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Level of Congruence between Household Perspectives and Mexican Climate Policies on the Issue of Climate Change

ABSTRACT

This study examines the extent of congruence across the issue of climate change between households and climate policies, based on a case study in Nuevo León, Mexico. We used thematic analysis to examine responses from a household survey and classify perceptions of climate change, which resulted in seven main themes. We then reviewed how the themes are used in selected climate policies to make a comparison between them and household perceptions. We found climate policy concerns focused on mitigating greenhouse gases, preparing for extreme weather events, and reducing impacts that affect economic development in Nuevo León and Mexico. By contrast, respondents showed a wider range of concerns and are especially worried about current issues in their homes and everyday lives. As households have an important role to play in addressing climate change, we argue that a stronger congruence between household perceptions and climate policies could make policies more approachable for households, and thus have a positive impact on policy implementation.

Keywords: households, climate change perceptions, policy congruence, climate policy, Latin America

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INTRODUCTION

Although households have an important role to play in addressing climate change, their role is not prominent in climate policies (Dubois et al., 2019; Shittu, 2020). Households can take on adaptation and mitigation responses to become more resilient against climate change effects and to reduce greenhouse gas (GHG) emissions (Ivanova et al., 2016; Elrick-Barr et al., 2017). National and subnational governments through decision-making processes can encourage and work together with households to take a greater role to respond to climate change (Uitto et al., 2017; Stavenhagen et al., 2018; Shittu 2020). However, for households to participate as active players, it is crucial to identify, recognize and represent their perceptions, interests, and concerns regarding climate policies (Rhodes et al., 2017; Schleich et al., 2018; Pardo Martínez et al., 2018).

One of the key aspects of democratic nations, and central to the purpose of political representation, is the assumption that public policies should correspond to a close degree with public interests (Arnold & Franklin, 2012; Warwick, 2015; Balatonyi, et al. 2022). Prior work stresses that an alignment between public interests and policies can provide momentum to make policy implementation much more effective, as the public gets the policies they prefer (Arnold & Franklin, 2012; Carattini et al., 2018; Bastida et al., 2019). Conversely, a lack of congruence between public interests and policies can lead to low policy acceptance and constrain the success of policy implementation (Warwick, 2015; Carattini et al., 2018). The level of alignment between the public and climate policies can be characterized through public-policy congruence approaches (Schlosberg et al., 2017; Repo et al., 2018; Kinnunen, 2021).

Previous public-policy congruence studies carried out in high-income countries such as the U.S., U.K., Finland, and Australia have shown that the levels of democratic performance, electoral systems, and climate policies, among other features, vary between nations and regions, as well as their implications (Anderson et al., 2017; Scholsberg et al., 2017; Repo et al., 2018; Kinnunen, 2021). However, in the context of low-income and middle-income countries, particularly in Latin America, knowledge is lacking. To build on prior research and address these shortcomings, in this study we examine the level of congruence across the issue of climate change between households and climate policies. As households have an important role to play in addressing climate change, our findings can provide valuable information for further discussion of households on climate change. Moreover, we argue that a stronger congruence between household perspectives and climate policies can make policies more approachable for households, and thus have a positive impact on policy implementation. To do so, we examine open-ended responses from a household survey carried out in Nuevo León, a state in Mexico, and compare them to climate policy text using a congruence scale.

LITERATURE REVIEW

Several lines of evidence suggest that household action on climate change requires support from public policies (Bryan et al., 2013; Porter et al., 2014; Sköld et al., 2018). Households are taking climate change action, for example by reducing energy and water consumption, but would likely take on even more and efficient action if properly incentivized (Sköld et al., 2018; González-Hernández et al., 2019, González-Hernández et al, 2022). However, in some circumstances, climate policy measures can lessen a household's willingness to take action. For instance, a study reviewing the use of carbon taxes in European countries finds that these types of policy instruments are often met with public resistance as they go against people's concerns and interests (Carattini et al., 2018). Instead, the use of information, communication technologies, and subsidies for renewable energies, which are more aligned with the public's interests, appears to encourage household action to mitigate CO_2 emissions from the electricity sector (Tvinnereim et al., 2017; Carattini et al., 2018; Bastida et al., 2019).

Recognizing the above, recent literature emphasizes the need to design effective policies with the ability to reach as many households as possible and motivate them to take action (Dubois et al. 2019). Progress can be further gained by exploring climate change perceptions as evidence indicates that household actions are not only motivated by economic, social, and political factors but also by internal factors, such as perceptions, that may motivate or prevent households from engaging with the issue (González-Hernández et al., 2019; Jia et al., 2019; González-Hernández et al, 2022). Greater focus has therefore been given to literature in understanding public perceptions, opinions, and concerns of climate change to tackle the issue.

