

In science we trust? Public trust in Intergovernmental Panel on Climate Change projections and accepting anthropogenic climate change

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Abstract

One barrier to action on climate change is public trust in climate science, and projections made by climate scientists. However, climate science projections are rarely measured in public surveys. We designed survey questions based on two Intergovernmental Panel on Climate Change projections regarding global warming and coral reef decline. We gauge Australians' trust in Intergovernmental Panel on Climate Change projections, and explore how trust in climate science is associated with accepting anthropogenic climate change. A slim majority of Australian adults trust Intergovernmental Panel on Climate Change projections, with trust correlated positively with accepting anthropogenic climate change. While partisan divisions are extant in accepting anthropogenic climate change, partisan influences are attenuated substantially after controlling for trust in Intergovernmental Panel on Climate Change projections, as trust in climate science mediates the influence of partisanship on the acceptance of anthropogenic climate change. A minority of those who accept anthropogenic climate change have low trust in Intergovernmental Panel on Climate Change projections, viewing scientists' computer models as unreliable, or believing climate scientists benefit from overstating the impact of climate change.

Keywords

Australia, climate change, IPCC, trust in science

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I. Introduction

The fossil fuel industry contributes substantially to CO₂ emissions, and the link between CO₂ emissions and anthropogenic climate change (ACC) is established (Anderegg et al., 2010; Cook et al., 2013, 2016; Doran and Zimmerman, 2009; Oreskes, 2004; Powell, 2015). The United Nations Intergovernmental Panel on Climate Change (IPCC, 2018) finds that an energy transition from reliance upon fossil fuels to renewable energy sources is required to meet the Paris Agreement target of limiting global warming to 1.5° or less above pre-industrial levels (IPCC, 2018). However, while there is near consensus among peer reviewed climate scientists over the veracity of human caused global warming, public acceptance of ACC in advanced democracies such as the United States and Australia is far lower (e.g. see Hornsey and Fielding, 2017; McCright and Dunlap, 2011a, 2011b; Tranter, 2011, 2020; Tranter and Booth, 2015).

Some argue that problematic science communication stands as a barrier to public acceptance of ACC (Besley and Nisbet, 2013; Hall Jamieson, 2017; Painter and Shafer, 2018). They argue that if laypeople were better informed about the consensus among scientists over ACC, public opinion would shift and climate mitigation strategies would be enacted (Kahan et al., 2017). Addressing the knowledge deficit and/or ‘scientific literacy’ still dominates scientists’ communication goals (Peters and Dunwoody, 2016). However, sender–receiver models of climate communication have been dismissed as simplistic (Lester and Foxwell-Norton, 2020; Simis et al., 2016). As Lester and Foxwell-Norton (2020: 270) claim, such models are

underpinned by a desire for a clear channel of communication that protects the message on its route from sender to receiver . . . [I]t epitomises frustrated attempts to eliminate ‘noise’ – that is, to control the ‘message’ on a path to the public or policy and decision-makers.

Public understandings of science cannot be divorced from social processes. Indeed, political party affiliations and political ideology are important barriers to attitudes and behaviour on climate change, particularly in the United States (e.g. Hamilton, 2016; Hamilton et al., 2015b; Jacques et al., 2008; McCright and Dunlap, 2011a, 2011b; Wood and Vedlitz, 2007) and Australia (Fielding et al., 2012; Tranter, 2011, 2013; Tranter and Booth, 2015). Political affiliations also reflect world-views and value orientations, with those holding ‘individualistic’ values more reluctant than ‘collectivists’ to accept that climate change has anthropogenic causes (Kahan et al., 2012). Political allegiances also mediate how knowledge of climate change is associated with acceptance of ACC (e.g. Hamilton, 2015; Tranter, 2020, 2021).

