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A Review of Climate Change Attitudes Using a Person-Centred Framework

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Executive Summary

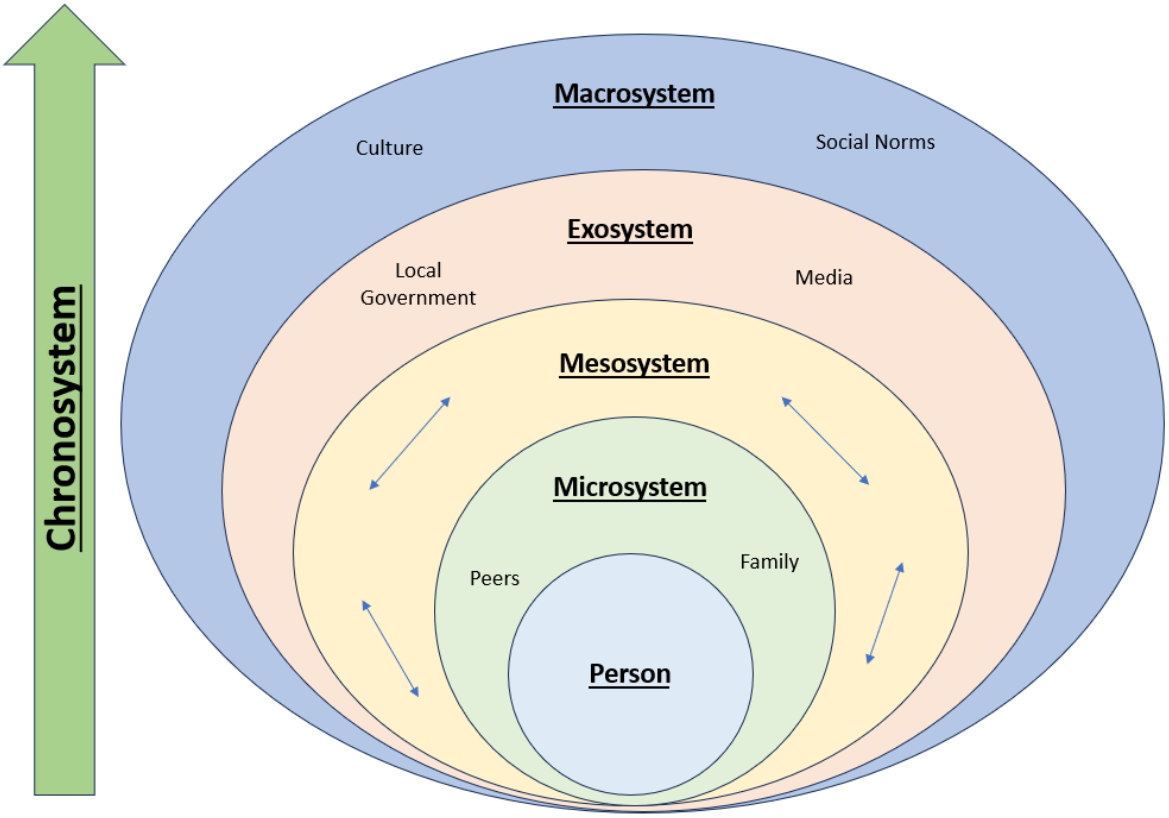
Introduction

The Environmental Protection Agency commissioned this review to explore attitudes towards climate change through a person-centred lens, recognising the paramount role of individual and collective human actions in both the genesis and mitigation of climate change. This review is underpinned by Bronfenbrenner's Bioecological Systems Theory and explores beliefs about climate change and highlighted key influences on climate change attitudes. At the heart of this exploration is the recognition that human activity significantly influences climate change, making individual actions, and the internal processes driving these actions, critical to addressing environmental challenges.

Bronfenbrenner Bioecological Systems Theory

Within this model, the individual is at the centre, followed by the microsystem which includes immediate environments and relationships that the person interacts with regularly, such as family, school, peers, and workplace. Immediately outside of that is the mesosystem; this level involves the interactions between the various components of the microsystem. Outside of the mesosystem is the exosystem, which includes settings or influences that the individual does not directly engage with but that still affect them indirectly, such as a parent's workplace or extended family networks. This outermost layer is the macrosystem, which encompasses the broader cultural, economic, legal, and societal influences that affect an individual. Finally, there is the chronosystem, which reflects the environmental events and transitions over the lifespan, as well as social and historical changes.

FIGURE 1 REPRESENTATION OF THE BIOECOLOGICAL SYSTEMS MODEL (BRONFENBRENNER, 2000)



Methods

Through a rigorous methodology that included searches in multiple databases and a detailed screening process involving several reviewers, the systematic review (PROSPERO CRD42023445108) aimed to synthesise high-quality evidence on people's perceptions of climate change in Europe. In this review, we identified and synthesised the findings from 66 studies that have a reasonable quality rating.

Results

There is an abundance of research on climate change attitudes, but the quality of the evidence is generally not strong and many of the findings are mixed. There is an over-reliance on cross-sectional research in the field, where data is collected from a population at a single point in time. This type of data can only tell us about possible associations between variables and that limits the conclusions we can draw from the data in terms of what might cause climate change attitudes across populations. If we want to understand how climate change attitudes are formed and what predicts these attitudes, there is considerable need for better quality studies using more rigorous, longitudinal methods. There is also a need for more research with child and adolescent populations to understand how attitudes are formed and the influences on these attitudes at a pivotal period during political and social attitude formation.

The reviews indicated a diversity in how climate change attitudes are defined ranging from beliefs about the existence of climate change (ranging on a continuum of belief, scepticism, and denial), to views on the causes of climate change, to concern about climate change and support for policy. Regardless of GDP levels, people living in European countries do not vary much in their attitudes towards climate change. Outright belief in

climate change is consistently high, with multiple studies reporting belief rates around 95-98%. However, belief in humans as the cause for climate change - anthropogenic beliefs – and concern about climate change result in lower prevalence rates.

Differences in climate change attitudes are found across different demographic groups. Gender plays a role in climate change attitudes - women consistently exhibit greater concern about climate change than men. For the most part, younger individuals were more likely to hold a higher belief in human caused climate change, but this was not a consistent finding, and some studies showed that older people were less likely to be sceptical about climate change. Thus, climate change communication should be tailored to specific demographic groups and work may need to be done to address the attitudes, including belief in the causes of climate change, of the older and male populations to increase belief and concern about the reality of human-induced climate change.

In addition, social influences – such as family and peer views on climate change – appear to impact individuals' attitudes. The studies generally suggest that we hold similar attitudes to those close to us – our parents, partners, friends. This points to the potential of using immediate social circles for the support and implementation of climate change communication and policy. The findings in relation to education level were inconsistent – some studies indicated a partial relationship with climate change concerns and others showed no clear differences in how educational attainment was associated with different climate change attitudes. Similarly, the role of educational environments in shaping climate change perceptions is not clear, with some evidence on the role of climate change education

indicating that didactive educational methods may not effectively alter attitudes towards climate change.

Social dominance orientation - a preference for hierarchy within society and the domination of higher-status groups over lower-status groups - was found to be associated with greater climate change denial. Across European countries, individuals who hold a such attitudes and show intolerance of particular social groups, including migrant and LGBT groups, were more likely to show more climate change scepticism.

The review showed consistent, although nuanced, findings were found for political ideologies and populist orientations. Studies suggested that greater scepticism or denial of anthropogenic climate change associated with conservative orientation, although the findings in Europe are not as defined across the liberal-conservative divide as findings from the US. Populism was a notable predictor of climate change attitudes in some European countries. The review findings provide evidence for tailoring climate change communication depending on a person's political orientation and beliefs - using scientific evidence and improving scientific literacy may only be effective for left-leaning people, whereas the use of non-experts in climate change communications may be more effective with climate sceptics.

Conclusion

The systematic review underscores that no single factor explains the diversity of views on this critical issue. The evidence points to a dynamic interplay between demographic, social and ideological influences on climate change attitudes, as underpinned in the Bronfenbrenner Bioecological model. The findings suggest that efforts to enhance public engagement with climate change must be multifaceted, tailored to address the specific contexts and underlying beliefs of different groups. However, methodological limitations very significantly hamper our ability to draw causal inferences about how climate change attitudes form and evolve.

More specifically, the following recommendations are made;

- There is a need for more rigorous, participatory, longitudinal research in order to understand how climate change attitudes form and how they may change across time, and to make stronger conclusions on the factors that impact on attitude formation and change.
- Climate change communication should be tailored to the differing belief levels across demographic groups and across political ideologies. Efforts should be made to address the lower levels of belief and concern found in males, older people, people with high levels of social dominance orientation, and individuals holding conservative and populist ideologies.
- Media literacy programs should target those specific groups who have higher or lower levels of climate scepticism to counter the spread of misinformation.
- Policy-makers in Ireland should be cautious of increased right-right and populist influence and monitor its impact on climate change scepticism in the population.
- Policy should take advantage of the bidirectional influence of social groups in climate engagement, including the influence of friends and family on individual attitudes and the influence of individual attitudes on the wider social contexts.

Introduction

Environmental issues, such as climate change, pollution, and loss of biodiversity, are, arguably, the most significant societal challenges. Ireland's climate is changing in line with global trends, with a temperature increase of, on average, 0.8° since 1900 and an increase in average annual national rainfall of approximately 5% in the past 30 years. As an island nation with 1,500 km of coastline and 70,000km of inland waterways, Ireland is particularly vulnerable to flooding and climate projections indicate considerably greater land areas are at severe risk of frequent floods. All major cities in Ireland are in coastal locations subject to tides, and rising in sea levels will have significant economic, social, and environmental impacts. In line with global trends, Ireland has seen record-breaking temperatures and precipitation in recent years (Murphy et al., 2023). There is an urgent need for more collective actions, but also for more individual action to mitigate the impacts of climate change, in Ireland and globally. Climate change attitudes play a significant role in enabling action. The Climate Change in the Irish Mind (CCIM) study shows very high levels of beliefs and concern about anthropogenic climate change in the Irish population, with more than 80% of people worried about climate change, and 3/4ths believing that "moderate or high risk" to their community over the next 10 years (O'Mahony et al., 2024).

