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## How do young people engage with climate change? The role of knowledge, values, message framing and trusted communicators

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### Abstract

Despite several decades of research on more effectively communicating climate change to the general public, there is only a limited amount of knowledge about how young people engage with an issue that will shape and define their generation. We provide a thorough review of international studies in this area, drawing on survey data and qualitative research. The review is organised into two main sections. The first briefly situates young people's engagement with climate change relative to other concerns and examines levels of awareness, concern and 'scepticism' among this age group. The second focuses on four key determinants of effective climate change communication and assess whether young people differ in any appreciable way from research findings relating to the general population. The four factors are the role of values and worldviews in determining climate change views; the efficacy of 'information-based' interventions; the 'psychological distance' of climate change and message framing; and the role of trusted messengers. In the concluding section we discuss the implications for engaging young people more effectively and explore possibilities for future research.

### Introduction

Young people are in a unique position as they face the reality of a changing climate. National and international legislation for mitigating climate change typically operates on decadal timescales, with many targets for decarbonisation focusing on the 2020–2050 time period<sup>1</sup>. As the generation whose adult lives will overlap most closely with this policy window, they are potentially best-placed to define the long-term societal response to climate change. Yet they are also the most vulnerable to the legacy of decisions made by older generations. Although young people arguably have the most to gain *and* the most to lose in a changing climate, their voices are not prominent in the political, media or cultural discourse on climate change<sup>2</sup> and (as the

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evidence presented in this review shows) engagement with climate change among this important demographic group is in many ways limited.

While some studies have captured young people's views about climate change, there is very little existing research exploring ways in which this population could be more effectively engaged. There is, however, a much larger literature on environmental psychology that dates back to the 1960s and, more recently, environmental education theory, both of which provide valuable and relevant insights. While we situate the current review within this broader literature and draw from it on occasion, the focus is on evidence directly related to climate change and how 12–25 year olds engage with this issue *specifically*. We define 'young people' using this broad age category for two reasons. Firstly, there is no universally agreed definition of 'youth', and studies in this review that have described their sample using terms such as 'young adults' or 'young people' exhibit substantial variation in the mean age (and range) of the sample investigated. Secondly, as the literature focusing directly on how young people engage with climate change is still relatively limited, excluding studies on the basis of a narrower definition of the target group seemed unwarranted.

We report a thorough review of international studies (including some published in German), although European, Australian and US research dominates the literature. We draw on survey data and qualitative research, and the review is organised into two major sections. The first briefly situates young people's engagement with climate change relative to other concerns (such as the economy) and asks how politically engaged young people are in general. It also examines levels of awareness, concern and 'scepticism' about climate change among the target age group and considers levels of knowledge about the underlying science, causes and impacts of climate change. In the second section, we consider four key determinants of effective climate change communication and assess whether young people differ in any appreciable way from research findings on the general population. The four factors are the role of values and worldviews in determining climate change views; the efficacy of 'information-based' interventions; the 'psychological distance' of climate change and message framing; and the role of trusted messengers. In the conclusion we summarise the key messages from the literature review, discuss the implications for engaging young people more effectively and explore possibilities for future research.

## **Public perceptions of climate change: are young people different?**

### ***Climate change in context***

In a recent review of international trends in public attitudes towards climate change over the past 25 years, Capstick et al.<sup>3</sup> identified a number of key themes. After a period of rising concern in many Western nations between the late 1980s and the mid 2000s, polls show a sharp decline in concern about climate change in countries such as the UK, the US and Australia. By contrast, in regions such as sub-Saharan Africa, much of mainland Europe, and South America, concern about climate change has been on the increase in recent years. However, climate change is typically relegated in the public mind behind issues such as the economy, health or education. Recent polls demonstrate that concerns over unemployment, inflation and government debt continue to dominate public concern in Europe and the United States<sup>4,5</sup>.

The situation for young people is no different. Research from the UK and Australia indicates that concerns about the economy, employment opportunities and access to affordable education trump worries about issues like climate change for the 15–26 age range<sup>6, 7, 8, 9</sup>. The post-2008 global economic downturn appears to have resulted in a re-prioritisation of economic concerns for many people; a particularly pronounced trend for young adults as they seek employment and to establish careers<sup>10</sup>. This is the background against which initiatives to engage young people on climate change must be viewed: there are many competing priorities for this age group's attention, as well as concerns and worries that are, in many ways, more immediate than climate change.