However, of particular interest here is a concept that has been studied in relation to accepting ACC – trust in science and scientists (e.g. Gauchat, 2012, 2018; Hmielowski et al., 2014; Leiserowitz, et al., 2012). Hmielowski et al. (2014: 869) claim public trust in scientists mediates acceptance of global warming. They argue that ‘in the USA, the media sources preferred by liberals and conservatives play a role in shaping their respective levels of trust toward scientists’ while ‘different media outlets help to cue audiences as to whether a particular institution or set of institutional actors, such as scientists, share a person’s values and are thus trustworthy’ (Hmielowski et al. 2014: 869). The more trust citizens place in climate scientists and in science more broadly, the more likely they are to accept that climate change has human causes (Leiserowitz et al., 2012; Tranter and Lester, 2015). We examine whether trust in science mediates the influence of political party identification on accepting ACC in Australia.

However, some studies of trust in science and scientific institutions use measurement items that are conceptually imprecise, potentially giving rise to validity issues. For example, Gauchat (2012) draws upon survey items from the General Social Survey to measure trust in science in the United States, based upon the question

I am going to name some institutions in this country. As far as the people running these institutions are concerned, would you say you have a great deal of confidence, only some confidence, or hardly any confidence at all in them [the Scientific Community]?

While the General Social Survey (GSS) question enables researchers to examine change over time, it is unclear who the ‘people running these institutions’ are. Are they a scientific elite, directors of scientific research centres, university administrators, lead scientists? The question is conceptually imprecise.

A recent study by Mann and Schleifer (2020) uses the same question, along with another from the GSS:

People have frequently noted that scientific research has produced benefits and harmful results. Would you say that, on balance, the benefits of scientific research have outweighed the harmful results, or have the harmful results of scientific research been greater than its benefits?

The latter question refers to a very broad concept, ‘scientific research’, but what sort of scientific research? For example, we suspect public trust in the science underlying COVID-19 vaccinations, would vary considerably to trust in science relating to cancer drugs.

Other researchers, such as Van Eck et al. (2020: 7) and Hamilton et al. (2015a), employ more specific measures, asking how much respondents ‘trust scientists as a source of information about climate change’. Hmielowski et al. (2014) use a similar measure, although they refer to ‘global warming’ rather than ‘climate change’. While data collected from such questions are undoubtedly useful, our aim was to develop more specific measures of trust in ‘climate science’.

‘Climate science’ is undertaken by scientists with expertise in different scientific fields, from physicists and biogeochemists to oceanographers and meteorologists. The lay public may or may not be aware of this scientific diversity, and the trust placed in ‘climate science’ may vary considerably across different scientific fields. We therefore decided to measure trust in climate science by operationalising two specific IPCC projections. The projected rise in global mean temperature will negatively impact people around the world, according to the IPCC (2018). IPCC climate change projections are also frequently reported by mass and other media. We explore public trust for IPCC projections regarding global temperature rise. We also consider a more Australia-specific measure, an IPCC projection relating to coral reef decline. The latter is geographically and metaphorically ‘close to home’ for Australians. The Great Barrier Reef, located off the coast of Queensland, is the largest coral reef system in the world. The Great Barrier Reef is also World Heritage listed and one of the ‘seven natural wonders of the world’ (UNESCO World Heritage Convention, n.d.). Using these two measures, we demonstrate how trust in specific IPCC projections is associated strongly with acceptance of ACC. We also show that trust in climate science appears to be more important than social background or political party allegiance for accepting ACC.

2. Trust and climate change

Seligman (1997: 171) suggests trust is an ‘an unconditional principle of generalised exchange unique to modern forms of social organization’; that Fukuyama (1995), claims is manifest through shared norms and cooperative behaviour within the community.¹ For Inglehart (1997: 166), social trust is ‘crucial to the survival of democracy’. Lorenzoni and Pidgeon (2006: 85) also highlight the importance of institutional trust, arguing trust ‘in institutional performance is another major influence on people’s responses to risk’. Trust in political institutions is pertinent to climate change attitudes as it ‘reflects people’s confidence in both the expertise and actions of agencies and

institutions that initiate and control risk' (Lorenzoni and Pidgeon, 2006: 85). However, scholars have observed the decline of trust relationships in advanced democracies over time (e.g. Hardin, 2006), notably the decline in trust in government (e.g. Dalton, 2005; Hooghe and Oser, 2017; Norris, 1999; Papadakis, 1999; Pharr and Putnam, 2000).