Environmental Attitudes

This report examines attitudes to the environment, and specifically climate change, using a person-centred approach. As the major causes of climate changes, humans and human activity are at the centre of these changes (IPCC, 2018), and individual actions - including the internal processes that drive action - are essential parts of the solutions. While people's actions are not always consistent with their behaviours (Ajzen & Fishbein, 1977), if we do

want to understand behavioural change and action, we must also understand environmental attitudes toward climate change (Albarracín et al., 2014). Understanding how people perceive and understand climate change should be a key priority in driving climate action and engagement. Climate change attitudes play a crucial role in the implementation of climate policies and individual acceptance of responsibility and willingness to make lifestyle changes necessary to address climate change (Leiserowitz, 2005).

Milfont and colleagues have shown that 'preservation' and 'utilisation' form the two higher order dimensions of environmental attitudes. Preservation attitudes reflect positive evaluations of the preservation of nature and the diversity of natural species in its original natural state and protecting it from human exploitation. In contrast, utilisation attitudes express the idea that it is right, appropriate, and necessary for nature and all natural phenomena and species to be used and altered for human objectives (Millfont & Schultz, 2018; Milfont & Duckitt, 2006). Such higher order dimensions therefore have implications for communication and framing of environmental policies. Preservation predicts self-reported ecological behaviour, whereas utilisation predicts attitudes toward economic liberalism (Milfont & Duckitt, 2006).

Millfont and Schultz (2018) defined environmental attitudes as evaluative beliefs, affect, and/or behavioural intentions about environmentally related activities or issues. More specifically, climate change attitudes incorporate a range of cognitive variables with multiple meanings given the complex multi-faceted nature of the climate debate (Poortinga et al., 2011). Such attitudes include scepticism, concern, cynicism, denial, uncertainty, and ambivalence. Some studies differentiate between beliefs about the reality, causes, and

impacts of climate change (European Social Survey, 2016) or trend, attribution, and impact scepticism (Rahmstorf, 2004).

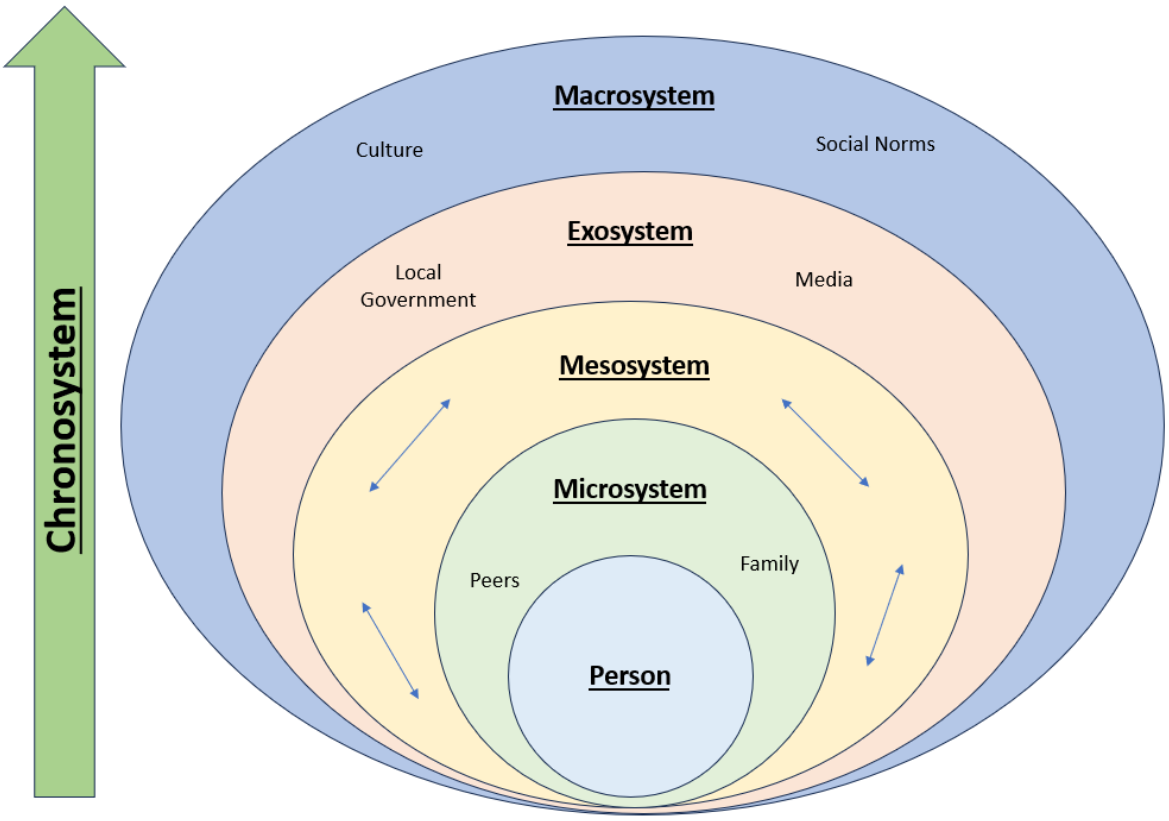
Person-Centred Systems Models

We used Bioecological Systems Theory (Bronfenbrenner, 2000) as the underpinning model for the purposes of this review and report. This framework can be used to understand multilevel influences on environmental attitudes in general and on climate change attitudes in particular. Bioecological Systems Theory was initially proposed - and is predominantly applied - to the context of children's development, although it can be used to understand other multilevel and multisystemic influences.

The model proposes that development is a process of bidirectional and reciprocal relationships between a developing individual and their surrounding environments (ecologies) (Bronfenbrenner, 2000). The model proposes a series of 'layers' of environment, ranging from the immediate surroundings to broad societal structures, each having an effect on an individual's development. Bronfenbrenner (2000) represented this model through a series of concentric circles (see Figure 2), similar to a set of Russian dolls, with the individual in the centre and a set of five nested structures surrounding the individual. The individual at the centre of the nested structure encompasses their biology, personality, and demographics. The next level is the microsystem, which represents the immediate systems surrounding the individual, such as with families, friends, and teachers. The microsystem is generally considered to be the most influential to development of all the systems. The next layer, the mesosystem, represents the dependence of systems on each other, or the relationships between the different systems, such as the relationship between an individual's friends and an individual's religion. The next layer is the exosystem, which represents the formal and informal social structures where there is typically no direct interaction with the individual, yet they influence that individual's development. This can

include government policies, media, or community resources. The outermost level is the macrosystem, which represents the broader society and culture in which the person lives. It encompasses cultural ideologies, attitudes, and social conditions. The final system of the model is the chronosystem, which refers to changes over time. It includes ageing and the transitions and turning points in an individual's life, as well as historical events and significant societal shifts.

FIGURE 2 REPRESENTATION OF THE BIOECOLOGICAL SYSTEMS MODEL (BRONFENBRENNER, 2000)



We chose to use this model for our review because we thought it would be the most useful in understanding complex issues of environmental and climate change attitudes. It

allows for consideration of how immediate and wider cultural influence attitudes towards climate change, while also considering how policies can influence and be influenced by individuals' belief systems. As Kashima et al. (2023) argue, people must understand both the relation between the human social system and the various ecosystems in which that social system is embedded, as well as the social system itself and how it produces the aggregated outcome of human behaviours. The chronosystem element also allows for consideration of people's changing attitudes toward climate change over time, and of the potential temporal gap between climate changes, attitudes towards climate change, and the visible impacts of actions and behaviours addressing climate change.

Integration of Theoretical Perspectives with the Bioecological Systems Framework

Our exploration of climate change attitudes is underpinned by a few different theoretical frameworks, but centres on Bioecological Systems Theory (Bronfenbrenner, 2000). We also reference the recent Conceptual Foundations of Sustainability model by Malt and Majid (2023), and the critical insights from Milfont and Schultz (2018) on environmental attitudes. This multidisciplinary approach, grounded in empirical evidence, offers a comprehensive framework for understanding the complex interplay between individual beliefs and broader environmental issues. In the next chapter, our systematic literature review will focus more specifically on the empirical literature on climate change attitudes.

The Individual.

Bronfenbrenner's Bioecological Systems Theory (Bronfenbrenner, 2000) places the individual at the centre of five different social ecologies that have varying levels of direct and indirect influence on the individual. The individual is at the centre of the model. An

individual's environmental attitudes may be influenced by personal factors such as biology, personality traits— potentially encompassing environmentalism itself (Kaiser & Byrka, 2011) —and demographic characteristics. Milfont and Sibley (2012), as well as Milfont et al. (2015), underscore the significance of personality traits like agreeableness, conscientiousness, and openness to experience in relation to environmental engagement. For example, human exceptionalism, similar to Milfont and Schultz's (2018) conception of 'utilisation', refers to the set of beliefs whereby humans are seen as and uniquely different (or exceptional) from other species (Kim et al., 2023). The belief also holds that human societies are also different and independent from other elements of the ecosystem. Human exceptionalism entails the belief that humans should be and are dominant or supreme over nature and animals, respectively. People with high levels of human exceptionalism will hold strict ontological boundaries between humans and the rest of the natural world and have low levels of connections to nature. This is somewhat similar to Eder and Ritter's (1996) description of how individuals frame moral consciousness as it links nature to society and engagement of utilitarian, deontological, and cognitive positions.

The Microsystem.

The microsystem, particularly through socialisation agents like family and friends, may play a crucial role in the development of environmental attitudes. Socialisation is the lifelong process by which individuals acquire the necessary skills, values, and behavioural patterns to function effectively in a certain group and culture (Maccoby, 2007). Socialising agents are especially important for young people whose attitudes are less stable than those of adults (Collado et al., 2017). The family is one of the most important agents contributing to

children's socialisation (Maccoby, 2007 and can have an effect in shaping children's sustained attitudes and behaviours (Rogoff, 2003). There is solid evidence for the transmission of environmental values from parents to children and the influence of peers' environmental behaviours, which highlights the importance of early socialisation in shaping environmental consciousness and attitudes toward climate change (Casaló & Escario, 2016; Collado et al., 2017).

Ideologies explaining human outgroup prejudice are frequently associated with environmental attitudes. For example, social dominance orientation - a narrow personality trait measuring an individual's support for social hierarchy and the extent to which they desire their in-group to be superior to out-groups - has been linked to climate change attitudes (Milfont and Schultz, 2018). Social dominance orientation and its links with climate change attitudes in European countries, will be addressed further in the following chapter.

The Mesosystem.