One particular challenge is the level and extent of political engagement among young people. There is a large body of literature examining the reasons behind the steep decline in civic engagement and de-alignment from political parties: this is a trend particularly pronounced among young adults, with a low percentage of young people (under 40% in some studies) reporting an interest in politics<sup>11,12, 13</sup>. However, it would be inaccurate to say that young people are simply apathetic: there is widespread scepticism about formal political parties, distrust in political figures and a general sense of alienation from mainstream politics<sup>6</sup>. International data suggest that young people are in fact more likely to engage in 'cause-oriented' politics or 'micro-politics'<sup>6, 12</sup>.

### **Attitudes to climate change**

Typically, surveys show young Europeans exhibit relatively high levels of reported interest and concern about climate change, either comparable to or above those of older respondents<sup>14</sup>. This is particularly pronounced in Germany, Austria and Switzerland with some studies reporting 76% of respondents perceiving climate change to be a *very* or *fairly big* problem<sup>15,16,17,18</sup>, and to a lesser extent the UK<sup>19,20</sup>. Studies of young people in India<sup>21</sup>, Oman<sup>22</sup>, and the US<sup>23</sup> also show elevated levels of concern relative to older age groups.

There is a significant degree of recognition among young Britons that climate change is happening 'now'<sup>19,24</sup>, although UK data and Australian research suggest that young people still view climate change as primarily affecting 'far away' places<sup>20,25</sup> reflecting a consistent trend among people of all ages towards psychological distancing<sup>26</sup>. In a nationally representative poll, American 18–35 year olds were found to be the most likely of all age groups surveyed to discount the harmful effects of climate change, with only 21% believing that people are currently experiencing any harm<sup>27</sup>.

In contrast to quantitative European survey data (including UK polls), qualitative research from the UK has suggested a lack of concern about climate change among 16–24 year olds, who reported feelings of disempowerment and inaction in relation to climate change<sup>7</sup>. The lack of low-carbon infrastructure, poor quality media coverage and an absence of shared values and practices to encourage sustainable lifestyles were cited as reasons for disengagement. In addition, nationally representative US survey data<sup>27</sup> found that only 10% of 18–34 year olds had thought about climate change a lot, only 9% felt very worried and 22% reported never having thought of global warming previously. However, a smaller subset of 18–22 year olds registered slightly higher levels of concern and perceived personal relevance than 23–34 year olds (possibly reflecting greater media attention and lower scientific uncertainty about the issue during their lifetimes).

A significant amount of research on young people and climate change has been conducted in Australia. A strong theme running through much of the Australian literature is a sense of foreboding and anxiety among young people about a future that cannot easily be predicted or controlled. The environment and climate change feature as a major cause for concern and in some cases are associated with feelings of anxiety, stress and despair<sup>6,9,28</sup>. Swedish research has explicitly recognised climate change as a ‘stressor’, with particular implications for the psychological well-being of children as young as 12<sup>29</sup>. A nationally representative US survey found similar emotions expressed by adult respondents when asked to think about global warming, including worry (50%), helplessness (45%), anger (44%), sadness (43%) fear (36%) and depression (26%)<sup>30</sup>.

Among the general population, women consistently exhibit higher levels of concern than men, a trend reflected in US<sup>31</sup>, Australian<sup>28</sup> and German<sup>32</sup> studies of adolescents. Another consistent finding in surveys of public opinion on climate change is that governments are seen as primarily responsible for taking action and exhibiting leadership on this issue; this is part of what has been termed the ‘governance trap’ of climate change between the public and politicians<sup>33</sup>, whereby governments claim that they would be more ambitious on climate change *if* they had the electoral mandate, while the electorate looks to the government for leadership. As per wider sampled age groups, Britons aged 18–24 select ‘national governments’ first in their choice of who is ‘most responsible for tackling climate change’<sup>20</sup>. About two thirds of Germans and Austrians aged between 12 and 25 attributed high levels of responsibility for climate change to industry and ‘big corporations’, politicians and ‘the rich’, with widespread agreement that ‘rich industrialised nations are primarily responsible for climate change’<sup>15, 17, 34</sup>.