More recently, several studies mostly confined to high-income countries, have investigated whether enacted climate policies are congruent with public perceptions, opinions, and concerns about issues related to climate change (e.g., Scholsberg et al., 2017; Repo et al., 2018; Kinnunen, 2021). What these studies find is that oftentimes climate policies tend to be disconnected from public opinion. For example, Schlosberg et al. (2017) identified a lack of congruence between government adaptation plans on climate change and community groups from Australia. While the first focused on risk management and financial liability when addressing climate change impacts, the latter identified a variety of issues and ways of looking at climate change impacts related to the vulnerability of their basic needs and capabilities of their everyday life. The community groups highlighted issues related to health, housing, economic development, flora and fauna, and the discrimination of Aboriginal heritage. The authors argued that the community's framing of impacts illustrates a capabilities approach, which climate policies can build on to promote climate justice and ensure a person's capabilities, security, and fulfillment in life.

Kinnunen (2021) examined the extent to which policy decisions on energy and climate policy measures are in line with public opinion. The author examined citizens' opinions on various energy and climate policy measures, collected as part of formal policy preparation processes, and compared them to the measures politicians later agreed to implement. This study found that the citizens' most

favored measures had not influenced public policy, indicating a weak public-policy congruence. Similarly, Repo et al. (2018) found a lack of congruence between public concerns and European policies on the topic of circular economies. European citizens depicted desirable and sustainable futures when discussing the circular economy, while the policies focused on practically-oriented action plans for building futures. Together, these studies show that the public's concerns, needs, and interests differ from policy goals and measures set by governments. Moreover, these studies indicate that the lack of congruence between the public and climate policies can have an impact on the implementation of policies by hindering public acceptance.

Studies like the above have highlighted several factors that may hinder public-policy congruence. These factors include a lack of community consultation and poor public engagement (Schlosberg et al., 2017; Perlaviciute & Squintani, 2020). Additionally, the way climate change is understood will differ between the public and policymakers because policymakers have a professional interest in the area, whereas public opinion varies and is based on experiences rather than systematic attention (Repo et al., 2018). Finally, the consensus is further complicated because the issue of climate change is complex and multidisciplinary, and it involves multiple stakeholders that tend to be in a stronger position to express their interests and opinions than the public (Kinnunen, 2021; Sümeghy, 2021).

Despite the empirical evidence provided by literature, indicating that the extent to which public policies are congruent with public perspectives can influence the success of policy implementation, this matter is largely unknown in the context of Latin American climate policies. Therefore, in this study, we explore the congruence between households in Nuevo León and Mexican climate policies.

METHODS

Case study

We focus on Mexico, where national policy efforts have been made to address climate change by building a climate-safe future that guarantees a more prosperous future for all (SEMARNAT-INECC, 2016). Climate change is expected to have widespread impacts throughout the country (SEMARNAT-INECC, 2016). Furthermore, as the climate change issue has gained public visibility in recent years, policymakers can take advantage of this momentum and create favorable conditions to facilitate action and achieve policy goals. However, several authors have argued that the country has fallen short of accomplishing its policy goals due to policy fragmentation, a lack of concrete goals and actions, in addition to weak accountability mechanisms, and gaps in leadership (Averchenkova & Guzman Luna, 2018; Silva Rodríguez de San Miguel, 2018; Solorio, 2021).

Specifically, the state of Nuevo León, located in a semi-arid region in northeast Mexico is selected for its experiences with extreme weather events, including recent droughts, floods, and torrential rains. The predictions of worsening effects due to rising temperatures are expected to exacerbate the state's current social, economic, and environmental issues (Gobierno del Estado de Nuevo León,

2010; Sisto et al., 2016; Ortega-Gaucin et al., 2018). The total territory of the state represents 3.3% of Mexico's total extension (INEGI 2020). Close to 85% of the population lives in the Monterrey Metropolitan Area, ranking it the second largest metropolitan area in the country. The metropolitan area holds most of the state government institutions and the federal government's regional offices.

Nuevo León is also one of the biggest producers of GHG emissions, generating close to 10% of Mexico's total GHG emissions (Chacón et al. 2010; Semarnat 2016). To tackle this double challenge, the state government has set ambitious policy goals to address the causes and consequences of climate change. If households should be moving towards mitigation and adaptation approaches, is it crucial that some alignment exists on the issue of climate change between households and climate policies?

Household data collection

A household survey was conducted via online and paper formats between August 2016 to January 2017. Respondents for the online survey were recruited by sending an invitation and a link to a Qualtrics survey via social media. Participant recruitment for the paper format took place in the main public squares of several municipalities throughout Nuevo León. The in-person questionnaires were self-completed without researcher intervention in order to emulate the conditions of the online version survey. The data from both formats were combined to create a working dataset, which resulted in 622 responses (229 online and 393 by paper questionnaire).