For Hmielowski et al. (2014: 869), citing Chrysochoidis et al. (2009), 'Trust in scientists is a form of social or institutional trust, which denotes impersonal trust attributed to people working in institutions – as opposed to personalized trust in a known individual'. According to Cologna and Siegrist (2020: 10), 'trust in scientists and trust in environmental groups strongly correlate with climate-friendly behaviours'. They find that 'environmental groups and scientists seem to be the actors that matter most for individuals' engagement in mitigation and adaptation behaviours' (Cologna and Siegrist, 2020: 10).

Scientists tend to be viewed as the most trustworthy sources of information about climate change (Brewer and Ley, 2013; Hagen et al., 2016; Marquart-Pyatt, 2016). Yet, while Gauchat (2012) found trust in science was generally stable in the United States, declining trust was apparent among political conservatives between 1974 and 2010. Public trust in climate scientists declined substantially following the 'climategate' affair, where right-wing commentators claimed so-called 'warmist' IPCC scientists conspired to misrepresent climate data (Bricker, 2013; Leiserowitz et al., 2012). The scientists were later exonerated of any wrongdoing (Lucas et al., 2015: 80); however, in the United States Leiserowitz et al. (2012: 818) found "'climategate" had a significant effect on public beliefs in global warming and trust in scientists . . . primarily among individuals with a strongly individualistic worldview or politically conservative ideology'.

Tranter and Lester (2015: 745) found 'those trusting of scientists as a source of environmental information were more likely to prioritise action on climate change in Australia'. In recent research, Tranter (2023) found Australian Greens party identifiers to be more likely than other party identifiers to trust scientists as sources of information across a range of fields, including climate change, vaccines and genetically modified crops. Sanz-Menéndez and Cruz-Castro (2019: 537) argue that trust in scientists as a source of information influences acceptance of ACC because 'it acts as an intermediate variable between the use of the media and the belief in climate change', while Hmielowski et al. (2014: 866) found 'conservative media use decreases trust in scientists which, in turn, decreases certainty that global warming is happening'.

We maintain that an important barrier to accepting ACC is the degree of trust one places in climate science. Trust in science is linked to one's worldviews (Kahan et al., 2012) and is influenced by political allegiances, as those who hold individualistic worldviews tend to be located on the right of politics. Sanz-Menéndez and Cruz-Castro (2019: 537) found that trust in scientists influences acceptance of ACC in their analyses of the Spanish public. We examine the extent that this association holds in Australia.

Tranter and Booth (2015) found trust in government was associated with lower levels of climate scepticism in Australia, the United Kingdom and the United States. In Australia, citizens who expressed greater general trust in others were more likely to agree that humans are mainly responsible for causing climate change (Tranter, 2018). However, as Cologna and Siegrist (2020: 4) found, the strength of the association between 'general' trust and climate friendly behaviours tends to be rather weak.

Previous studies have shown knowledge of climate-related facts is positively associated with accepting the veracity of ACC in the United States (Hamilton, 2015) and Australia (Tranter, 2020, 2021; Tranter et al., 2020). While greater knowledge of climate change is associated with increased acceptance of ACC, some studies have shown that the nature of this association varies according to political party affiliations (Hamilton, 2015; Tranter, 2020, 2021). Among those with

progressive political affiliations the association between climate knowledge and acceptance of ACC is positive, but the strength of this association is far weaker among political conservatives (e.g. Hamilton, 2011).

We examine public trust in two IPCC projections relating to increasing global warming and declining coral reefs. Drawing upon the expert advice of climate scientists, we also designed questions to examine the reasons why public trust in some IPCC projections may be low.