Compared to older age groups, young people appear to be somewhat less fatalistic about combating climate change, with polls showing that the majority perceives climate change to be a serious but ‘solvable’ problem<sup>35,18</sup>. For example, 69% of young Germans in one poll opposed the statement ‘it is already too late, nothing can be done against climate change’<sup>17</sup>, while over half of 18–34 year olds in the US believe humans can reduce global warming, roughly 10% more than older age groups<sup>27</sup>. This tendency towards lower levels of fatalism may be related to the way that young people perceive the immediacy of climate threats: in the same US study, young Americans were less likely than older adults to believe that climate change was *already* harming people in the US and across the world<sup>27</sup>. One study of young people in Sweden<sup>36</sup> found that ‘constructive’ hope in the face of climate change (but not denial of the problem altogether) was positively associated with pro-environmental behavior. We return to the relationship between distancing, coping strategies, emotion and self-efficacy later in the paper.

### **Knowledge about climate change**

In terms of knowledge about climate change, it has been suggested that the current generation of 18–25 year olds is likely to be the best informed of any in history<sup>25</sup>, but polls and qualitative research paint a mixed picture. Young people in Germany and Austria show relatively high levels of knowledge about the causes and effects of climate change, particularly the socio-economic factors<sup>37,34,17,15</sup>. However, as in the general population, there remains much uncertainty around basic underlying scientific concepts among young people, for example confusing damage to the ozone layer with climate change<sup>38,34</sup> or making inaccurate causal links between short-term weather and long-term climate change<sup>39</sup>. Unclear distinctions made by

school pupils in Turkey, Greece, Iran and the USA between the causes and effects of climate change were found to produce confusions between mitigation and adaptation measures<sup>40,41,42,43</sup>.

Studies in Australia found limited conceptual and even worse factual knowledge about environmental issues among high school students<sup>28,44</sup>, although, of the concepts tested, the greenhouse effect was among the better known and understood<sup>28</sup>. The majority of UK surveys indicate lower levels of knowledge, either comparable or below that found in other age groups<sup>20,7</sup>. When asked how many degrees global temperatures need to rise for climate change to become dangerous only 7% of 18–34 year olds in one survey chose the ‘correct’ answer of 2°C, compared to 9% of the British public<sup>45</sup>. While aware of climate change and broadly able to define the term, 16–26 year olds in a qualitative UK study showed an uneven knowledge of key events and concepts<sup>7</sup>. In a survey of young people in six nations, awareness of the term ‘carbon footprint’ was found to be high in the US, UK and South Africa, but with the majority of respondents reporting that they didn’t fully understand what it meant. Awareness was considerably lower in South Korea and Brazil<sup>46</sup>.

Even given these low levels of carbon literacy, climate scepticism is less likely to be found among younger age groups, who show a greater acceptance of the scientific consensus on anthropogenic climate change<sup>27,7</sup>. Research from Germany and Austria found high levels of agreement on the anthropogenic nature of climate change in age groups ranging from 10 to 25, in some cases as high as 80%<sup>17</sup>. Despite higher levels of acceptance of climate change, young people still tend to underestimate the level of scientific consensus on climate change<sup>47,25</sup>, although this disparity appears to be less than in the general population<sup>45,48</sup>. This underlines the consistent finding among older adult populations that there is not a straightforward relationship between knowledge and concern about climate change. Instead (as we explore in the next section), beliefs about climate change tend to be grounded in political views with a consistent relationship between ‘conservatism’ and scepticism about climate change<sup>49</sup>, values<sup>50</sup> and ‘worldviews’ (preferences for how society should be structured)<sup>51</sup>.

In this section we have summarised the key findings from studies of young peoples’ perceptions of climate change. In the next section, we move on to consider the challenge of communicating about climate change more effectively with this important demographic. We focus on four key determinants of engagement with climate change and indicate (where there is youth-specific evidence available) how young people differ from older cohorts.

## **Communicating climate change: are young people different?**

### ***The role of values and worldviews***

The ideological divide over anthropogenic climate change between Democrats and Republicans in the US is a consistent finding in public perceptions research. Typically, being politically of the ‘left’ is associated with higher levels of concern about climate change, while those on the ‘right’ are more skeptical about the reality and seriousness of the problem<sup>52</sup>. This pattern is replicated among 18–34 year olds<sup>27</sup>, and research investigating how political ‘worldviews’ and knowledge about climate change influenced risk perceptions among adolescents in the US found that young people with ‘individualist’ and ‘hierarchical’ worldviews were more likely to be sceptical about climate change<sup>31</sup>. Interestingly, though, this ideology-based polarisation in climate change beliefs was substantially reduced for those participants with higher levels of climate science

knowledge. The authors proposed that while worldviews are well entrenched among adult populations, during teenage years they are still forming and this ‘plasticity’ may explain why climate change knowledge mitigates worldview-based scepticism among young people.