Besides sociodemographic items, which asked about the respondent and household characteristics, the survey measured climate change perceptions and reported action. For this paper, respondents were asked three open-ended questions:

1. What do you think will be the effects of climate change?
2. How do you think climate change can affect your household?
3. What do you think the government can do to support your household against climate change?

The responses to these questions informed the analysis of this study, while the responses from the other survey questions are analyzed in more detail in three other papers. As respondents were allowed to skip questions, only participants who responded to at least one of the open-ended questions relevant to the goal of this paper will be considered for analysis (n=539) (Table 1). All extracts used in this paper were translated into English from Spanish by the lead author.

A comparison was made between the socio-demographic characteristics of the initial sample and the respondent sample against the Nuevo León population (Table 1). The average age, gender distribution, household size, and the percentage of respondents living in an urban setting are roughly representative of the state's population. Household income per month ranged widely, with 29% of the respondent sample earning less than MXN $10,000 (about USD $500). Regarding education, most respondents had at least completed high school, and half had completed a bachelor's degree or higher. Therefore, people with higher educational levels are overrepresented in the sample.

Table 1. Summary of sociodemographic characteristics of the Nuevo León population, the initial sample, and the respondent sample

Sociodemographic characteristic	Nuevo León population	Initial sample (n=622)	Respondent sample (n=539)
Gender			
Male	50%	44%	44%
Female	50%	55%	56%
Age			
Range	-	18-84 years	18-84 years
Average	30 years	34 years	35 years
Education			
Less than high school	48%	12%	11%
High school	26%	41%	40%
Bachelor	26%	34%	35%
Graduate	-	13%	14%
Household location			
Urban	92%	91%	92%
Rural	8%	7%	6%
Income per month (MXN per month)			
<$5,000	Average is $474.4 per individual per day*	15%	13%
$5,000-10,000		17%	16%
$10,000-20,000		18%	17%
$20,000-30,000		15%	16%
$30,000-40,000		9%	10%
$>40,000-50,000		12%	12%
Household size			
Average	3.5 members	3.7 members	3.7 members

*1 USD is approximately 20 MXN (September 2022). Figures obtained from Data Nuevo León (Secretaría de Economía y Trabajo del Gobierno Estatal de Nuevo León; September 2021; datos.nl.gob.mx). The rest of the data is obtained from the Census of Population and Housing (INEGI, 2020).

Policy data collection

For the policy document analysis, we selected policies and policy tools that have been passed by the national and the Nuevo León State legislatures to tackle climate change. We used the *General Law of Climate Change* (Ley General de Cambio Climático; hereafter GLCC), the main policy instrument in Mexico, and the key planning instruments that are defined in it: *The National Strategy on Climate Change* (Estrategia Nacional de Cambio Climático Visión 10-20-40; hereafter NSCC), *The Special Climate Change Program* (Programa Especial de Cambio Climático 2014-2018; hereafter SCCP) and state climate change programs (PACC). Because this study takes place in Nuevo León, we used the *Nuevo León State's Climate Change Action Program* (Programa de Acción ante el Cambio Climático

para el Estado de Nuevo León 2010-2015; hereafter PACC-NL). The policy documents are available on the official websites of the federal and state government and are described in short below.

The GLCC adopted in 2012 and amended in 2018, envisions Mexico as a competitive, sustainable, and low-emission economy and identifies strategies to achieve this vision based on mitigation and adaptation actions geared towards various development sectors. It provides the basis for the creation of institutions, legal frameworks, and financing to move towards a low-emission economy (SEMARNAT 2016). The GLCC establishes the National System for Climate Change, which is composed of the Inter-Ministerial Commission on Climate Change, the Climate Change Council, the National Institute for Ecology and Climate Change, representatives of the Federal Congress, and state and municipal governments. The National System for Climate Change represents the collaboration and coordination between the aforementioned entities, which are mandated by the GLCC to develop, conduct, and evaluate the country's key policy instruments: NSCC, SCCP, and PACC's.

The NSCC is the medium to long-term (10, 20, and 40 years) guiding instrument of national climate change policy. It prioritizes strategic lines of action to deal with the challenges of climate change and transition towards a low-emission economy. The NSCC is complemented by the SCCP and PACC's. The SCCP is aligned with Mexico's National Development Plan and sets short-term strategies, actions, and goals for adaptation and mitigation at a national level to reduce population vulnerability and that of productive sectors. Additionally, SCCP identifies actions to increase Mexico's infrastructure resilience to climate change. PACC's establish short-term goals and strategic frameworks for measuring, planning, and reducing GHG emissions and the related impacts of climate change at the state level.