The mesosystem examines the relationships between systems. At a broad level, societal norms, and perceptions, as part of the mesosystem, interact with individual demographic characteristics to influence environmental attitudes. Pearson et al. (2018) discuss the environmental belief paradox, where certain groups (non-white and low-income people) are mistakenly perceived as less concerned about the environment, pointing to the importance of challenging stereotypes to foster inclusive environmental engagement. This tendency to misperceive groups that are among the most environmentally concerned and most vulnerable to a wide range of environmental impacts as least concerned about the

environment may pose a barrier to broadening public engagement with environmental initiatives (Pearson et al., 2018).

The Exosystem.

The exosystem refers to the settings that are not directly experienced by the individual, but which affects, or are affected by, the individual. It includes the social institutions relevant to the individual such as include governmental policies, social services, NGOs, media, etc. The mechanisms of engagement and the framing devices between the exosystem and the individual are important to the influence of the exosystem. The bidirectionality of influence underpins the bioecological systems framework; thus, it is critical that the framing devices used by institutions in the exosystem employ framing devices to allow for the cocreation of solutions rather than it being viewed as a top-down route of influence. Public and governmental policy can also play a significant role in individuals' beliefs and behaviours.

When developing and implementing environmental policies, the extent to which different strategies are effective in encouraging environmental actions, as well as the extent and why such strategies are acceptable to the public, must be considered. Steg (2016) argues that individuals will do a cost-benefit analysis when evaluating policies; when people expect them to have more positive consequences and less negative consequences for themselves or the collective, they are seen as more acceptable. Which consequences of policies people consider, and how they evaluate and weigh various consequences, depends on which values people prioritise, and can include instrumental costs and benefits, such as financial costs, time, or functionality, but also values-based and social-based costs and benefits (Steg, 2016). For example, intrinsic motivation to engage in pro-environmental

behaviour can include feeling good about doing good, which is linked to altruistic and biospheric values. Such values result in stable more durable behaviour, but they need to be supported by the specific context. Individuals also have a need to be consistent in their behaviour, and for their behaviour to be similar to others and receive the approval of others. Furthermore, policies are more acceptable when costs and benefits are distributed in a fair way, and when fair decision procedures have been employed. Therefore, environmental policies will be more acceptable when individuals believe they have more positive and less negative consequences for their biospheric, fairness, and consistency values (Steg, 2016).

Given the potentially important role of policy in shaping attitudes, it is essential to get the public 'on board' with policies. There are a large number of frameworks for how to involve the public in understanding, developing, evaluating, and being involved in the implementation of these policies. The OECD (2001) policy brief - which describes that the government can either give information to citizens (information), can give information and then get feedback (consultation), or can have a relationship based on partnership between the government and the public (active participation) - is a strong framework for understanding level of engagement and how engagement might be fostered. Similarly, Shannon & O'Leary (2020) created clear guidance for civic participation in decision making, how this can occur in context, and what the barriers are. They highlighted the *Have Your Say - Participatory Budgeting Initiative* from South Dublin County Council as a good example of empowering the public in setting policy and practice. Another example is Ireland's citizens' assemblies, which - where they result in real changes - are clear examples of active participation of the public in policy making.

The Macrosystem.

Malt and Majid (2023) argue that there are cultural differences in human exceptionalism, such that some individuals in industrialised cultures, think they are not so much part of nature as something different from, separate from, and even superior to nature. They highlight the importance of considering cultural differences in conceptualisations of human-nature relationships, especially in the context of Indigenous peoples.

Incorporating the Value-Belief-Norm Theory of Environmentalism into our narrative enriches our understanding of how societal norms within the macrosystem shape individual attitudes towards climate change and environmental behaviours (Stern, 2000; Stern et al., 1999). This theory elucidates the causal chain through which values, beliefs, and norms influence environmental actions, and provides a framework for examining the interplay between personal convictions and societal expectations. It posits that when individuals perceive environmental threats that conflict with their fundamental values, they experience a moral obligation to act in ways that are consistent with those values, whether through supporting environmental policies, engaging in activism, or adopting sustainable practices. The framework comprises five components, including 1. socio-political values and engagement, 2. beliefs about climate change, 3. concerns about climate change and energy security, 4. personal norms and efficacy beliefs, and 5. energy preferences (Stern, 2000). Steg (2016) expanded on the concept of norms within the Value-Belief-Norm framework by delineating four types of norms that influence environmental behaviour: personal norms, prescriptive norms, behavioural norms, and perceived norms. This theory suggests that efforts to promote sustainable behaviour can benefit from targeting not only individual

attitudes and behaviours but also the broader societal norms that influence these attitudes and behaviours.

The Chronosystem.

Finally, the chronosystem considers the temporal, transitional, or historical influences on environmental attitudes. One of the biggest challenges to environmental issues - particularly climate change - is that substantial temporal gap between attitudes, actions, and consequences. The chronosystem is critical to examine both because the climate is changing over time and because people's attitudes may change.

Methods

We first determined the search terms and the databases to be searched, and then pre-registered this rapid review on PROSPERO (CRD42023445108). We conducted our searches of PsycInfo, Web of Science, SciElo and Scopus on 14 September 2023, and uploaded the results to Covidence. Table 1 presents the inclusion and exclusion criteria used. Title and abstract screening required consensus from two reviewers that the paper appeared to be relevant before the full-text of the paper was reviewed. LW screened all 4554 included titles and abstracts. A second screen of title and abstract was conducted by AB (76%), AM (21%), and KH (3%). Approximately 85% of the full text screening (*n* = 543) was completed by AM, and the remaining 15% was completed by KH, SJ, and AB. A second full text screen was conducted on 43% of the papers by LW. For both title/abstract and full text screening, where there was a conflict between reviewers, this was resolved through discussion. At the beginning of data extraction, LW, AB, and SJ extracted data from the same articles and met together to discuss and systematise the extraction process, after which the three independently extracted data, with most extractions conducted by LW.

Given the differences in the underlying assumptions of qualitative and quantitative research, reviewers have tended to use two separate tools to appraise the quality of studies; however, there are a growing number of tools that allow for the appraisal of both types of research in parallel. This review used the Quality Assessment for Diverse Studies (QuADS) tool (Harrison et al., 2021). It allows the reviewers to appraise the quality of methods, quality of evidence, and quality of reporting for individual studies. It "explores the completeness of reporting of studies" and thereby allows the reviewers to reflect on the

"transparency and research purpose that is being reported and the implications this has for evidence quality" (Harrison et al., 2021).

Following data extraction and quality assessment, the data was exported to an excel spreadsheet found at: https://osf.io/b3a9y/files/osfstorage. Although we included all studies when conducting our review, for the purposes of this report, we decided to focus only on evidence with a higher quality rating. For this reason, we split the QuADS scores into quartiles and then only included studies in our review which were in the 2nd or higher quartile (e.g. not including those in the 1st quartile, a cut-off score of 20). There were 19 studies with a risk of bias score in the lowest quartile. However, five of those papers used data from the European Social Study (ESS); these were included in our review because they 'artificially' had a low-quality score because they had not included key details on sampling, methodology, etc, but they had linked to this information in other papers. We chose to focus solely on studies conducted in Europe so that the results would be most directly comparable to Ireland. This resulted in a total sample of the 66 studies included in the review, all of which were conducted in Europe and had a relatively low risk of bias. Please see Figure 3 for the PRISMA diagram.

The Irish Context: Climate Change in the Irish Mind (CCIM)

Climate Change in the Irish Mind is a major research project, conducted by the Environmental Protection Agency, which explores perceptions climate change in a nationally representative sample of Irish adults. It is conducted every two years and examines public knowledge, attitudes, policy preferences and behaviours related to climate change and the underlying psychological and cultural factors that influence the public (Leiserowitz et al.,

2021; O'Mahony et al., 2024). This project highlights the nuances in examining climate change attitudes – including high levels of belief, but only moderate understanding anthropogenic causes – and clusters individuals into alarmed, concerned, cautious, and doubtful categories (Leiserowitz et al., 2021; O'Mahony et al., 2024). These research reports were not included in the review below as they did not meet the inclusion criteria of per reviewed from the databases selected. However, given their importance in understanding public attitudes to climate change in the Irish context, the findings of this systematic review from European findings are interpreted in light of the CCIM findings in the discussion section of the report.