There is a robust body of evidence documenting the relationship between the values that people hold and their views about climate change<sup>50</sup>. ‘Self-transcendent’ values (such as altruism and concern for the welfare of others) are associated with positive engagement with climate change, while ‘self-enhancing’ values (like wealth, status and power) are generally not. Analyses of data from multiple European nations suggest that self-transcendent values are consistently rated as more important by members of the public than self-enhancing ones<sup>53</sup>. Several recent studies have pointed to the effectiveness of framing messages about climate change using ‘self-transcending’ values, and the potential for increasing positive ‘spillover’ between pro-environmental attitudes (or behaviours) based on this strategy<sup>54</sup>.

Openness to change and a willingness to think deeply about issues have been linked to positive engagement with climate change among school students<sup>55</sup>. However, studies from several different countries suggest that young people lack ‘post-materialistic’ values and therefore tend to put self-enhancing principles like comfort, ease and luxury above other more self-transcendent concerns when considering pro-environmental behaviour choices<sup>56,57</sup>. In a qualitative UK study, young people identified self-image, self-identity and social recognition as key values linked to high-carbon behaviours such as personal car use<sup>58</sup>. With only limited evidence on how their values interact with the issue of climate change, though, it remains unclear whether younger age groups possess distinct value-orientations and how these might influence communication around the issue.

### ***The efficacy of information-based interventions***

It has long been recognised in studies of the general population that merely presenting the scientific evidence for climate change is insufficient to increase engagement or overcome scepticism<sup>59</sup>. There is some evidence from Finland and the US that education about climate change tends to increase young people’s engagement with the issue<sup>60,61,31</sup>. However, while many educational campaigns are broader in scope than simply conveying facts and figures, most studies suggest (as is the case in the general population) that being informed about climate change is not, on its own, sufficient to engage young people, much less galvanize behavioural changes<sup>62,63,64,65</sup>. In fact, research from several different countries indicates that young people tend to engage in minimal inconvenience, individual, pro-environmental behaviours, such as switching the lights off or recycling<sup>60,21,62,15,34,67</sup>, even when they know that more inconvenient behavioural changes (taking public transport or giving up meat) or collective, political actions (attending a demonstration) are likely to be more effective<sup>22,57,67,40,68,69</sup>.

While information-based interventions alone are unlikely to engage young people effectively, there has been significant interest among scholars and practitioners in the potential of ‘edutainment’ programmes that seek to make scientific issues engaging by placing them in an informal and entertaining context<sup>70,71</sup>, which we explore in the next section on overcoming ‘psychological distance’.

### ***Psychological distance and message-framing***

One key consideration for effective communication is the widely documented ‘psychological distance’ between climate change and the public<sup>26</sup>, which (as discussed earlier in the paper),

may be particularly pronounced for young people. Typically, people living in countries in the northern hemisphere are yet to physically experience the more extreme impacts of climate change and even when climate-related impacts are ‘encountered’, they may not lead directly to greater concern about climate change<sup>72</sup>. In response, some research has focused on framing messages around the ‘co-benefits’ tackling climate change may bring, typically around improvements in public health or by addressing energy security<sup>73</sup>. These findings are consistent with other work showing that a ‘gain’ frame (emphasising the benefits of action, rather than the negative consequences of not acting) produces more positive attitudes towards taking action on climate change<sup>74</sup>. Reflecting this, recent practitioner debates in the UK and US have focused on ways of making climate change more salient by demonstrating the ways in which climate change will affect the ‘things people love’<sup>75</sup>, with one recent UK qualitative study (see Box 1) finding support among 18–25 year olds for this principle<sup>76</sup>.

Strategies to reduce the psychological distance of climate change are likely to be as important for younger age groups as they are in the general population, although there is very little direct evidence regarding the impact of differentially ‘framed’ messages on young people. However, it is also possible that distancing is part of a (constructive) process of ‘meaning-focused coping’<sup>77</sup>, whereby positive emotions are marshalled in order to provide strength in times of difficulty, or in the face of serious threats. The relationship between different types of affect, the function served by psychological distancing, and coping strategies employed by young people in the face of climate change is an important question for further research<sup>78,79,80</sup>.

