determine the influence of changes in externally recorded seasonal temperature on an individual's perception of climate change and support for climate policy, while taking into account the individual's traits and past views.

The study advanced our understanding of this topic by utilising a representative longitudinal dataset collected from a German population by the GESIS Panel (GESIS, 2019) and a high-quality interpolation of weather and climate observations made at Deutscher Wetterdienst weather stations that was available at the Potsdam Institute of Climate Impact Research (Potsdam Institute for Climate Impact Research, 2019). Germany is one of the largest nations in the European Union in terms of territory, population, and economic output; as such, it has one of the highest greenhouse gas emissions (IEA, 2022). The country actively participates in European Union environmental and climate policy, and its strong environmental social movements are recognised to influence the country's politics. Following the Fukushima nuclear accident in 2011, public outrage resulted in a quick change in domestic energy generation known as the 'Energiewende'. Several studies have been conducted on the German population to investigate the relationships between political orientation, values, personal attributes, and environmental and climatic perceptions, attitudes, and behavioural choices. Engels et al. (2013), for example, utilised German population survey data to examine the relationships between popular climate-change denial, energy preferences, and political engagement. According to the study findings, climate-change doubt correlates negatively with support for renewable energy resources and political involvement, despite the fact that this pessimism has not spread extensively in Germany. Smith et al. (2020) examined the association between knowledge, worry, and individual readiness to adopt behavioural adjustments in response to polar ice loss using data from a German society panel. The authors discovered that concern for the polar areas is the biggest predictor of an individual's propensity to adopt behavioural adjustments in response to polar ice loss.

The impact of weather events on climate change views and attitudes towards mitigation policies

Numerous studies on common information, personal perspectives, and risk perceptions surrounding climate change have been published over the last decade, with some focusing specifically on Germany. Diekmann and Preisendörfer (2003) demonstrated that environmental issues were an emotionally charged topic in Germany as early as the early 2000s: 74% of poll respondents expressed concern about environmental circumstances and their impact on future generations, and 66% predicted an environmental disaster if the current way of life was continued. Fifty-four percent of those polled at the time felt that individuals should be ready to decrease their level of living, and 27% favoured environmental protection measures, even if they meant losing employment. According to Ziegler (2017), 78% of Germans think climate change is actually happening, and nearly three-quarters support increased government sponsored climate protection measures. This author also said that his research found that membership in the Green Party was positively associated to support for climate change policies and willingness to pay for environmentally friendly items. Age, gender, and education, among other socio-demographic factors, appear to influence attitudes on climate change. Smith et al. (2020) discovered that one-third of all Germans (31%), were somewhat or very well educated about polar ice loss, whereas more than half were unconcerned about polar ice loss. Many studies have found that certain criteria such as a person's gender, age, political affiliation, education, and economic level impact their views on climate change and readiness to mitigate. A rising number of research are being conducted to understand how changing or extreme weather and climatic circumstances affect such views. There are two primary study lines that differ in terms of whether the person experience of climate change is

self-reported or obtained from climatic and meteorological data. The perceived experience of climate change study stream solicits an individual's subjective perspective on the issue. It shows how many individuals feel they have personally experienced climate change, the occurrences they believe are the outcome of climate change, and the link between these reported experiences and climate change attitudes. According to the conclusions of a significant body of literature, the majority of persons polled claim having experienced some type of occurrence associated with climate change.

In contrast to perceived experience studies, the research exploring the impact of observed weather and climatic conditions on climate change opinion employs objective meteorological data to determine if particular climatic variations and weather occurrences influence an individual's viewpoint. Prior assumptions, such as mental models and motivated reasoning, have been shown to affect perceptions of experienced weather and climate change.

An individual's psychological distance from an object or event determines how it is viewed and treated. While the complexity and ambiguity of climate change make it difficult to draw unambiguous inferences between action and impact, personal experiences help lessen psychological detachment. Climate action is impeded when climate change is regarded as psychologically remote, abstract, less real, or unimportant, according to research.