FIGURE 3 PRISMA DIAGRAM SHOWING IDENTIFICATION, SCREENING AND INCLUSION OF STUDIES

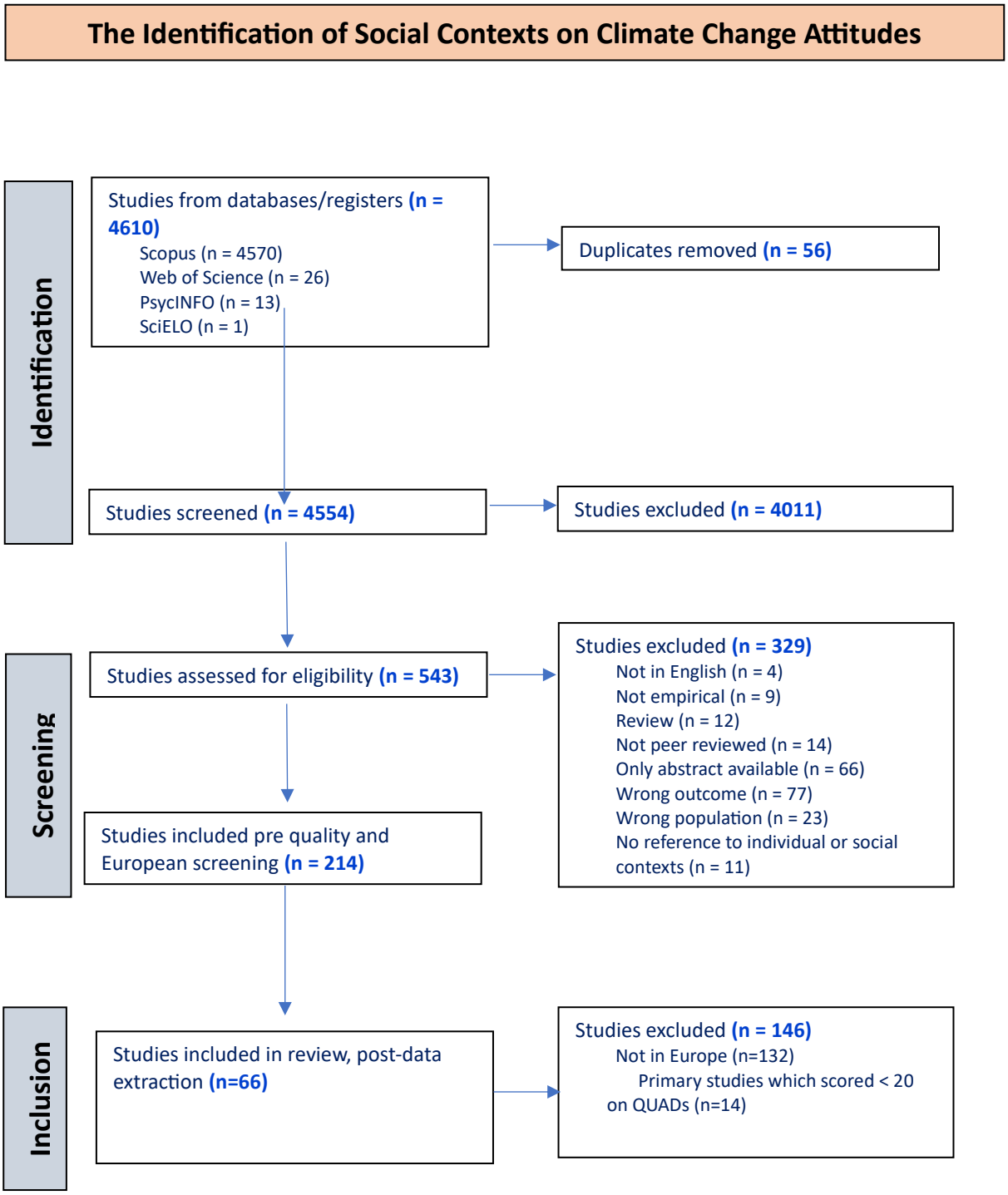


TABLE 1 INCLUSION AND EXCLUSION CRITERIA FOR PAPERS

Inclusion	Exclusion
• All age groups were included • Years spanning 2013-2023 • Climate change attitudes • Climate change belief • Climate change concern as an attitude (i.e. cognitive concern, but not distress e.g. anxiety) • Belief that humans are responsible for climate change • Climate Change Scepticism • Climate Change Denial • Climate change education with climate change attitudes as an outcome • The impact of the media on individuals' attitudes as an outcome variable	• Unavailable papers • Not published in the English language • Not peer reviewed • Climate change concern as an emotion rather than an attitude • Impacts of specific extreme weather events (unless longitudinal and measuring how long the event affects attitudes) • Attitudes towards the environment in general unless it includes climate change • Specific groups (e.g. forest workers in Bavaria or tourists in Sicily) as the findings would not be widely generalisable • General media discourse on climate change attitudes without a person-centred outcome variable

Results

Methodologies Used

The final group of included studies were predominantly quantitative, with only two papers using a solely qualitative approach (Filimonov & Carpentier, 2022; Singh, et al., 2023), and five papers using a mixed-methods approach (Hope & Jones, 2014; Ajaps & McLellan, 2015; Happer & Phillo, 2016; Kurup et al., 2021; León et al., 2021). In terms of the quantitative studies, almost all of these were cross-sectional survey studies (*n*=54). There were also two experimental studies (Harker-Schuch & Bugge-Henriksen, 2013; Sacchi et al., 2016), one prevalence study (Buckley et al., 2017), and two longitudinal studies (Ojala, 2015; Glogger & Shehata, 2022), although note that these studies only used two time points. Overall, this is quite a limited mixture of methods used, and the over-use of the relatively weak methodology of cross-sectional survey studies is problematic for making strong recommendations based on these results. It suggests that while there is quite a lot of research on this topic, if we want to have an understanding of how climate change attitudes are formed and what predicts these attitudes, there is considerable need for better quality studies using more rigorous methods.

Climate change attitude measures

The studies identified rarely addressed attitudes toward climate change comprehensively. The studies tended to use scales with a small number of items on attitudinal components rather than psychometrically validated or robust measures (e.g., Minor et al., 2023; Bertin et al., 2021). Some studies asked one or two questions about outright denial that climate change exists or about levels of climate change denial (Jylhä et al., 2021). Individuals who accept the reality of climate change to an extent, but qualify their beliefs with contrasting

attitudes tend to be defined as climate change sceptics (e.g., Huber et al., 2022; Stefkovics & Hortay, 2022). Climate change scepticism, which is generally a more common attitude now than outright climate change denial, is also multifaceted (Poortinga et al., 2011). It includes the general scepticism towards climate change's existence, but others have also described it as scepticism about who is to blame for climate change and how to address climate change. Some studies included a measure of Anthropogenic Climate Change (ACC) belief; this is the belief that climate change exists due to human behaviour rather than naturally occurring environmental processes (e.g., Furnham & Robinson, 2022). Other attitudes included the urgency individuals feel towards climate change, which was usually assessed by asking participants whether they feel climate change would be a major concern as of this generation or future generations. Less consistently addressed were participants' beliefs in the level of scientific consensus regarding climate change (Bertoldo et al., 2019).

A number of studies used methods to cluster participants into groups based on their responses to attitudinal measures. Similar to the influential six Americans project (Leiserowitz et al., 2021) and the Climate Change in the Irish Mind project (Leiserowitz et al., 2022; O'Mahony et al., 2024) latent class analysis was used in some studies to segment populations or to identify how groups cluster with their attitudes towards climate change and other variables, as one way to maximise targeted approaches. For example, Kácha et al. (2022) used data from the European Social Survey to classify participants into four groups with distinct profiles, ranging from the most concerned to the least concerned about climate change: engaged, pessimistic, indifferent, and doubtful. Individuals who were "Engaged" with climate change were more likely to be from Switzerland, Portugal, Spain, and Iceland, felt the most personally responsible to address climate change, and were

confident that individuals and institutions can effectively address climate change. On the other hand, while "Pessimistic" individuals did believe in climate change and the urgency of tackling it, they tended to be less confident that societal actors could take effective action against climate change (Kácha et al., 2022). Other studies which used latent class analysis to classify individuals through their attitudes include Lind et al.'s (2023) study ("Disengaged/Dismissive" and "Concerned/Cautious") and Otto and Gugushvili's (2020) study which classified Europeans according to their attitudes towards both climate change and social welfare ("Eco-social enthusiasts", "Welfare Enthusiast", "Environmental Devotees", and "Eco-social Sceptics").

Use of Secondary Datasets

Twenty-three of the studies used large-scale secondary datasets in their research. A secondary dataset is a dataset which was collected by someone or an organisation other than the research team, to address a different research question. These datasets are often collected at the national level or a similarly large-scale level. Of those included in this review, most of the datasets were not created to address climate change specifically, but instead include some climate change variables which then were secondarily analysed by a separate set of researchers. Of the 23 studies which used secondary data in this review, 12 studies used data from the European Social Survey (ESS). Ten of these used data from only round 8 (Čermák & Patočková, 2020; Gregersen et al., 2020; Bodor et al., 2020; Otto & Gugushvili, 2020; Fairbrother et al., 2019; Pröpper et al., 2022; Fisher et al., 2022; Czarnek et al., 2021; Johansson, 2022; Kácha, 2022) and one from only round 10 (Mata et al., 2023) of the ESS. Only one study used data from more than one round of the ESS: Vaznonienė and Vaznonis (2021) used data from across rounds 8 and 9.

The other sources of secondary data across multiple European countries were: the Eurobarometer data from 28 EU member states (Crawley et al., 2022); the European Perceptions of Climate Change (EPCC) study (Bertoldo et al., 2019); the Populist Representations Survey (Staerklé et al., 2022); and a study conducted by the European Parliament conducted in the autumn of 2020 (Stefkovics & Hortay, 2022). There were also secondary analyses of national-level data: the British Election Study (Huber, 2020), the British Social Attitudes Survey (Ali et al., 2018), the Norwegian CICERO's climate survey (Aasen & Sælen, 2022), the Swedish Environmental Protection Agency (Elert & Lundin, 2022), the Greenlandic Perspectives Survey and the Indigenous Perspectives Survey (Minor et al., 2023), and the Austrian National Election Study (Huber et al., 2022). There was no primary research conducted in or looking specifically at Ireland. However, Ireland is represented in a small number of analyses of secondary datasets, such as of the European Social Survey (ESS).

Populations Studied

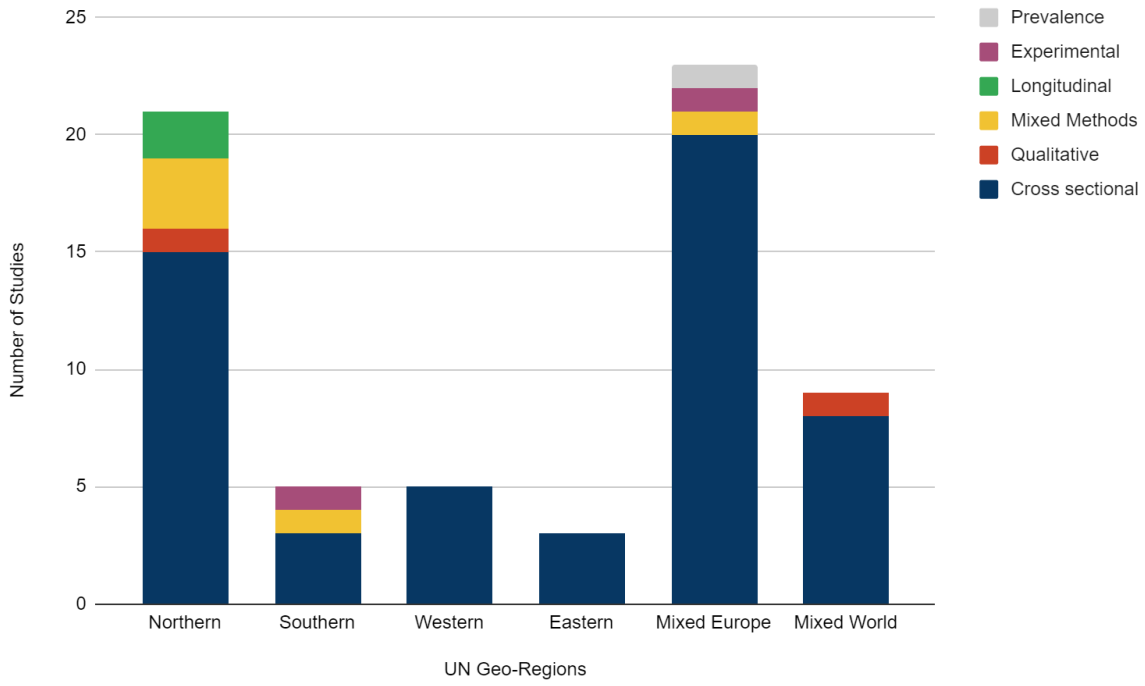
The studies included were mostly focused on adult populations (18 years and over). Nine studies use second-level students as their sample and the ages in these studies ranged from 12 to 18 years of age (Kurup et al., 2021; Yli-Panula et al, 2021; Ojala, 2015; Stenseth et al., 2016; Nepras et al., 2023; Harker-Schuch & Bugge-Henriksen, 2013; Harker-Schuch et al., 2021; Skamp et al., 2021). The only studies which specifically focused on children were Nepras et al. (2023) who sampled 12-13-year-olds in Czechia, the United Kingdom, and Portugal; Harker-Schuch et al. (2021) who sampled 12-13-year-olds in Austria and Australia; and Kurup et al. (2021) who sampled 13-14-year-olds in the United Kingdom. None of the included studies focused on primary-aged children. Nine studies used university student

populations (León et al., 2021; Sacchi et al., 2016; Maran & Begotti, 2021, Itkonen, 2015; Jylhä & Hellmer, 2020; Jylhä et al., 2021; Bertin et al., 2021; Ajaps & McLellan, 2015; McKercher, 2013). The lack of research on children is problematic for understanding attitude formation and from a child right's perspective. All studies include data from Europe and the findings can be broadly generalised to the Irish context.