Research hypotheses

1. Trust in IPCC projections is positively associated with accepting ACC.
2. Interpersonal (general) trust is positively associated with accepting ACC.
- 3a. Men are *less* likely than women to accept ACC.
- 3b. Age is negatively associated with accepting ACC.
- 3c. The tertiary educated are more likely than others to accept ACC.
- 3d. The non-religious are more likely than the religiously affiliated to accept ACC.
- 3e. Those on high incomes are more likely than others to accept ACC.
- 3f. The self-identified working class are *less* likely than others to accept ACC.
4. Knowledge of climate change is positively associated with accepting ACC.
- 5a. Those with egalitarian/communitarian worldviews are more likely than those with hierarchical/individualistic worldviews to trust IPCC projections.
- 5b. Those with egalitarian/communitarian worldviews are more likely than those with hierarchical/individualistic worldviews to accept ACC.
6. Greens and Labor party identifiers are more likely than Liberal and National party identifiers to accept ACC.
7. The association between political party identification and ACC is mediated by trust in IPCC projections.

3. Data and method

We analyse data from the 2019 Australian Survey of Social Attitudes (AuSSA), a nationally representative sample of Australian adults (i.e. aged 18+). The AuSSA sample was selected at random from the Australian Electoral Roll by the Australian Electoral Commission (McNeil et al., 2020). AuSSA surveys were administered in four waves. Wave 1 was collected in May 2019, Wave 2 in August 2019, Wave 3 in November 2019 and Wave 4 in February 2020. From the 5000 randomly selected participants, 283 were ineligible while 1089 returned a completed questionnaire. The 2019 AuSSA had a completion rate of 23.1% and 1089 respondents.

The AuSSA also contains the Australian component of the International Social Survey Project (ISSP), a cross-national collaboration of surveys administered in 40 countries. The ISSP has a dedicated topic each year, with the 'Social Inequality' module included in the 2019 survey. We utilise some of the ISSP questions in our analyses below.

Dependent variables

Three survey questions were designed for the 2019 AuSSA by the authors. While the most recent IPCC report was published in 2022 (IPCC 2022), our survey questions were based upon IPCC projections from the report of IPCC (2018) and developed in consultation with climate scientists from Griffith University, Australia. The IPCC-related trust questions we commissioned for the AuSSA were:

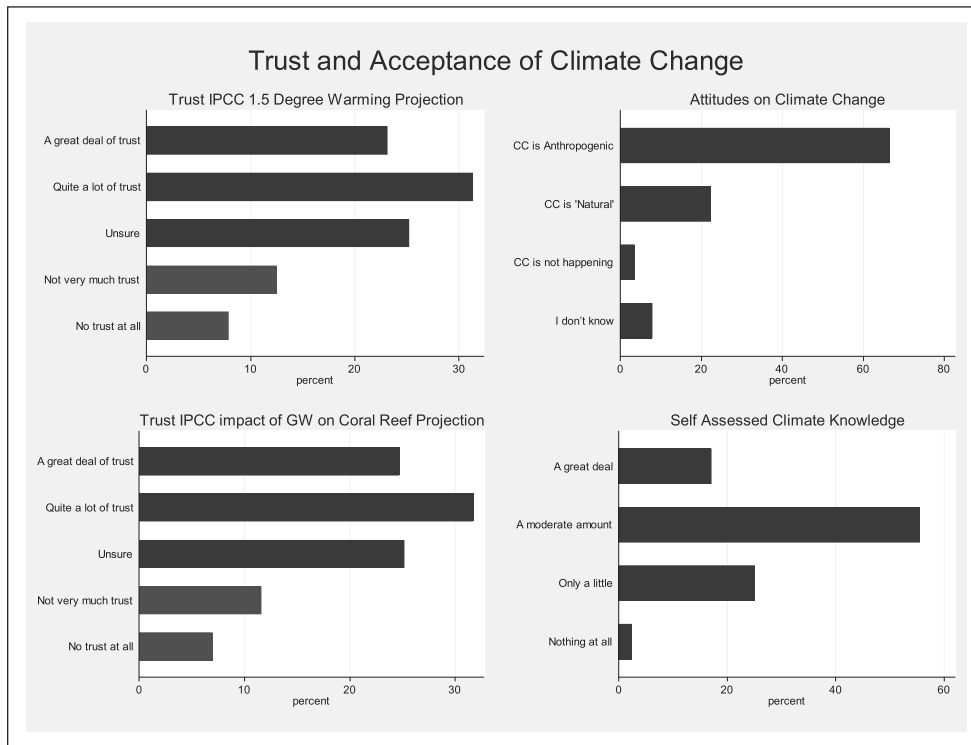


Figure 1. Trust in IPCC projections and acceptance of anthropogenic climate change.

1. *The United Nations IPCC found that human activities have caused the Earth to warm by approximately 1.0°C since 1850. IPCC scientists estimate that global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate.*

How much trust do you have in this IPCC estimation of global warming caused by human activities?

2. *IPCC scientists estimate that global warming will increase the amount of damage to many ecosystems. For example, they estimate that coral reefs will decline in size by 70% to 90% at 1.5°C global warming.*

How much trust do you have in this IPCC estimation of the impact of global warming on coral reefs?

Response categories for both questions were a great deal of trust, quite a lot of trust, unsure, not very much trust and no trust at all (see Figure 1). We constructed an additive scale by combining responses to these two IPCC projection questions ($\alpha = .946$). In preliminary analyses, we operationalised these projection questions as separate dependent variables. However, as responses on the basis of social and political background indicators were very similar, we combine these variables to form a single scale. The scale is operationalised as a dependent variable to measure trust in

Table 1. Why low trust in the IPCC projections? (%).

	%
Scientists benefit by overstating the impact of climate change	36
Scientists' computer models are too unreliable to predict the climate of the future	31
Human activities do not cause global warming	10
I do not understand the science	8
Global warming does not cause climate change	7
Other, please specify	7
<i>N</i>	228

Source: Australian Survey of Social Attitudes (2019).

Question wording 'If you answered "not very much trust" or "no trust at all" to either of the IPCC questions, what was your MAIN reason for doing so?'

IPCC projections, where it is coded to range from 0 to 100 for ease of interpretation of the regression coefficients.

We also use the IPCC scale as an *independent* variable examining acceptance of ACC (Table 3). When used as an independent variable, missing cases were coded to the scale mean. The scale was centred at its mean, as Hamilton (2013: 189) suggests, 'centering helps to reduce multicollinearity problems' and makes 'main effects easier to interpret'.

In addition, to capture the main reasons for low public trust in the IPCC projections, we designed a follow-up question, with response categories based on the literature, and through consultation with climate scientists at Griffith University, Australia. Our third question and its response categories are shown in Table 1. The question was:

If you answered 'not very much trust' or 'no trust at all' to either of the IPCC questions, what was your MAIN reason for doing so?

Our final dependent variable measures acceptance of ACC following Hamilton (2015), using the question 'Which of the following statements do you believe?': *climate change is happening now and is caused mainly by human activities*; (66% scored 1); *climate change is happening now, but is caused mainly by natural forces*; (22% scored 0); *climate change is not happening now* (3% scored 0); *I do not know whether climate change is happening or not* (8% scored 0).

Independent variables

We operationalise several independent variables. Public understanding and acceptance of climate change is influenced by one's social background, with existing research showing gender, education, age and worldviews to be associated with attitudes on climate change (e.g. McCright and Dunlap, 2011a; Whitmarsh, 2011). Women are more likely than men to participate in pro-environmental behaviour (Dietz et al., 2007; Zelezny et al., 2000), while Tranter and Booth (2015) found climate scepticism was higher among men in several Western countries. In Australia, women are more concerned about 'the environment' and climate change (Tranter, 2014, 2018, 2020). However, men score higher than women on climate change knowledge in Australia (Tranter, 2020, 2021; Tranter et al., 2020), similar to the gender differences in general scientific and environmental knowledge (Hayes, 2001).