Data analysis

Before carrying out the analysis, the responses to the questions of interest were read carefully to become familiarized with the data. Respondents' entries were analyzed through thematic analysis, a method for analyzing qualitative data that provides a flexible and reflective approach to obtain a rich understanding of respondents' perspectives on climate change (Braun & Clarke, 2006). The thematic analysis uses codes to identify, analyze, and report patterns within qualitative data (Braun & Clarke, 2006). A system of inductive coding was used to fully capture participants' views from the data itself. For this, we assigned codes to represent each answer. We carried out several rounds of coding where codes that shared similarities were grouped to form themes. We kept track of the codes and their definitions in a codebook.

As an example of the thematic analysis carried out, the theme "physical health" encompassed entries related to the impact of climate change on human physical health. A typical response for this theme was: "Climate change will cause health problems" (P445), and the codes used to describe it included: "general health" infectious diseases", and "respiratory diseases" (Table 2).

Table 2. Seven main themes, keywords, and illustrative quotes from respondents

Theme description	Codes examples	Indicative quotes from respondents
Household infrastructure *Describes ways in which heat, rainfall, and extreme weather events affect homes.*	Roof leakage, roof damage, paint peeling, moisture problems, mold problems	"Climate changes can damage my home's construction and security" (P5) "High temperatures can damage my home's construction materials" (P126) "Rains cause leaks" (P130) "My house got flooded causing the paint to peel and even mold appeared" (P156)
Physical health *Portrays ways in which climate change can affect human physical health.*	Infectious diseases, respiratory diseases, allergies, heat-related illness, general health	"It will likely impact my family's health" (P81) "It will cause different diseases, respiratory diseases, allergies, etc." (P84) "We'll get sick" (P105) "Older people from my family will become sick because of the cold" (P173)
Mental health *Comprises ways in which climate change can affect mental health.*	Environmental well-being, emotional well-being, distress, lack of comfort, affecting daily life	"Warm weather gets me in a bad mood" (P75) "It will make daily activities uncomfortable" (P404) "It affects your way of life completely… from what you eat, your habits, and schedules of your daily activities, psychological effects, behavior." (P455) "We are not psychologically prepared for those changes" (P539)
Work *Describes the negative impacts on work productivity and employment.*	Impact on work productivity, employment, unemployment	"If it rains, I can't work, if it's very cold neither" (P25) "Some days I'll be able to work comfortably but some days I won't (P129) "As a consequence of natural disasters, jobs will be affected" (P445) "Unemployment will worsen" (P565)
Energy use *Addresses renewable energy, and matters related to the use of air conditioners.*	Energy transition, electricity usage, renewables, solar panels, energy costs, increased electric bills, air conditioner usage, air conditioner as adaptation measure	"Air conditioners will be running all day due to increasing heat. More resources will have to be used to generate electricity" (P37) "We'll need to use more energy to maintain a comfortable temperature at home" (P86) "In order to have energy savings, we have to make change like have solar panels, but they are out of our budget (P485) "Investment in renewable energy is expensive, so I'm waiting for prices to drop" (P509)
Water use *Addresses the impacts on water resources that exacerbate water scarcity.*	Water scarcity, water use, water costs, increased water bills	"Considering the scarcity of water in the city, the cost of water will increase because they will have to bring it from far-away places." (P438) "There will be less water available, so the water service will increase" (P577) "We'll have to start water rationing" (P585) "The water that supplies the city will run out" (P586)
Food production *Portrays how climate change will affect agriculture, reducing food supplies and raising food prices.*	Impact on agriculture, impact on food production, increased food prices, decreased food quality	"Temperatures affect food harvest and that will affect our nutrition" (P45) "As everything we consume comes from the field, droughts will prevent us from stocking our pantry" (P221) "There will be less water, so there will be less food" (P346) "Natural disasters limit food production" (P446)

Quotes were translated from Spanish to English. The number in parenthesis represents the identification number of the survey.

Ultimately, we arrived at seven main themes pertaining to respondents' concerns about climate change impacts: household infrastructure, physical health, mental health, work, energy use, water resources, and food production. Next, to directly compare and assess the congruence between policy text and respondents' perspectives, we conducted a deductive thematic analysis. For this, the selected policies were examined and coded accordingly using the predefined codes from the codebook. Relevant excerpts from the policies were saved and compiled in a spreadsheet, which led to the formation of a detailed dataset.

In the final step of the analysis, findings were brought together to examine the level of congruence between data sources. A congruence scale with three categories was developed (lack of congruence, partial congruence, and total congruence). This scale draws inspiration from the Just Sustainability Index (JSI), an ordinal scale that measures an organization's commitment to issues of equity and justice (Agyeman, 2005). Modifying the JSI to measure the level of congruence between respondents' entries and climate policies, a "lack of congruence" label was given if there was no mention, limited mention, or if the policy texts contradicted respondents' concerns. "Partial congruence" was assigned if there was some overlap between respondents' perspectives and the policies. A "total congruence" label was allocated if the policy text shared a close resemblance to respondents' concerns, in addition to presenting goals or measures related to the topic.