Findings by Region

We examined the number and type of studies, separated into where they were located according to the classification of the UN Geographic Regions of Europe. Of the 66 studies included, 34 of these looked at a country or group of countries in just one European region. The vast majority of these 34 studies came from Northern European countries (31.8%). Most Northern European studies used cross-sectional methodologies, although two used a qualitative methodology (Filimonov & Carpentier, 2022, *n* = N/A); Happer & Philo, 2016 (*n*=150), and two were longitudinal (Ojala, 2015, Time 1: *n* = 870; Time 2: *n* = 684; Glogger & Shehata, 2022, Wave 1: *n* = 2,058; Wave 2: *n* = 1700).

FIGURE 4 BREAKDOWN OF STUDY METHODOLOGIES BY UN GEO-REGION



Overall, there are high levels of belief across Europe that climate change is occurring. Two studies using ESS data both reported that 98% of the population believe in climate change (Fairbrother et al., 2019; Fisher et al., 2022). Buckley et al. (2017) carried out a prevalence

study across 10 European countries and found similar belief levels of 96%. Using the ESS data for Ireland, levels of belief were reported as 96.1% (Bodor et al., 2020). The most recent Climate Change in the Irish Mind: Wave 2 report,not included in the systematic review, indicates similar levels of belief at 95% (O'Mahony et al., 2024).

There are differences in prevalence rates depending on the attitudinal measures employed and the samples used in the studies. For example, Skamp and colleagues (2021) reported that 77% of their 11-country secondary school student sample thought global warming was occurring, with 74% concerned about the consequences. Harker-Schuch and colleagues (2021) reported that 85% of 12-13-year-old students in Austria and Australia believe climate change is happening now, 83% believe it to be anthropogenic, and 89% believe it to be something to worry about. Finally, Harker-Schuch and Bugge-Henriksen (2013) reported that 92% of their 16-17-year-old student sample from Austria and Denmark believed that climate change was happening now. Minor et al. (2023) found that 89% of Kalaallit people - who are a Greenlandic Inuit ethnic group - believed climate changes were happening.

Data Synthesis using Bronfenbrenner's Bioecological Systems Theory

Below, we will discuss the results of the review within the framework of Bronfenbrenner's bioecological systems model, which emphasises the complex interrelations between an individual and their environment. As described in more depth earlier, the individual is at the centre of the model, followed by the microsystem which includes immediate environments and relationships that the person interacts with regularly, such as family, school, peers, and workplace. Immediately outside of that is the mesosystem; this level involves the

interactions between the various components of the microsystem. Outside of the mesosystem is the exosystem, which includes settings or influences that the individual does not directly engage with but that still affect them indirectly, such as a parent's workplace or extended family networks. This outermost layer is the macrosystem, which encompasses the broader cultural, economic, legal, and societal influences that affect an individual. Finally, there is the chronosystem, which reflects the environmental events and transitions over the lifespan, as well as social and historical changes.

The Individual.

When examining individual level-variables, most studies tended to focus on demographic information such as age, gender, educational level, and occupation as control variables. Personality or psychological constructs were less frequently examined, and the targeted variables (e.g., self-esteem) were less systematically addressed or conceptualised. Overall, many demographic characteristics showed a mixed relationship with climate change attitudes.

With the exception of Johansson et al. (2022), all studies looking at age found that participants' views on climate change tended to be associated with the age of the participants. However, the findings are inconsistent as the pattern of this effect was different across studies and the lack of longitudinal research limits the conclusions that can be drawn from the age findings. For example, using data from the ESS, Kácha et al. (2022) found that participants who were 'Concerned' or 'Engaged' about climate change (i.e., who believed that anthropogenic climate change is happening, and that individuals and institutions can take effective action against climate change) were younger. However, being younger was not

uniformly associated with having less sceptical attitudes towards climate change nor to believing that climate change is human-caused. For example, older individuals (55+ years old) in the UK tended to be less sceptical about the human impact on climate change than younger participants (Ruiu et al., 2022). These substantial variations in the impact of age on climate change attitudes tended to be attributed to either educational differences or lived experiences - depending on the outcome - with no clear indication on why age as a demographic variable has such a differential impact on different climate change attitudes.

Unlike with age, the pattern for gender was very clear and was mostly consistently replicated. Being female was associated with believing more strongly that climate change is an important concern (e.g., Elert & Lundin, 2022) and that climate change is human-caused (e.g., Kácha et al, 2022). The exception to this pattern was Harker-Schuch and Bugge-Henriksen (2013) study with Austrian 12- and 13-year-olds, which found that while both boys and girls held strong concern for climate change, girls tended to believe less that climate change is anthropogenic.

Findings on educational levels were again inconsistent and suggest that either education level is unrelated to climate change attitudes or that greater education is associated with stronger belief in anthropogenic climate change. In line with the former, Kiss et al. (2022) found that education level was only partially related to climate change concerns in Hungary. Similarly, Kácha et al. (2022) did not find clear differences in how educational attainment was associated with different climate change attitudes (e.g., being pessimistic, indifferent, engaged, or concerned with climate change) across 23 European countries. By contrast, other studies found that lower educational levels were associated with the belief that climate change is caused by natural causes rather than human activity (e.g., Ruiu et al.,

2022 in the UK). Where an association between educational attainment and belief in climate change exists, there appears to be some nuance to it. Two studies examined how education level was associated with attitudes to climate change when also looking at an individual's political orientation and a country's developmental level (Czarnek at al., 2021; Pröpper et al., 2022). Across 64 countries, Czarnek et al. (2021) found that individuals who are more educated tended to acknowledge climate change is happening and that it is a serious issue caused by humans, but the effects of education on these attitudes only held when a country's developmental level was low- to mid- on the Human Development Index. Where countries are at high levels of development, educational levels were attenuated by right-wing political ideology. Pröpper et al. (2022) found similar results: higher educational levels predicted greater belief in anthropogenic climate change, but these effects were moderated by political beliefs.

The Microsystem.

There were only 14 studies which examined how an aspect of the microsystem impacted climate change attitudes. The research broadly focused on the impacts of close relationships, social dominance orientation and intolerance towards others, and educational environments. Studies which looked at specific relationships with family members, romantic partners, or friends found that individuals tend to hold similar views on climate change as others within their immediate social circles. For example, a cross-sectional study of 758 couples across 25+ European countries found that couples tended to hold the same views on climate change. Even when romantic partners had varying attitudes of alarm towards climate change, they were not likely to be on different ends of the attitude spectrum

(Goldberg et al., 2022). Similarly, a cross-sectional study on Grade 10 students in Sweden found that having a parent sceptical of climate change predicted adolescents' own climate change scepticism one year later (Ojala, 2015).

Social dominance orientation is the tendency to accept and endorse group-based social hierarchies. There is solid evidence that having a social dominance orientation is associated with more climate change denial, although the importance of this as a predictor is not clear. A small cross-national study across Hong Kong, New Zealand, and Sweden found that a social dominance orientation was a significant predictor of climate change denial, particularly in Sweden (*n*=223) (Jylhä et al, 2021). Indeed, in a model containing demographic variables, social dominance orientation, and human-nature and human-animal dominance (the belief that humans should be and are dominant or supreme over nature and animals, respectively), social dominance orientation was one of the strongest predictors, explaining 33% of the variance in climate change denial in Sweden. However, Furnham and Robinson's (2022) study from several countries - including Great Britain - showed that in a model containing different variables from the social ecological model (e.g., political beliefs, self-esteem, levels of social comparison and others), political beliefs played a stronger role and had more explanatory power than other variables on anthropogenic climate change. There was only one study which specifically examined intolerance towards others: an examination of cross-sectional data from the European Social Sciences survey (*n*=3587; Johansson et al, 2022). They found that intolerance indicators towards others in Europe, namely intolerance towards Muslims, foreign workers, and LGBTQIA+ people, is associated with climate change scepticism. Having 10% higher levels of racial intolerance

reduced the probability that an individual would consider the consequences of climate change to be extremely bad by 21.5% (Johansson et al., 2022).

Finally, educational settings such as schools and universities are important elements of the microsystem, but their influence on climate change attitudes are relatively unstudied. We only identified one study that examined the influence of climate change education in schools on climate change attitudes (Harker-Schuch & Bugge-Henriksen, 2013), likely given the strict inclusion criteria of climate change attitudes to be the outcome variable in this systematic review. Among 16- and 17-year-old high school students in Denmark and Austria exposed to a 71-slide lecture on climate change, a pre-post study showed that the lecture did not significantly contribute to any attitudinal changes on climate change. One explanation is that 92% of the sample already held favourable opinions on climate change before the lecture and thus there was limited room for change. Second is that changing attitudes on climate change may need to be approached differently (i.e., not by instructive or didactic methods).