Tranter (2020) found that women, tertiary graduates, those with no religious affiliations and younger Australians are more likely to accept that climate change has anthropogenic causes. We construct dummy (1/0) independent variables for men, bachelor's degree or higher and the non-religious. Climate change is claimed to impact low-income groups more severely, even though those on low incomes contribute less to the causes of climate change (Arndt et al., 2022). We measure income with a dummy variable for incomes of \$100,000 Australian dollars or higher.

Social class differentiates environmental concerns in Australia, with the middle classes more likely to claim they will pay higher taxes for renewable energy, and to 'protect the environment' (Tranter, 2011). Middle-class Australians were also more likely to say they will pay higher taxes, more for electricity and higher fuel prices to reduce global warming (Tranter, 2014). A self-assessed working-class dummy is constructed from the ISSP question 'Please tell me which social class you would say you belong to?' (responses: lower class=0; working class=1; lower middle class + middle class + upper middle class + upper class=0).

Political party identification is strongly associated with climate change attitudes in the United States (e.g. McCright and Dunlap, 2011a, 2011b) and Australia (Tranter, 2011, 2017, 2020, 2021; Tranter and Lester, 2015). In the United States, McCright et al. (2013: 1) found 'conservatives will report significantly less trust in, and support for, science that identifies environmental and public health impacts of economic production . . . than liberals'. In Australia, those who identify with the Liberal/National coalition are less likely to accept ACC (Tranter, 2011, 2017, 2018). A dummy variable contrasts coalition identifiers with other AuSSA respondents.

Public knowledge of climate change is measured using two variables. The first is a dummy variable for self-rated knowledge of climate change from the question 'How much do you feel that you understand about climate change – a great deal, a moderate amount, a little, nothing at all?' (a great deal and a moderate amount = 1; other responses = 0). The second variable is a scale that replicates Hamilton's (2015) 'polar knowledge' questions. Hamilton (2015: 100) argues that 'awareness of geography or the sea/land ice distinction, unlike other basic facts such as ice decline, appears unrelated to respondents' politics or climate-change beliefs'. As Hamilton (2015: 100) puts it, the 'polar knowledge score defined as the number of correct answers among sea level, North Pole and South Pole questions . . . provides a limited but analytically useful marker for knowledge'. The climate knowledge scale measures the number of correctly answered polar questions (range 0–3).

Kahan et al. (2012: 732) argue that 'people who subscribe to a hierarchical, individualistic world-view – one that ties authority to conspicuous social rankings and eschews collective interference with the decisions of individuals possessing such authority – tend to be sceptical of environmental risks'. Hierarchical/individualists tend to view the prioritisation of environmental risks as giving rise to restrictions on commerce and industry. Alternatively, those with an 'egalitarian, communitarian world-view – one favouring less regimented forms of social organization and greater collective attention to individual needs – tend to be morally suspicious of commerce and industry' (Kahan et al., 2012: 732).

We construct a worldview scale from some ISSP questions in the AuSSA ($\alpha = .74$) as a proxy measure of hierarchical/individualistic and egalitarian/communitarian worldviews (Kahan et al., 2012). The additive worldview scale combines four Likert-type items (i.e. 5-point strongly agree to strongly disagree responses): 'Differences in income in Australia are too large'; 'It is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes'; 'The government should provide a decent standard of living for the unemployed'; and 'It is the responsibility of private companies to reduce the differences in pay between their employees with high pay and those with low pay'. The scale ranges from 4 (highly hierarchical/individualistic) to 20 (highly egalitarian/communitarian). Missing cases were coded to the scale mean, and the scale was centred at its mean (Hamilton, 2013). Egalitarian

worldviews are expected to be positively associated with higher levels of trust in IPCC projections, and a greater propensity to accept ACC.

Interpersonal or 'general' trust (Cologna and Siegrist, 2020) is measured using a dummy variable from the question 'Generally speaking, would you say that people can be trusted or that you can't be too careful in dealing with people?' (responses: people can almost always be trusted + people can usually be trusted=1; you usually cannot be too careful in dealing with people + you almost always cannot be too careful in dealing with people + cannot choose=0).