RESULTS

Household infrastructure

16% of respondents were worried about the impacts of extreme weather events on their homes, as stated by one participant: "Extreme weather can affect my house and its physical integrity" (P467). Houses are considered not well suited to existing weather conditions, let alone to a future further affected by climate change, as suggested by one participant: "Current homes are not prepared to suffer the effects that lie ahead" (P40). Concerns regarding the impacts of heat and rainfall on their homes were common. As one participant wrote: "The materials of my house will wear down because of the heat and rain" (P418). Other reported problems were mold growth and moisture damage due to prolonged rainfalls, and damage to their homes' exteriors caused by excessive heat. As for measures, respondents emphasized the need for financial assistance to climate-proof their homes against current and future effects.

According to the NSCC, up to 28% of homes in the country are located in climate change risk zones, which are regions at risk from extreme weather events, specifically hurricanes, floods, and landslides. Most of the homes at risk from extreme weather events belong to low-income groups who live in precarious housing. To ensure the resilience of households, the NSCC established a line of action: "Design and strengthen public policies to protect the population's assets" (NSCC, p. 38). It also advised developing regulatory policies that aim to minimize the impacts of extreme events

on future housing constructions. The SCCP proposed setting building standards that incorporate "climate change criteria" in urban areas (SCCP, p. 25). The SCCP and PACC-NL advised restricting the construction of homes in hillsides and near protected natural areas to ensure public safety.

Although both the respondents and policies reported on the impacts of extreme weather events, the policies did not address respondents' concerns about the current impacts of heat and rainfall on their homes. Moreover, incongruence was observed in relation to the proposed measures since the policies did not promote respondents' proposed measures asking for financial assistance to climate-proof their homes against current and future effects.

Physical health

Twenty per cent of respondents alluded to "a rise in health problems". There was a belief that climate change would cause a surge of "allergies", "heat strokes", "viruses", "plagues" and "respiratory problems". Respondents felt that decreased air quality is particularly harmful to children, as the following entry illustrates: "Primarily children will become sick due to air pollution" (P125). There was also a sense among them that impacts will affect older adults with chronic health conditions or disabilities, as one participant mentioned: "My dad is really affected by weather changes because of the stroke he had" (P327).

According to the NSCC and PACC-NL, impacts on health include increased respiratory and cardiovascular diseases and direct injuries and fatalities caused by extreme weather events. Climatic changes in Nuevo León can favor the spread of food- and water-borne illnesses and infectious diseases like dengue (PACC-NL). Health impacts can be especially devastating for vulnerable populations such as children, older adults, and people with a low-socioeconomic status (GLCC; SCCP; PACC-NL). To reduce health challenges, the SCCP proposed designing educational strategies that communicate the health risks of climate change to the public.

Looking across the results, congruence between respondents and policies emerges when describing impacts on physical health. Each explained that climate change poses many threats to health because it exacerbates existing diseases and conditions, aside from introducing pests and pathogens. Both also noted that children and older adults are particularly vulnerable to climate change.

Mental health

Around 10% of respondents described ways in which climate change can diminish their mental health. On the topic, one participant wrote: "It puts the mental integrity of my family at risk, as well as our health" (P528). Climate change can induce widespread "stress" and "anxiety", as noted by a participant: "The uncertainty and disruption will cause stress among society" (P417). Climate change is also likely to have a negative impact on their well-being, for example by making them feel

"uncomfortable" and "exhausted" due to extreme heat in indoor and outdoor spaces. Concerning measures, we observed that a handful of respondents believed the government should provide them with information on possible negative scenarios to mitigate their "panic", and "uncertainty" and give them "courage" to prepare against impacts.

References to mental health in the policies were relatively scarce, apart from PACC-NL, which was the only policy document to briefly reference the matter: "[…] climate change can present various health consequences (traumatic, infectious, nutritional, psychological and other)" (PACC-NL, p. 148, 149). As for wellbeing, mitigation and adaptation strategies offer important opportunities that produce health co-benefits by fostering wellbeing. However, there was no accompanying discussion or measures on the matter (NSCC; SCCP; PACC-NL).

A comparison between data sources shows a lack of congruence on the topic of mental health. Although well-being was addressed in a few instances in the policies, accompanying discussion and policy measures were lacking. Moreover, the near exclusion of the implications of climate change for mental health in the policies, reveals a gap between the policies and respondents' concerns.