A small-scale study on Spanish undergraduate students (*n*=120) examined climate change communication and how the frame used impacted on attitudes (León et al., 2021). This study found that - among students with high levels of environmental concern - narrating climate change according to different frames (e.g., climate change has negative effects globally vs locally) did not alter their perception of how serious climate change is. However, for those who had low or medium environmental concern, framing climate change through a global lens (i.e., climate change has negative effects globally and there are benefits to addressing climate change on a global scale) had a more significant impact on their perception of the seriousness of climate change compared to participants exposed to

frames with a local perspective (León et al., 2021). Although just one study, this experimental evidence suggests that it is possible to change people's climate change attitudes provided the right framing.

Finally, one study examined scientific literacy and climate change attitudes. Arroyo-Barrigüete and colleagues (2023) found that, in a sample of 604 adults in Spain, having greater scientific literacy was only associated with a strengthened belief in anthropogenic climate change for left-leaning individuals. Where a participant was a centrist or right-leaning, having greater scientific literacy was not associated with any stronger belief in anthropogenic climate change.

The Mesosystem.

The mesosystem refers to the interactions between different systems, and thus many of the constructs included here address trust in institutions - such as the media or government - or levels of support for different policies. The evidence for the impact of mesosystem on climate change attitudes is mixed.

There were three key studies on political trust and climate change: Fairbrother et al. (2019), Otto and Gugushvili (2020), and Kaltenborn et al. (2017). Fairbrother and colleagues' (2019) study using data from the European Social Survey found that greater political trust in one's parliament, politicians, and political parties is one of significant factors associated with less belief (not more) in anthropogenic climate change. However, Otto and Gugushvili (2020) found differing results. They also used the European Social Survey, but derived group memberships related to (1) support for climate change policies and (2) support for public welfare provision. Individuals considered to be "eco-social sceptics", defined as low-income

groups which perceive less immediate needs for addressing the challenges of climate change and are distrusting of welfare states, were the largest group and constituted around 28% of the sample. Otto and Gugushvili (2020) using the same ESS data from Ireland showed that the largest group at 36% of the sample were 'eco-social sceptics', those who disliked both public welfare and environmental policies; followed by 'environmental devotees' at 29%, a group suspicious of the welfare state but in favour of policies mitigating climate change; followed by 'welfare enthusiasts' at 23% who supported public welfare programmes but rejected climate change policies'; the smallest group was made up of 'eco-social enthusiasts' who had a positive stance towards public welfare and climate change policies.

The differences between the studies' results may be due to the differential impacts of income. Otto & Gugushvili (2020) also found that as dissatisfaction with one's financial situation decreased, participants became less sceptical of the need to address climate change and adopted instead more favourable views towards both state welfare and environmental provisions. Indeed, this was also found with Norwegian participants (*n*=4,077) in Kaltenborn and colleagues' (2017) study. When age, gender, and income were controlled for, participants with high levels of trust in institutions were less likely to believe that climate change is mainly caused by natural fluctuations. There was no direct effect of cultural resources (as a proxy for the role that early socialisation and available cultural/social resources during childhood) on climate change attitudes. However, when participants had lower levels of trust, the effect of cultural resources became significant, suggesting that individuals' trust in institutions is intricately linked to one's experiences.

Surprisingly, we identified only one study that examined the relation between media use and climate change beliefs (Glogger & Shehata, 2022). Again, this is likely due to the inclusion criteria. While there is a significant body of literature on the communication of climate change attitudes online, the studies did not meet our inclusion criteria using the person-centred model with attitudes as an outcome variable. This study was conducted with 2,800 people in Sweden and examined the role of media use in impacting the association between social and economic ideology with climate change beliefs. They found that media use was a significant moderator between socio-cultural ideologies and climate change beliefs. When participants who had more 'traditional' social and economic beliefs and who engaged with right-leaning media, they were more doubtful of the scientific evidence supporting climate change and believed it was less dangerous than those who had more 'traditional' social and economic beliefs but engaged less with right-leaning media.

The Exosystem.

The exosystem is how the individuals' indirect environment, including social institutions, influence them. There were 7 studies which examined this. Most of the 7 studies looked at governmental factors (e.g., GDP) and, surprisingly, none addressed the media as a governing/institutional structure. These studies found that regardless of GDP levels, people living in European countries do not vary much in their attitudes towards climate change. According to data from the European Social Sciences survey, most participants tended to have high levels of belief in the anthropogenic nature of climate change (e.g. Fairbrother et al., 2019). While there was broad agreement about anthropogenic climate change, differences arose in levels of support for mitigation measures. For example, people in

Czechia, Ireland, Hungary, and Portugal were strongly against support for higher fossil fuel taxes whereas people in countries such as Switzerland and Finland were strongly supportive. People from countries which had greater per capita carbon emissions also exhibited a stronger relationship between climate change scepticism and endorsement of hierarchical, right-wing, conservative, and individualist ideologies than people from countries with lower per capita carbon emissions (Hornsey et al, 2018). Across both Germany and Poland (*n*=1,969 participants), the perceived effectiveness of carbon tax was a significant predictor of support for climate change mitigation (Bohdanowicz, 2021). In Poland, an additional significant exosystem factor was the perceived effectiveness of renewable energy, suggesting that individuals' beliefs in governmental successes and efficiency in one field lead to the trickling down of support to another, namely climate change mitigation in this case (Bohdanowicz, 2021).

The Macrosystem.

The macrosystem level focuses on individuals' political, cultural, or national values and their relation to different climate change attitudes. There were 24 studies in this area, all of which used cross-sectional or qualitative methods. As with the results presented in this review focusing on other social ecological levels, the lack of studies using rigorous methods limits our ability to establish causality or to be confident in the study findings. While most studies examined political orientation (e.g., left-right axes, liberal-conservative continuum), there were others which examined general environmental values or degree of individualism/collectivism.

Three studies investigated what participants felt was the underlying cause of climate change. A qualitative study by Hope and Jones (2014) in the UK (*n*=18) which looked at how religiosity affect attitudes towards environmental issues (including climate change) among UK Muslims, Christians, and seculars highlighted how most participants (Christian participants, to a lesser degree) accepted the reality of climate change, but differences arose in the degree to which climate change would impact humans as opposed to other living things and its urgency, with religious participants believing less in climate change urgency than secular participants. Importantly, however, all groups agreed that regardless of whether climate change is a current or future problem, it did not negate the fact that humans and their use of technology are abusing the environment. Although this study was conducted with a small sample size, it illustrates two important distinctions within the literature on climate change and environmentalism, generally: (1) attitudes towards climate change and the environment overlap but are distinct from each other, (2) individuals who are sceptical of the urgency to tackle the impacts of climate change may be approached

from a broader environmentalist perspective in an effort to have them hold more positive views towards climate change. A study among a non-representative Hungarian sample in Budapest (*n*=545; Jankó et al., 2018) illustrated similar perspectives on how most participants do believe that climate change is caused by humans' abuse of the environment. In fact, the two most common responsibility attributions to climate change were consumer society and fossil-fuel energy resources. Respondents who had lower salaries or worked in either offices or trade blamed individuals whereas those with a tertiary-level education or were working as white-collar executives blamed the failure of environmental policy as the reason for the state of climate change today (Jankó et al., 2018).

Other studies examined broad cultural and political values in relation to different climate change attitudes. Besides political orientation - which was the most commonly examined variable - studies measured degrees of individualism-collectivism (e.g., Chan & Tam, 2023), belief in a just/unjust world (Furnham & Robinson, 2022), identification with humanity (Bertin et al., 2021), and belief in a "model of science" (Bertoldo et al., 2019). While these studies note what values individuals hold rather than observe the broad values adopted within a culture or subculture, when examined as a continuum, these constructs can be construed as reflective of society's adoption or rejection of certain norms. For example, a cross-national comparison (*n*=5,323) of the effects of five different ideologies (conspiratorial ideation, individualism, hierarchy, left–right political ideology and liberal–conservative political ideology) on climate change attitudes showed that the USA was the only country to have all five ideologies significantly correlated with climate change scepticism, whereas that was not the case for people in Europe (Hornsey et al., 2018). There were significant but quite modest correlations between conservative ideologies and climate

change scepticism in Europe, suggesting that there may be more important political indicators for scepticism than political conservativeness in Europe.

This finding was somewhat replicated in a large cross-national study comparing people in 15 Western and 6 Central and Eastern European countries in terms of their political orientation and climate change attitudes. It found that left-leaning individuals in 13 of the 15 included Western European countries were more likely to attribute climate change to human causes than right-leaning individuals, whereas there was no relationship between level of conservative/liberal ideology and climate change attitudes for people in any of the Central and Eastern European countries (Fisher et al., 2022). However, there are other studies which have found that right-wing ideology is a significant predictor of negative attitudes towards climate change (e.g., Aasen & Sælen 2022, in Norway). This may be due to the salience of other constructs, namely populism, in some European regions as opposed to left-right wing ideology. This is consistent with Glogger and Shehata (2022) finding that adopting a sociocultural lens ("Green-Alternative-Liberal" and "Traditional-Authoritarian-Nationalist") provides stronger explanatory power than focusing predominantly on right-wing ideologies.

Indeed, there are a number of studies which suggest that populism may be an important predictor of a lack of belief in anthropogenic climate change or concern about climate changes. Populism is a set of ideas revolving around anti-elitism and a belief that society is divided, on moral grounds, to two groups: the people and the "elite". In the UK, populism was not correlated with political ideology but did significantly predict climate change scepticism and denial (Huber et al., 2022). While populism as a whole is related to climate change scepticism and denial, specific subdimensions of populist belief appear to be

particularly important. Jylhä & Hellmer (2020) examined the relation between several subdimensions of populism in relation to climate change denial (a more extreme negative attitude towards climate change and one which is not commonly held among most participants) and found that, among Swedish participants (*n*=909), exclusionism/anti-egalitarianism was most predictive of climate change denial. A cross-national comparison of other populist dimensions showed that even when populism was significantly associated with perceptions of climate change responsibility, the relationship was not always similar across contexts, nor was the specific dimension of populism predicting climate change responsibility (Staerklé et al., 2022). For example, in France and Greece, both people's sovereignty (the belief that the in-group, or the "people", should have decision-making power) and anti-elitism (antagonism to the out-group, usually elites who are seen as categorically different than ordinary people, such as scientists) had a significant and negative effect on perceptions of climate change responsibility. By contrast, anti-elitism was the only significant predictor in Switzerland and Finland, with a significant indirect effect on personal responsibility to mitigate climate change. Finally, the opposite was true in Italy, where people's sovereignty revealed the only significant indirect path.