Seasonal temperature change

The observed weather data is an extrapolation of weather and climate observations from Deutscher Wetterdienst weather stations and is derived from a weather and climate dataset accessible from the Potsdam Institute of Climate Impact Research (PIK) (Potsdam Institute for Climate Impact Research, 2019). The data spans the years 2000 to 2018, with post codes serving as the smallest geographical unit. In a preliminary investigation, the impacts of a variety of weather and climatic factors on the suggested dependent variables were investigated, including the number of snow, heat, and storm days, the length of the longest hot phase, and seasonal averages of temperature and precipitation. The analysis that resulted selected to look at the consequences of seasonal temperature changes. As a result, the reported temperature for each time was compared to the previous year's temperature and the 19 year average for each post code region. An examination of the departure from the 30 year average was investigated, but 30 year averages were only available at the municipality level, which was deemed insufficiently thorough. Seasons were defined as the averages of the following months to test temperature deviations experienced as close to the collection date of the social data in July as possible:

- (1) winter: January, February, March;
- (2) spring: April, May, June;
- (3) summer: July, August, September; and
- (4) fall: October, November, December. All temperature deviations were computed in both relative (positive or negative change) and absolute (change extent) terms. Because seasonal temperature variation relative to the previous year showed to have the most significant and greatest influence, comparisons to the 19-year average are not examined further.

Discussion

According to the findings of this study, seasonal temperature variation impacts personal climate change worries even in moderate climate zones. While relative fluctuations of temperatures in the fall had no significant effects, absolute winter and summer temperature changes did. The change in spring temperatures has a big detrimental impact on climate change concerns. Furthermore, while the impacts of relative temperature change are not statistically significant, absolute temperature change has far bigger consequences. This suggests that if seasonal temperatures are seen as "different from normal" is more relevant than whether they become colder

or warmer. While the effects of temperature change on desire to mitigate are less substantial than those of climate change worry, temperature fluctuation in spring and autumn is considerable. Furthermore, reactions to support for mitigation efforts correspond to the amount of each individual's sense of climate change (Fig. 1c). As a result, the impact of seasonal temperature variation on climate change concern may provide a window of opportunity for more strict climate change policies. Furthermore, the stronger results for the summer seasons may imply that these impacts are larger when seasonal temperature variation is conceived as a result of climate change. This communication might be aimed at changing people's mental models for interpreting their surroundings, retrieving learned information, and applying this knowledge to problem solving. Mental models are malleable and malleable, and they may be rectified for defects or uncertainties that lead to unexpected outcomes. Furthermore, the findings indicate that respondents are more willing to embrace self-determined mitigation choices, such as decreasing living standards and paying higher prices, but governmental solutions, such as taxes and the phase-out of fossil fuels, are less popular.

The favourable effects of temperature change on climate change perceptions were predicted and are consistent with earlier research that found beneficial effects of local temperature change on climate change perceptions. The diminishing substantial influence of absolute spring temperature fluctuation, on the other hand, is surprising and might be explained by a number of variables. Spring average temperatures rose between 2014 and 2018 and the milder seasons may have been appreciated. Furthermore, spring temperatures have been associated with climate change less than temperatures in other seasons in the media. While the individual experience of temperature change in summer had a lesser influence on climate change worry than in winter, it is important to remember that the yearly factors have represented wider social shifts. The growing importance and impact of larger societal changes in recent years suggest that worry about climate change grows with time, notably in the spring and summer models. This trend is most likely the result of a mix of shared experiences with warmer springs and summers, increasing media and political attention to climate change, and a growth in the visibility of climate action (e.g., through the Fridays for Future movement).

The estimated maximum expected effects of the independent variables, indicating the extent and limitations of each variable's influence on people's worry about climate change and desire to mitigate. It also emphasises the potential consequences when comparing extremes, such as persons with far-left and far-right political beliefs or no temperature change vs a maximum temperature shift of 6°C. While the regression coefficients for seasonal temperature variables are minor, persons who experience dramatic temperature swings in the winter and fall may be more concerned about climate change or more motivated to mitigate, depending on characteristics such as gender or political involvement.

Living further away from a metropolis reduces the influence of both dependent variables. This variable was classified into six unequal levels ranging from 10 km to 20 km, thus each extra 15 kilometres between a house and a city reduced worry about climate change and readiness to mitigate by around half a percent. Janko et al. (2018) discovered similar results in the Hungarian population, where the size of respondents' settlements significantly affected their worry about climate change and readiness to act.

The large and statistically significant influence of socio-demographic characteristics may imply that various groups of respondents require different approaches. Climate change communication, aimed at various citizen groups, is critical for amplifying the impacts of changing climate and weather on climate change opinion, because message reception is largely reliant not just on experiences but also on preexisting views.