Work

Around 8% of respondents addressed work-related matters. Views surfaced mainly in relation to work productivity and unemployment. Respondents complained about a decline in their work productivity due to heat exhaustion, rainfall, and cold days, as indicated by a participant: "If it rains, I can't work, if it's very cold neither" (P251). Concerning unemployment, respondents considered that "many jobs will be lost" due to climatic changes.

We found that the policies briefly alluded to work matters. The NSCC defined its vision of Mexico becoming a country that "generates sufficient and well-paid jobs for its entire population, particularly for the most vulnerable" (NSCC, p. 10). Likewise, a transition from Mexico's economy away from its dependency on fossil fuels to clean energy sources is anticipated create new green jobs that contribute to environmental conservation and a sustainable economy (NSCC; SCCP).

Results reveal a lack of congruence regarding work productivity. The respondents believed that current impacts already make them less productive at work, however, the issue was not discussed in the policies. However, an overlap is evident when referring to employment. Whereas the respondents believed that jobs will be lost due to climate change, the policies hinted at a solution to unemployment by suggesting that a sustainable economy will create multiple green jobs.

Energy use

Eighteen percent of respondents described matters related to energy use in their homes. Besides wanting to improve their homes' energy efficiency with energy-saving appliances, respondents hope to power their homes with renewable energy, specifically solar panels. A common view among

respondents from households with low to middle incomes was that rising temperatures will drive up their electricity bills due to increased energy usage to cool their homes. Reporting on this issue one participant wrote: "We'll notice changes in our bills since we'll need to use air conditioners for much longer periods" (P543). Some respondents made it clear that they simply cannot afford the running costs of air conditioners, or in some cases, they cannot afford to purchase a unit as they struggle to stay afloat, as one participant revealed: "Times of extreme heat have already made me think about purchasing an air conditioner, but it is an expense I can't afford" (P151). Respondents were of the opinion that the government should implement subsidies to encourage the use of solar panels along with subsidies for the use of air conditioners to minimize heat stress.

The policies explained how energy use is expected to increase due to rising temperatures, population growth, and urbanization (NSCC; SCCP). With this in view, the GLCC established the commitment to generate 35% of the country's electricity from clean sources by the year 2024. On the topic of air conditioners, PACC-NL stated that currently, these units can use over 50% of all electricity produced in homes. As temperatures can rise over 40ºC in the state, air conditioning will create one of the largest sources of energy demand, when using conventional energy can generate a large share of GHG emissions (PACC-NL). To reduce GHG emissions from households, the policies recommended adjusting or removing current energy subsidies (NSCC; SCCP; PACC-NL). The policies also recommended the creation of a financial assistance program designed to offer loans to finance solar panels, as well as help households replace their older and less efficient appliances with newer and more efficient ones (SCCP; PACC-NL).

The importance of energy efficiency and the use of financial instruments for solar panels and energy-efficient appliances is consistent among data sources. In turn, incongruences were identified when discussing the use of air conditioners. Respondents use air conditioners to cool their homes to minimize extreme heat, however respondents from low- and middle-income households worried about their affordability. Thus, they believed that the government should assist them with energy costs. The policies, in contrast, depicted the use of air conditioners as exacerbating climate change by contributing to GHG emissions, and therefore argued that subsidies ought to be adjusted or removed to mitigate emissions from air conditioning.

Water resources

Approximately 15% of entries mentioned water scarcity issues. Respondents worried about water shortages in the metropolitan area and how these can lead to increases in service charges, affecting their expenses. On the topic, one participant reported: "We will have less water available so the service will become more expensive" (P528). Besides representing a financial burden, water shortages can disrupt a household's daily activities by causing discomfort due to a lack of sanitation and hygiene, as one participant puts it: "Many of our daily needs are related to water" (P608). Furthermore, a few respondents considered a lack of drinking water, as it can cause dehydration. To reduce water scarcity,

respondents believed that the government should promote rainwater harvesting, besides informing them on ways to conserve water at home.

According to SCCP, climate change will affect rainfall, resulting in a higher frequency of droughts for some regions, and a higher frequency of floods for others. For northern states like Nuevo León, there will be fluctuations in river flow and groundwater levels, all of which will impact the water supply (PACC-NL). This in turn is expected to affect water access for households, especially for those located in urban areas (SCCP). Several measures were identified, for example, the SCCP proposed to: "Provide rainwater collecting systems for domestic use in dwellings located in marginalized and poor areas" (SCCP, p. 35). Furthermore, because the water service is currently subsidized, the NSCC proposed to "gradually adjust" water service prices that reflect actual water consumption and treatment costs to promote its conservation an efficient use (NSCC, p. 28).