The Chronosystem.

The chronosystem examines the influence of time on climate change attitudes. Only two studies examined how people's opinions change over time or what specific factors shape people's views on climate change over time. Taylor and colleagues (2014) found that among UK residents (*n*=1,848 participants), both perceived changes in hot-weather and wet-weather related events were significant predictors belief in anthropogenic climate change

and concern about this change, with wet-weather related events being a stronger predictor. Previous personal experience with heat-wave discomfort and flooding were also associated with greater belief in anthropogenic climate change and concern about this change.

Ojala (2015) conducted a hierarchical regression among adolescents (*n*=780 participants at Time 1, *n*=684 participants at Time 2) in Sweden to understand what factors predict climate change scepticism over a 1-year period. They found that out of the several factors that predicted climate change scepticism at Time 1 (e.g., factors related to societal powerlessness and social norms, environmental values), only perceiving parents as having climate sceptical attitudes and low tolerance toward immigrants predicted an increase in climate change scepticism over the one-year period.

Discussion

This review has revealed that there is a considerable body of research on climate change attitudes. However, there were few rigorous studies, and there was considerable variety in how climate change attitudes were conceptualised and measured. This limits what conclusions can be drawn from the extant evidence - although there is a wide breadth of research on the topic, there is a considerable need for better quality studies using more rigorous methods. We employed the Bioecological Systems Model (Bronfenbrenner, 2000) to guide our understanding of the results of the included studies. The majority of studies fell into the exosystem, with relatively few studies on the microsystem or chronosystem.

Broadly, the review indicated very high levels of climate change belief across Europe, ranging from 96% (Bodor et al., 2020) to 98.4% (Fisher et al., 2022). Bodor and colleagues (2020) found that rates of belief in climate change were similar in Ireland. These findings are in line with those from the Climate Change in the Irish Mind survey which show 95% of people in Ireland believe in climate change (O'Mahony et al., 2024). However, there are many nuances to climate change attitudes, and while we have very high levels of climate change belief in Ireland, only 56% of the population believe that climate change is caused by human activity (O'Mahony et al., 2024).

One of the most consistent findings in terms of demographics associated with climate change belief is the finding that women believe more strongly that climate change is an important concern (e.g., Elert & Lundin, 2022) and that climate change is human-caused (e.g., Kácha et al., 2022). This finding is in line with gender differences in environmental attitudes more generally, where women are found to have stronger pro-environmental attitudes and more pro-environmental behaviour than men (Gifford & Nilsson, 2014; Milfont

& Schultz, 2018). It is argued that women are more likely to hold these types of attitudes toward climate change and environmentalism than men because women are socialised to be interdependent and cooperative and to empathise with the needs and welfare of others (Milfont & Schutz, 2018). These characteristics are communicated through the gender role socialisation processes heavily influenced by culture within the macrosystem.

Findings examining the demographics associated with climate change attitudes tended to be nuanced and varied and linked with other variables such as lived experiences and political belief. Similar to environmental variables generally, younger people are more likely to fall into the 'climate concerned' or 'climate engaged' categories (Kácha et al., 2022). Other studies found that older participants (55+ years) were less sceptical about the human impact on climate change (Ruiu et al, 2022). Educational level was found to be unrelated to climate change attitudes in some studies (Czarnek at al, 2021) or positively associated with stronger belief in anthropogenic climate change and moderated by political beliefs (Pröpper et al., 2022). This could be compared with CCIM where the *alarmed* and *concerned* groups were more likely to have higher levels of education than the *cautious* or *doubtful* groups (Leiserowitz et al., 2022). In the absence of any longitudinal data, it is difficult to disentangle cohort and age effects or comment on the directionality of any associations.

The influence of the microsystem is unsurprising, such that individuals hold similar views on climate change as their partners (Goldberg et al., 2022) and adolescents have similar levels of climate scepticism as their parents (Ojala, 2015). This has relevance to youth engagement in climate action and the potential of integrating family and peer influence in climate change initiatives. Climate change education may play an important role in supporting massive and radical adjustments to attitudes and behaviours required to counter

the effects of climate change (Reid, 2019). Within the Irish population, educators are seen as a trusted source of information for 87% of the population (O'Mahony et al, 2024). Given the nature of the review, we included only those studies that measured the impact of climate change education on climate change attitudes. Nonetheless, we were surprised to identify only one study that examined the influence of climate change education in schools on climate change attitudes (Harker-Schuch & Bugge-Henriksen, 2013). This study found limited impacts of climate change education but was focused on a didactic teaching method in contrast to the recommended participatory, creative approach (Rousell & Cutter-Mackenzie-Knowles, 2020), and so it is difficult to know how generalisable this finding is.

The relationship between climate change attitudes and intergroup attitudes and intolerance to others are concerning. A consistent finding that emerged from this systematic review - which mirrors the findings elsewhere on environmental attitudes more generally - is the association between social dominance orientation and climate change denial (e.g., Jylhä et al., 2021). Individuals with a social dominance orientation - a tendency to accept and endorse group-based social hierarchies - explained approximately a third of the variance in climate change denial. One study which found an association between climate change scepticism and intolerance indicators towards Muslims, foreign workers, and LGBTQIA+ people estimated that a 10% increase in racial intolerance reduced the probability that an individual would consider the consequences of climate change to be extremely bad by 21.5% (Johansson et al. (2022). Although the current levels of climate change denial are low, there is a significant risk of this increasing when these findings are interpreted in the context of increased 'far right' influence in Ireland, illustrated by the anti-immigrant sentiment evidenced at the Dublin riots, recent arson attacks on accommodations planned for asylum

seekers, and the transphobic rhetoric underlying high profile court cases and protests at public libraries (Cannon et al., 2022; McGee, 2024). Additionally, recent elections have shown the increased popularity of the far right in Europe (Powers, 2024). Recent years have also seen an increase in the spreading of mis- and dis-information and harmful content and activity online which has strengthened the reach and influence of the far-right in Ireland (Gallagher et al., 2023). Much of this content has been aimed towards immigrants and LGBTQIA+ individuals. Hate crimes have increased in Ireland in recent years, with the largest proportion of crimes against immigrant and LGBTQIA+ individuals (An Garda Síochána, 2022). Although the figures indicate that these incidents are currently relatively infrequent, changes in such intolerance attitudes should be interpreted in light of the association between such intolerance and climate change attitudes (e.g., Johansson et al., 2022). Considering the bidirectional nature of social ecological systems, increases of such sentiment among individuals and groups can influence other systems including families, media, schools, communities, and subcultures. For example, the examination of the circulation of mis- and dis-information online in Ireland reported that discussions about climate change are being exploited by far-right political parties in an effort to position themselves as the 'true defenders' of rural interests, with references made to 'culture war' and a conspiracy to control the population, attempts made to trivialise the issue, and the denial of scientific evidence (Gallagher et al., 2023).

There is a body of literature that indicates a significant association between public policy support and political trust (Cologna & Siegrist, 2020). The CCIM research found that less than half of the sample reported having trust in their political leaders (O'Mahony et al., 2024). An earlier version of the study found *alarmed* and *concerned* groups were more likely

to have higher political trust than the *cautious* or *doubtful* groups (Leiserowitz et al., 2022). The findings with regards to political trust and climate change attitudes in this current review were mixed. Some studies suggested that greater political trust was associated with less belief in climate change (Fairbrother et al., 2019) while others suggested trust to be associated with higher levels of belief (Kaltenborn et al., 2017). When clustering individuals according to their support for climate change policies and support for public welfare provision, Otto and Gugushvili (2022) found that 'eco-social sceptics', those who disliked both public welfare and environmental policies, were the largest group represented at 28% and 36% respectively.

The review also identified political beliefs as a significant predictor of anthropogenic climate change beliefs (Furnham & Robinson, 2022). For the most part, left-wing ideologies were associated with belief in anthropogenic climate change and right-wing ideologies are associated with climate change scepticism (Hornsey et al., 2018; Aasen & Sælen, 2022). A stronger association was found between climate change scepticism and hierarchical, right-wing, and conservative ideologies countries with a greater per capita carbon emission (Hornsey et al., 2018). This should be interpreted in the context of Ireland which has one of the largest per capita emissions rates in EU; although CCIM does not suggest a strong link between climate attitudes and political views in Ireland currently (Leiserowitz et al., 2022; O'Mahony et al., 2024). More recently, research suggests that the socio-cultural dimension of ideology is a better predictor than a left–right continuum in predicting beliefs about climate change (Glogger & Shehata, 2022). Our review identified populism as a predictor of belief in anthropogenic climate change and concern about climate changes (Huber et al., 2020). More specifically, the dimensions related to egalitarianism, anti–elitism, and people's

sovereignty have been associated with climate change beliefs (Jylhä & Hellmer, 2020; Staerklé et al., 2022). Glogger and Shehata (2022) suggest that adopting a "Green-Alternative-Liberal" and a "Traditional-Authoritarian-Nationalist" (TAN) dimension provides stronger explanatory power than focusing predominantly on right-wing ideologies. Media then has the potential to widen belief gaps about climate change through this ideology, such that identifying the TAN dimension and using more right-leaning media decreases the belief in the danger of climate change and increases the doubt in scientific evidence (Glogger & Shehata, 2022). These findings should be interpreted in the context of increased 'far-right' online content and engagement in Ireland (Gallagher et al., 2023) and attention should be paid to susceptible ideologies in this context. Engagement with such media can reinforce and amplify existing beliefs about climate change.

These findings have implications for tailoring climate change communication according to individuals' political beliefs. The findings would suggest that climate change communication should be tailored such that different types of messaging is used for those with high or low belief in anthropogenic climate change belief. For example, using scientific evidence and improving scientific literacy may only be effective for left-leaning people (Arroyo-Barrigüete et al, 2023), and the anti-elitism findings (Staerklé et al., 2022) may lend support for the use of non-experts in climate change communications to the small minority of the population that are climate sceptics. Research more broadly suggests that we select and attend to information that supports our beliefs and avoid information likely to challenge them (e.g., Eagly & Chaiken 2005; Hart et al., 2009). The frequently cited explanation is the theory of cognitive dissonance, that is, after people commit to an attitude, belief, or decision, they gather supportive information and neglect unsupportive information to avoid

or eliminate the unpleasant state of post decisional conflict known as cognitive dissonance (Festinger, 1957, 1964). An interesting, albeit small scale, study on climate change communication found that correct framing can influence levels of environmental concern. For individuals with low or medium environmental concern, narrating climate change through a global frame had a more significant impact on their perception of the seriousness of climate change compared to participants exposed to frames with a local perspective. The effect was not found for those who had high levels of environmental concern (León et al., 2021).