4. Analyses

The results presented in Figure 1 show that over half of all respondents (54%–57%) have a great deal, or quite a lot of trust in these two IPCC projections, while about one-quarter remain unsure. Around 20% have low trust in the IPCC estimates relating to the impact of global warming. We also asked respondents with low trust in the IPCC estimates why their trust was low. We developed responses based upon expert advice regarding the most common potential reasons for low trust in the IPCC and also provided an 'other, please specify' response category (see Table 1).

Thirty-six per cent of those with low trust claim scientists benefit by overstating the impact of climate change (a justification also raised by climate change deniers, e.g. see Maslin, 2019), while 31% believe scientists' computer models are too unreliable to predict the climate of the future. A further 10% do not believe human activities cause global warming, while 7% believe global warming does not cause climate change. Finally, 8% of respondents claim they do not understand the science, consistent with previous studies finding that those with low self-assessed climate knowledge score lower on factual knowledge of climate change (Tranter, 2020). The 'other, please specify' category attracted only 7% of responses, indicating the listed response categories account for the vast majority of variation for those with little trust in these IPCC projections.

Figure 1 also presents responses to a question about Australians' beliefs in climate change. Similar to previous Australian studies conducted from 2015 to 2018 (Tranter, 2017, 2020; Tranter et al., 2020) around two-thirds of Australians sampled agree that climate change is happening and is mainly caused by humans, while 22% believe it has 'natural' causes. Only 3% reject climate change outright (i.e. climate deniers) while the remaining 8% 'do not know'.

Ordinary Least Squares regression results

The scale-dependent variable analysed in Table 2 ranges from 0 to 100, where 100 represents the highest level of trust in the IPCC. The trust scale is regressed on social background variables, political party identification, climate change knowledge and worldviews.

The ordinary least squares (OLS) results in Model 1 indicates that men (−4.73) score approximately five points *less* than women do on the IPCC scale, while those holding a bachelor's degree or above score 11 points higher than non-graduates on the 0–100 trust scale. Being secular (6.56) and having higher levels of interpersonal trust (6.1) are also associated with higher trust in IPCC projections, with trust increasing with greater knowledge of polar facts (i.e. 2.76 increase on the dependent variable for a unit change on the 0–3 scale), the latter serving as a proxy for climate change knowledge (Hamilton, 2018; Tranter, 2020, 2021). Self-rated knowledge of climate change has a separate effect, with those who believe they understand a great deal, or a moderate amount about climate change scoring 5.9 points higher than others. Australians who identify as working-class score 7 points *lower* than others on the trust-dependent variable.

Political party identification has a strong association with trust in IPCC projections. Coalition identifiers score 14 points less than Labor/Greens and the politically unaligned on the 0–100 trust

Table 2. Social and political background of trust in IPCC projections (OLS).

Model	1	2
Intercept	53.54	53.30
Men	-4.73**	-4.72***
Age (years)	-0.124*	-0.122*
Bachelor's degree or higher education	11.01***	11.06***
No religious affiliation	6.56***	6.64***
Income \$100K+	2.12	2.15
Working class (self-identified)	-6.92***	-6.29**
Most people can be trusted (agree)	6.1***	6.24***
Polar knowledge scale (0–3)	2.76***	2.82***
Self-rated climate knowledge	5.87**	5.98**
Worldviews scale (4–18)	2.51***	2.78***
Coalition party identification	-13.70***	-13.69***
Working class × worldviews scale	–	-1.47*
Accept ACC	–	–
Adjusted R ²	.32	.32
N	(1052)	(1052)

Source: Australian Survey of Social Attitudes (2019).

ACC: anthropogenic climate change.

IPCC scale ranges 0–100. Controls for survey wave not shown.