Both the respondents and the policies discussed the reduction of available water supplies, as well as rainwater collection systems for households. Regarding water service charges, both the respondents and policies made references to water prices, however, the effects are opposite. While the respondents worried about water services charges increasing due to the water supply being low, the policies discussed removing water subsidies to encourage people to use less water. This contradiction resulted in a lack of congruence between them. Moreover, to our knowledge, the policies did not propose education strategies that specifically target increasing awareness of water issues, which respondents listed as potential measures.

Food production

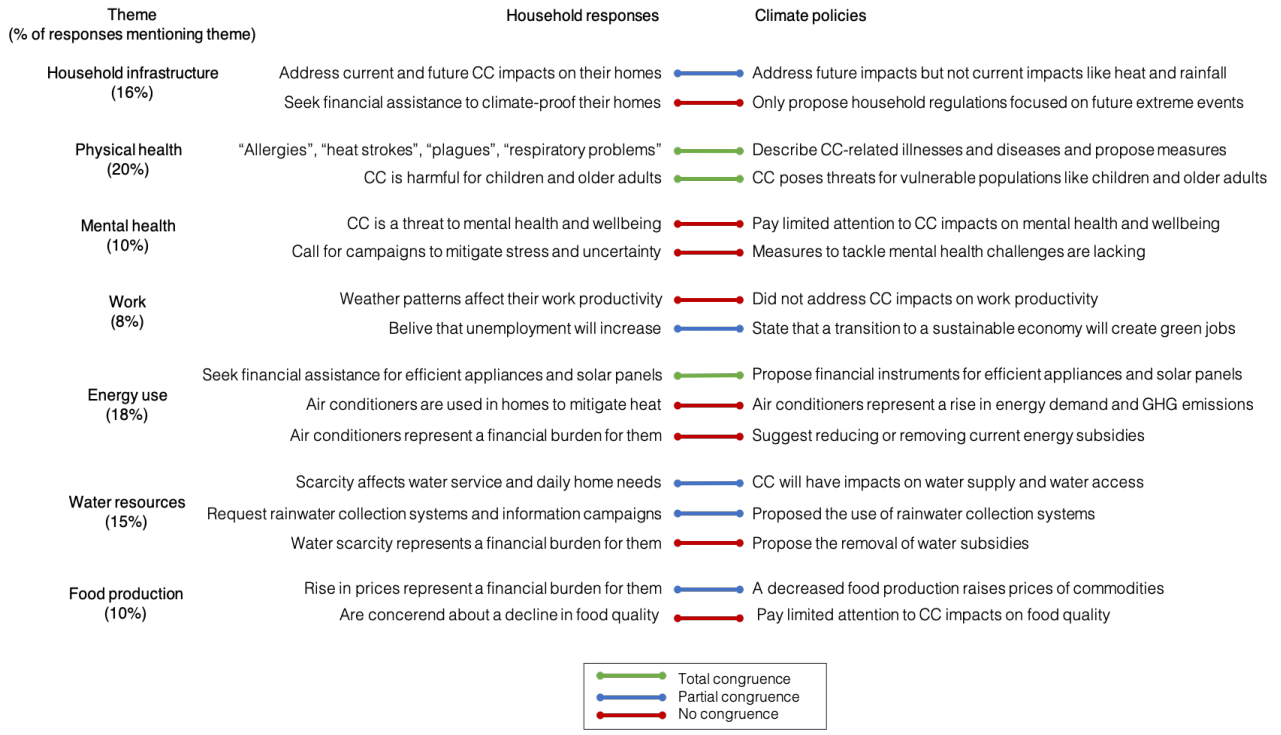
Ten percent of respondents described ways in which climate change will affect food production and availability. They believed that extreme weather events like heatwaves and droughts threaten agricultural production. Consequently, a reduction in food supplies will result in a rise in food prices, affecting household spending, as illustrated in the following entry: "Droughts will ruin food harvests, which makes food more expensive, affecting our finances" (P190). Other reported problems were related to a decline in food quality, as climate change is expected to make food less nutritious.

According to the policies, the agricultural sector will face threats due to changes in rainfall patterns which can result in flooding and droughts (SCCP; PACC-NL). Particularly for Nuevo León, water scarcity represents a great risk for agriculture, a key productive sector for the state (PACC-NL). This can trigger rises in the prices of agricultural commodities, affecting "*la canasta básica*" (market basket). Food nutrition was briefly recognized in terms of climate change contributing to malnutrition (PACC-NL).

We observed that the policies were aligned with respondents' concerns related to decreased food production. Nevertheless, while an increase in food prices was acknowledged in a few instances in the policies, no accompanying discussion or measures related to households were observed, resulting

in partial congruence with respondents' concerns. Lastly, unlike the respondents who worried about food quality, limited attention was given to policies on nutrient food quality.