### **Box 1: Young Voices on climate change**

COIN’s Young Voices report was released in October 2014<sup>76</sup>. It was one of the first attempts to involve young people directly in a conversation about more effectively engaging them on climate change. In a series of qualitative discussion groups (termed ‘narrative workshops’) with 36 young adults in the UK, participants’ views on climate change and climate policies were explored. Four climate change ‘narratives’ (short pieces of written text using different language styles to describe climate change and potential policies) were then evaluated. Based on participants’ responses to these materials, a number of recommendations were made for more effective engagement with this audience. These included:

**Here and now:** young people respond positively to messages that frame climate change as a contemporary concern requiring an immediate response.

**Everyday concerns:** young people are receptive to the idea of protecting the ‘things they love’ from climate change, but these need to be identified through research, not assumed.

**Speak plainly:** jargon such as ‘managing climate risks’ and concepts such as the ‘2 degrees limit’ can be unfamiliar and disengaging.

**Focus on the ‘social’ as well as the ‘scientific’ consensus:** the idea of a ‘97% scientific consensus’ was viewed by some as a compelling and persuasive statistic, but finding ways to communicate the ‘social consensus’ around tackling climate change is likely to be important too.

**Trusted messengers:** peer networks and social media are important sources of information on climate change for young people. Generally speaking, they are suspicious of the mainstream media (with the exception of the BBC), big businesses and politicians.

One relevant factor that is known to play a central role in how young people engage with climate change is perceived self-efficacy. Research from several different countries indicates that this is a key determinant of pro-environmental engagement and behaviour change among children and young people, particularly in relation to large-scale environmental problems like climate change<sup>81,82, 83,84,85</sup>. Feelings of powerlessness in the face of global climate change, and the sense that personal actions won't make a difference have been reported in several youth studies<sup>29,28,34</sup>.

Recommendations for enhancing perceived self-efficacy among young people include the use of positive and relevant narratives and frames in the media<sup>7</sup>, schools<sup>29</sup> and campaigns<sup>75</sup> and guidance on individual and collective action to accompany information on the causes and impacts of climate change<sup>87,67</sup>. Positive experiences in nature and 'key outdoor moments' in childhood and adolescence have been linked to pro-environmental attitudes and behaviour in later life<sup>88,81,87</sup>.

A substantial amount of international research also demonstrates that children and young people are more likely to understand, care and act on climate change if they can engage with it directly and experientially, through some form of educational, outreach or social activity<sup>82,89,90,85,91,92</sup>. A US study found that high school students benefited from a series of 'edutainment' assemblies on climate change in terms of improved scientific knowledge and pro-environmental attitudes and behaviours, in addition to more frequent 'interpersonal discussion with parents and friends'<sup>71</sup>. However, the context in which new beliefs and behaviours are acquired and then subsequently reinforced is important. British and Australian studies have suggested that climate literacy programmes and pro-environmental education are most effective when young people can embed their learning in their daily social practice (that is, when there are regular opportunities to 'practice' new behaviours, where the social environment is supportive of this, and where positive social norms in terms of their peers' behaviours are visible.<sup>85,65</sup>

### ***The role of trusted messengers***

Among the general population, scientists continue to be perceived as highly trusted messengers on climate change<sup>33</sup>, and although there is an expectation that government should lead on climate change, there is generally very low trust in politicians. These trends are largely reflected in youth-specific studies. American 18–35 year olds were found to be more trusting of scientists (82% of those surveyed in a nationally representative poll), President Barack Obama and Al Gore than older age groups, with least trust in the former Alaskan Governor Sarah Palin, a well-known Republican climate sceptic<sup>27</sup>.

Peer-to-peer interaction and communication around climate change is particularly effective for engaging younger age groups<sup>82,93</sup>. For example, UK students sharing their experiences of a climate campaign (particularly via social media) proved a better recruitment tool than informational advocacy<sup>91</sup>. Unsurprisingly, some of the best-known youth-focused climate change organisations are either entirely youth-driven<sup>94</sup> or encourage youth participation<sup>95</sup>. By contrast, activities seen as designed by large or corporate organisations are less likely to either meaningfully resonate with young adults or maintain a long-term hold<sup>96</sup>.