We identified only two studies on climate belief changes across time, which found that individuals' perceptions of changes in hot-weather and wet-weather related events were positively associated with anthropogenic climate change and concern about this change (Taylor et al., 2014). Ireland has witnessed some major climate events in recent years and months, including heat waves and significant storms. Research suggests a moderate amount of worry about events among the Irish population, at 62% and 54% worried about flooding and extreme heat respectively (O'Mahony et al., 2024).

Only one study examined climate change scepticism longitudinally (at two points) which found that parents' scepticism and intolerance towards immigrants were the only predictors of increased climate change scepticism over a one-year period (Ojala, 2015). The lack of any longitudinal studies on climate change belief is notable and suggests a clear need for more rigorous research on the development and change of climate change attitudes across the lifespan.

Overall, the review highlighted limitations in the current research landscape on climate change attitudes. While a wide body of research was identified, there were

considerable limitations in the depth in the research. In the main, the findings were cross-sectional in nature, and relied almost exclusively on participant self-report. Some studies - particularly those drawn from secondary data sources - had the advantage of large sample sizes. However, they were limited in the depth with which they were able to explore attitudinal levels. Studies tended to focus on the existence of attitudes; there was a significant absence of research on attitude formation, changes in attitudes, or providing nuance in terms of climate change attitudes. For the most part, the samples used in the research were from adult populations. Research on adolescents was limited and research on children was non-existent. This is problematic given that very young children develop attitudes (Halbeisen et al., 2017; Halim et al., 2017) and that attitudes crystallise by late adolescence (e.g., Henry & Sears, 2009). Children and adolescents are most affected by the impact of climate change and most exercised in addressing the crisis. There was also a surprising lack of systematic exploration of microsystem variables despite proximal variables being frequently considered as the most critical for attitude formation.

We recommend that in order to examine attitudes more comprehensively, particularly in the Irish context, we examine how climate change attributes are formed from childhood, through adolescence, to adulthood with an in depth focus on immediate proximal influences, as well as the role of out-group intolerance on attitudes. This could be the inclusion of a module on engagement with climate change on existing longitudinal studies, or more ideally, a research study specifically designed to explore the influences on climate change attitude formation and modification across time. We also recommend employing a participatory methodology if conducting such research, including the public and key stakeholders in developing the study design, implementing the research,

interpreting results, and disseminating study findings. This could use, for example, the INVOLVE Public Involvement in Research: Values and Principles Framework (2016). Given the limitations of the review and the wide breadth of research available, we were not able to examine the role of media on attitudes in any detail. However, there is a significant body of research on attitude communications on social media and traditional media that warrants a systematic review. We also recommend a systematic review of the research on public support for climate change policies, including the specifics of the policies that support intrinsic and extrinsic motivating factors to climate action.

The review examined attitudes and thus we cannot comment on the application of these variables on behaviour. The attitude-behaviour gap is particularly evident within the context of climate change where there is a considerable intergenerational time gap and frequent geographic gap between action and outcomes (Higham et al., 2016; Whitmarsh, 2009). According to the theory of planned behaviour (Ajzen, 1991) individuals consciously weigh the pros and cons before making decisions, evaluating the importance and consequences of the behaviour (Ajzen, 1991). In the theory of planned behaviour, behavioural intentions are the most proximal determinant of behaviour. An individual's intention to perform a particular behaviour is, in turn, predicted by three socio-cognitive factors: attitudes, subjective norms, and perceived behavioural control. The theory of planned behaviour has been used widely to understand, predict, and change environmental attitudes and behaviours broadly as well as in specific domains such as recycling, car use, conservation behaviours, and environmental activism (Milford & Schultz, 2018). There is good evidence that interventions underpinned by a theory of planned behaviour approach can be effective at changing climate change-relevant behaviours, such as climate adaptive

farming practices (Bergquist et al., 2023; Zhang et al., 2020), energy conservation (Macovei, 2015; Masud et al., 2016), and transportation choices (Fyhri et al., 2017; Yuriev et al., 2020).

While the theory of planned behaviour is a commonly cited theoretical approach, there are more specific models within the context of climate, such as the Awareness Behaviour Intervention Action framework (Hayles et al., 2013). This model attempts to explain the lack of translation from public concern to action or lifestyle changes. The framework proposes that any system aiming to address environmentally responsible behaviour and implement policy effectively must: 1) address feelings of individual helplessness in the scale of the global crisis; 2) acknowledge that end users are active stakeholders who understand what they need and want; and 3) understand that decisions regarding environmentally responsible behaviour are largely influenced by familiarity and habit rather than deliberate informed choices.

Future research may also examine the routes to attitudinal change. The elaboration likelihood model of persuasion provides an integrative framework for understanding the processes by which source, message, recipient, channel, and context variables have an impact on attitude change (Cialdini et al., 1981; Petty & Cacioppo, 2012). According to the model, there are two routes to behavioural change. In central route processing, individuals engage in explicit thinking about issue-relevant information and are motivated to evaluate the merits of recommendations suggested. According to the elaboration likelihood model, when a person carefully considers how the presented information bears on the recommended attitude or behaviour, the new attitude is more likely to be integrated into a belief system that has the potential to influence behaviour (Petty & Cacioppo, 1981; 2012). On the other hand, in peripheral route processing, rather than focused thinking, peripheral

cues play the key role in attitude change. These cues allow an individual to evaluate a message or decide what attitudinal position to adopt without engaging in any extensive focused thought process. The peripheral route will be adopted when motivation and ability to process is low and the resultant attitude change is less enduring and less predictive of subsequent behaviour (Petty & Cacioppo, 1981; 2012).

More recently, Steg (2016) has made some suggestions for strengthening pro-environmental actions, many of which are built on strengthening pro-environmental and altruistic behaviours. In particular, Steg emphasises the interaction between attitudes and the rewards and costs of pro-environmental behaviour, including instrumental, value-, and social-orientated rewards and costs. She emphasises the importance of providing feedback to individuals on the rewards and costs of their behaviours when trying to promote pro-environmental actions. Steg suggests that some of the strategies that target individuals' extrinsic motivation to act pro-environmentally (e.g. reduced taxes) may lead to egoistic values and to people focusing on individual costs and benefits of actions (Agrawal et al., 2015). Nonetheless, small financial incentives can encourage people to engage in pro-environmental actions if the incentives are clearly linked to pro-environmental goals and if the incentives remind people of their biospheric values and pro-environmental intentions (Jakovcevic et al., 2014). Steg argues that this may be important when environmentally harmful habits have been formed. She also suggests employing strategies that take advantage of people's need to be consistent. For example, hypocrisy strategies - in which case people are made aware of the inconsistency between their attitudes and behaviour - make use of people's desire to be consistent and have proved to be effective for encouraging pro-environmental actions. Related to the current report on person-centred

models and social influence, Steg argues for using social influence strategies, where people or groups are used to influence an individual's thoughts or actions. This technique has proved to be effective for encouraging pro-environmental actions (Abrahamse & Steg, 2013) by providing recipients with information about the behaviour of other people or groups and providing social comparison feedback.

Conclusion and Recommendations

The findings of the review suggest that there are a myriad of social influences on climate change attitudes and no single factor explains the diversity of views on this critical issue. Findings suggest that efforts to enhance public engagement with climate change must be multifaceted and tailored to address the specific contexts and underlying beliefs of different groups. However, methodological limitations very significantly hamper our ability to draw causal inferences about how climate change attitudes form and evolve. The following conclusions and recommendations are made;

- **Need for more rigorous research**: Current research on climate change attitudes is extensive but a significant proportion lacks rigor. Priority should be given to funding and supporting well-designed, longitudinal studies that use psychometrically validated measures to provide more reliable data on climate change attitudes. Research should be extended beyond adult populations to children and adolescents.

- **High Belief Levels**: There are high beliefs in climate change across Europe. However, the findings are less strong for belief in humans as the cause for climate change and concern and support for climate change policies.

- **Demographic Differences**: Differences in climate change attitudes emerge across different demographic groups. The gender effect is the most consistent – women show higher levels of belief and concern about climate change. Younger people may also show higher levels of belief; however, these findings were less clear.

- **Microsystem Influences and Intolerance to Others:** Attitudes towards climate change are influenced by immediate social influences – peers, family. Policies should

promote social- and community-based initiatives to combat climate change scepticism. For example, familial and peer influence should be considered to ensure public engagement.

- **Political Beliefs and Social Dominance Orientation**: Climate change scepticism is associated with right-wing ideologies, populism, and social dominance orientation. Policy-makers should be cautious of increased right-right and populist sentiment in the Irish and European context and consider what this might mean for the possibility of increasing climate change scepticism in Ireland.

- **The Bidirectional Nature of Influence**: The bioecological framework argues for the bidirectional nature of social ecological systems. Therefore, policy and climate literacy campaigns should consider how social contexts shape the individual but also how the individual shapes social contexts.

- **Media Literacy**: Media has the potential to widen belief gaps about climate change through political ideology. Given increased mis- and dis-information, particularly far-right content, policy makers should support media literacy programs and regulate the spread of misinformation to ensure accurate and science-based climate change information.

- **Tailored Communication Strategies:** Climate change communication should be tailored to the individual's belief in human-caused climate change - using scientific evidence and improving scientific literacy may only be effective for left-leaning people, whereas the use of non-experts in climate change communications may be more effective with climate sceptics. Policy initiatives should also consider gender-

and age-specific communication strategies to enhance the effectiveness of climate change messaging.

- **Addressing Attitude-Behaviour Gap**: These findings illustrate the factors associated with climate change attitudes. However, policies should also be cognisant of the need to bridge the gap between climate change attitudes and behaviours. This can be achieved through addressing feelings of helplessness; enabling active public involvement in policy; and understanding the role of familiarity and habit in individual decision-making.

- **Comprehensive and Inclusive Research**: Future research should be comprehensive, involving longitudinal studies and participatory methodologies. Engaging the public and stakeholders in research design, implementation, and dissemination will ensure more relevant and impactful findings.

By addressing these points, policy makers can develop more effective strategies to influence climate change attitudes and behaviours, ultimately contributing to more robust climate action and policy implementation.

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