Figure 1. Summary of the level of congruence of main themes



CONCLUSIONS

Prior studies have noted the importance of congruence between the public and policies for the success of climate policy implementation. Therefore, in this study, we aimed to examine the level of congruence across the issue of climate change between households in Nuevo León and Mexican climate policies. Our results first shed light on how households in Nuevo León perceive climate change impacts. The use of thematic analysis, a valuable method for analyzing qualitative data from open-ended survey questions, showed that respondents perceived a range of climate change impacts including impacts on household infrastructure, physical health, mental health, work, energy use, water resources, and food production. In line with previous studies such as Schlosberg et al. (2017), who found that community groups tend to focus on climate change impacts on their basic needs and capabilities of everyday life, we found that respondents from households in Nuevo León worried about the impacts that climate change is already having on their households, as well as the financial burden they face to mitigate and adapt to a changing climate.

The summary of the analysis (Figure 1) shows that congruence between respondents' perspectives and the climate policies emerged in a few instances. First, we found that the policies identified and described a variety of physical health impacts and related measures similarly to the respondents.

Another direct parallel was in relation to the use of financial measures, such as loans, for the purchase of energy-efficient appliances and solar panels. These findings indicate that attention should be given to these topics and measures as households would likely welcome policy focus on these issues, contributing to a successful implementation of climate policies (Repo et al., 2018).

Some of the respondents' concerns found distant parallels in the climate policies, resulting in a partial congruence. The analysis found that both the respondents and the policies identified work, water resources, food production, and household infrastructure as priority areas. However, the ways in which the policies depicted the impacts on these areas fell short of the respondents' perspectives, which presented a wider reach of concerns. For example, while the policies focused on the future impacts of extreme weather events on new home constructions, the respondents worried about the current impacts of heat and rainfall on their homes, besides the impacts of extreme weather events.

We observed that respondents' concerns related to mental health, work productivity, and food quality were not accounted for at all in the policies. If households are expected to be involved in a greater extent in the fight against climate change, it would be useful to incorporate these priority areas in climate policies. Moreover, we found that the policies contradicted some of the respondents' interests and concerns related to financial matters. Financial concerns emerged in part because of expected increased costs due to a reduction in the quantity or access to natural resources. Therefore, respondents worried about having to spend a greater portion of their household income to meet their everyday needs, such as food, energy, and water. Evidently, the policies fail to provide support to households by proposing the removal of water and energy subsidies, contributing to a lack of congruence.

Along those lines, we observed a lack of congruence regarding the use of air conditioners. From the perspective of respondents, air conditioning emerges as a basic need to tackle rising temperatures. However, for the policies, air conditioners represent an important source of GHG emissions. To minimize their demand and use, the policies move towards the removal of energy subsidies. The adjustment or removal of subsidies, however, can put an additional burden on households that might not be able to afford a unit or its running costs. Some of the issues emerging from these findings relate specifically to energy poverty, which in turn leads to discussions on climate justice (Randazzo et al., 2020). Further studies to understand the use of air conditioners as adaptation strategies or as contributors to climate change are therefore recommended. In addition, future studies can take into consideration case studies, where the subnational government has actually offered rebates to encourage households to purchase energy-efficient air conditioners and therefore adapt to increasing temperatures, such as the case of Victoria, Australia.

A reason contributing to a lack of congruence between households and climate policies may be the fact that the selected policies are formulated at a national and state level. Mexico is a large, geographically diverse country with a large population, and climate policies formulated at the national and state level face the challenge of ensuring consistency of delivery. This makes it difficult to engage with the range of concerns recognized by households.

A lack of public participation in the development of policymaking could also partly explain the disconnect between household and climate policies (Schlosberg et al., 2017; Perlaviciute & Squintani, 2020). As reported in PACC-NL, a public consultation was launched to collect feedback on the proposed strategies from different interest groups of Nuevo León's society, including the 'household sector'. However, upon closer examination of PACC-NL, we observed that this consultation only took place between 'household experts' and government officials and failed to provide an opportunity for households to contribute to policy development. The lack of recognition and meaningful participation of the public in decision-making inhibits climate justice as the policies fail to engage households in decision-making processes. Therefore, further research must understand how social participation schemes, such as public consultations, can become more efficient to include households in policy-making processes.

We have made an important step forward by presenting one of the first analyses of public-policy congruence in Mexico. The comparison of climate policies and respondents' perspectives of the impacts of climate change, captured by a household survey, provides a number of insights with respect to the level of congruence across the issue of climate change. More importantly, this study identified potential household concerns and impacts that were excluded from Mexican climate policies. Because congruence influences policy acceptance, and as noted households can become prominent players in the fight against climate change, current climate policies could be implemented so that they take household concerns, interests, and perceptions into better consideration to stimulate the acceptance and support of climate policies.

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