## Box 2: Practical initiatives to engage young people

Many practical initiatives have focused on visual media as a tool for engaging young people. Connect4Climate has run two short filmmaking competitions for the under 35s, asking young directors to tell their stories of climate impacts, solutions and actions<sup>95</sup>. In 2014, The Climate Reality Project called for young climate activists to upload their videos addressing the UN Climate Summit<sup>97</sup>. Music has also been utilised as a tool for engaging younger generations in environmental issues. For example, the Hip Hop Caucus in the U.S. works to engage young urban Americans with environmental and social justice by linking their cultural expression with their political experience<sup>98</sup>. Two climate change games – Climate Challenge<sup>99</sup> in 2007 and Fate of the World<sup>100</sup> in 2010 – have been played by over a million people. By creating a role-play platform for engagement, and combining it with real life information, the games are seen as a way of empowering young adults in climate-related decision-making processes.

Besides youth-driven communications, teachers and lecturers rank highly in the list of messengers successfully facilitating climate awareness among young people<sup>88,15</sup>. Researchers in Australia have suggested broadening the scope of environmental and climate related education to introduce a more inter-disciplinary approach that includes the economics and politics of climate change as well as negotiation, analytical and scientific skills<sup>43,44,38,9</sup>. There have also been calls for a more localised, solutions-based approach in schools, focusing on impacts that young people can relate to their own lives combined with positive messaging around alternative visions and the capacity of humans to adapt<sup>42,9,28</sup>.

Unsurprisingly, a host of studies from several different countries conclude that parents have a strong influence on their children's attitudes and behaviour towards the environment and climate change<sup>88,87,101,102,84</sup>. Encouraging greater intergenerational dialogue and involving parents (and other social groups) directly in climate education have both been identified as ways of facilitating the positive influence of parents on their offspring's climate-relevant beliefs and behaviours<sup>44,9</sup>.

Celebrities play a prominent role in many youth-focused advocacy campaigns, but their impact on public engagement is unclear, with some research cautioning that young people who follow celebrity culture are 'the least likely to be politically engaged'<sup>103</sup>. While the intersection of environmentalism and celebrity has been the subject of some academic critique<sup>104,105</sup>, the efficacy of celebrities as climate change messengers specifically has not been well researched. However, the limited amount of existing evidence suggests that the perceived popularity, credibility and trustworthiness of a celebrity need to be considered carefully before involving them in climate campaigns<sup>106</sup>. In one British study of 16–26 year olds, some participants felt that celebrity involvement was a good way to raise the issue's profile but a greater number felt it was inappropriate due to their questionable legitimacy in terms of high carbon lifestyles and relevant expertise<sup>7</sup>. Other studies have argued that the notion of 'eco-celebrity' (i.e. values-driven engagement with environmental issues, perceived as being central to the celebrity's public persona), can be very effective at mobilizing young people in pro-environmental discourses and advocacy, including 'fans' of the celebrity making environmental-based connections with each other<sup>107</sup>.

This is particularly the case if 'eco-celebrities' can tap into the collectivism of the social media generation via platforms such as Twitter<sup>107</sup>. However, while social media has clearly

transformed the way in which informal communication about a whole range of issues occurs, there is currently very limited research on the role of social media in climate change engagement. One recent study<sup>108</sup> focused on the way in which Twitter users responded to the release of the most recent Intergovernmental Panel on Climate Change (IPCC) report. For the most part, individuals tended to engage with others who shared their views, with only limited evidence of cooperative engagement among people with conflicting or contrasting opinions. While there is certainly potential, therefore, for social media to transcend some of the challenges associated with more traditional media, issues such as attitude polarisation may continue to pose barriers to public engagement on climate change, whatever the mode of communication.

### **Discussion & conclusion: how do young people engage with climate change?**

Many of the trends that characterise adult populations' views about climate change are reflected in young people's views. For example, there are generally high levels of climate change concern among the young (in some cases higher than in older age groups), but it is rarely the top priority among younger people or the general population. There are competing priorities for this age group's attention as well as concerns and worries that are, in a sense, more immediate and important than climate change. This is the context against which initiatives to engage young people on climate change must be viewed.

There is a fairly low level of knowledge about the basic scientific concepts that underpin climate change among young people, and a tendency to underestimate the level of scientific consensus on climate change. However, this seems less prominent than among the general population, and importantly, levels of scepticism about the reality of climate change seem to be lower among younger people.

Compared to older age groups, young people in Europe appear to be less fatalistic about combating climate change, possibly reflecting a strategy of 'meaning-focused coping' that permits the magnitude of the climate threat to be manageable<sup>78</sup>. But negative affect is still a central theme of young people's views about climate change (as it is in older populations), with feelings of anxiety, stress and despair reported in several studies of Australian young adults. Young people tend to see governments as having the greatest responsibility for catalysing a response to climate change, but express low levels of trust in them. There is also a great deal of dissatisfaction with the political process, and a low level of voting among the young in many countries across the world, which is an obvious barrier to engaging with climate policies. For these and other reasons, there appears to be a lack of perceived self-efficacy among younger people with regards to climate change. Young people do not necessarily see what they can do in response to climate change, and when perceived self-efficacy is limited, personal engagement with climate change is likely to be lower.

In terms of engaging young people more effectively, there are some tentative lessons that can be drawn from the existing literature. Firstly – as for older populations – providing accurate information (either about the science of climate change or behavioural/policy responses) is insufficient for effective engagement. Instead, messages should be presented in a way that speaks to the interests and values of young people – perhaps using 'edutainment' programmes<sup>71</sup> or by focusing on the issues young people are passionate about that may be

affected by climate change<sup>75</sup>. Importantly, young people's interests should not be assumed but instead established through elicitation exercises with this audience.

As well as better understanding the recipients of climate change messages, paying careful attention to the messengers is also crucial. Our review has identified parents, teachers, peers and scientists as well-trusted messengers for climate change messages. Building young people's sense of self-efficacy would also appear to be important: this variable has been identified in several studies as a barrier to behavioural engagement. In terms of encouraging behavioural change, it is the 'experiential' that seems to matter the most: topics and media driven by young people themselves, preferably facilitated through a peer-to-peer approach, have been found to promote sustainable behaviour. Group activities, and peer-led programmes may prove more successful in encouraging long-term modification of environmental behaviour than information campaigns.

Of these potential messengers, young people themselves would appear to offer significant promise, also raising the possibility of promoting positive social norms among this age group around climate change engagement. Negative social norms associated with pro-environmental behaviours have been identified as a challenge for communicating with this audience<sup>58</sup> and if pro-environmental behaviours conflict with other priorities (e.g., leisure activities), they are likely to be avoided. In particular, energy-saving or conservation behaviours that are 'inconvenient' or 'uncool' are unlikely to appeal to young people. Finally, there would appear to be limited interest among young people in challenging the arguments and positions of organised sceptic groups<sup>76</sup>. It may therefore be more effective to focus on the merits of different climate policy solutions (framed using tangible benefits to health, for example), than the credibility of the underlying science as a means of engagement.

There are still some major gaps in terms of understanding how to engage young people on climate change – including significant discrepancies in the level of understanding about young people and climate change in different nations, with a strong bias towards European, Australian and US data. Building a richer understanding of international youth perspectives on climate change should be an important priority for future research. Although the literature on how the general population engages with this climate change has proliferated, there are many areas where no direct evidence in relation to young people is yet available. For example, while the challenges of communicating risk and uncertainty<sup>109</sup> and the pitfalls of using fear, guilt or 'alarmism' to attract public attention<sup>110</sup> have been explored, there is limited guidance for young people specifically (although there is evidence that guilt-based messaging on climate change risks 'disengaging, desensitizing and even antagonising young people' in the UK<sup>7</sup>). Worry and fear may not in themselves be barriers to engaging with climate change, but they must be counter-balanced by constructive emotions such as hopefulness if engagement with climate change is to be maintained<sup>36</sup>.

It may be that young people are no different to older populations in many regards – and certainly, there is evidence in this review that this is largely the case in some key respects. Plus, it should be acknowledged that many psychological studies are conducted using undergraduate populations (i.e., aged 18–22), but are neither labeled nor analysed as studies of 'young people'. But future research should seek to more closely investigate any discrepancies between younger and older cohorts of the public in terms of climate change engagement – in particular to compare and evaluate the sorts of messages, language and narratives that are likely to resonate with young people. If carefully designed, this kind of 'action research' (whereby

communication strategies are explored and improved at the same time) can help to ensure that when the young people of today assume decision-making positions in sectors across society, the evidence-base for engaging them on climate change is much stronger than it is today.

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