* $p < .05$; ** $p < .001$; *** $p < .0001$.

scale ($p < .0001$). These results are similar to findings from the United States, where conservatives and Republicans score lower than liberals and Democrats on scales measuring trust in science (Gauchat, 2012). The worldview scale also has a strong association with trust in these IPCC projections (i.e. 2.51 points change on the dependent variable for a unit change on the worldviews scale). In other words, those who hold collectivist worldviews are more likely than those with hierarchical worldviews (Kahan et al., 2012) to trust IPCC projections, supporting Hypothesis 5a.

An interaction with the worldview scale by self-assessed class location is also statistically significant ($p < .001$; Model 2). While the interaction does not increase the R^2 statistic, it does illustrate an interesting association between self-assessed class and worldviews. This finding is more easily interpreted in graphical form (Figure 2). Collectivists are generally more likely than individualists to trust IPCC projections. However, the interaction between worldviews and self-assessed class illustrated in Figure 2, suggests this association is weaker among those who identify as working class. Among the working class, worldviews have a positive association with trust in IPCC projections, but the gradient is more pronounced for the other classes (i.e. confidence intervals do not overlap beyond a score of 12 on the scale).

Binary logistic regression results

A dichotomous-dependent variable measures acceptance of ACC contrasted with other responses (i.e. those who believe climate change is 'natural', climate sceptics and those who do now know). Binary logistic regression analysis is used to estimate the odds of accepting ACC, compared to other responses (Table 3). Two models are presented. Model 1 includes social background variables, knowledge variables, worldviews and a coalition political party identification. Model 2 adds the trust in IPCC projections scale as an independent variable (Table 3).

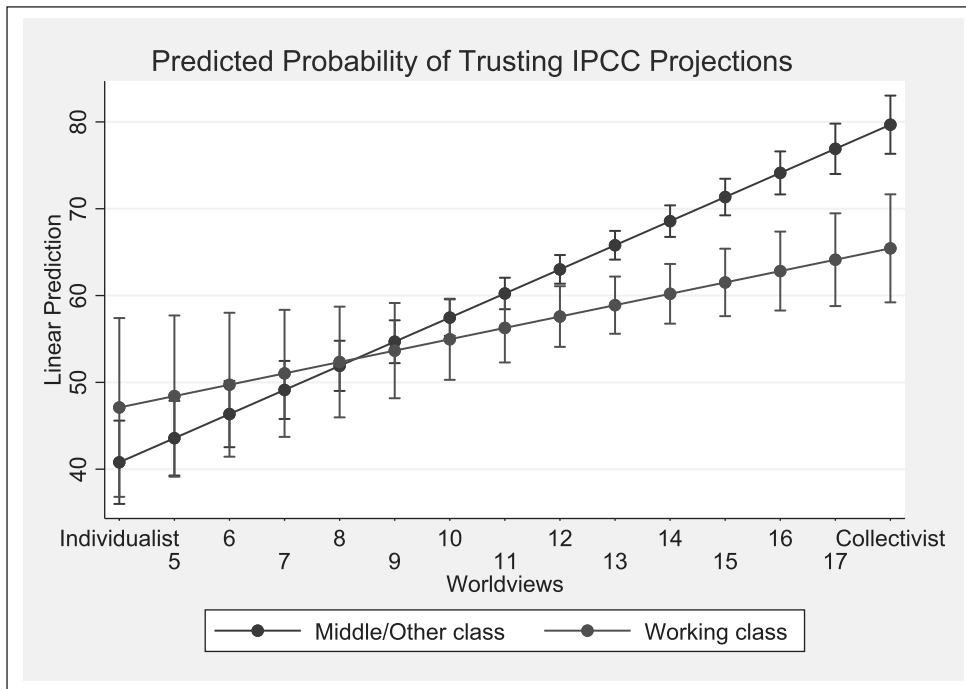


Figure 2. Trust in IPCC projections worldviews and self-assessed class.

Several social background effects are apparent (Model 1), supporting Hypotheses 3b (age), 3c (tertiary education) and 3d (non-religious), while Hypotheses 3a (gender), 3e (income) and 3f (class) are rejected. Similar to previous research in Australia and elsewhere (e.g. Tranter, 2020, 2017; Tranter et al., 2020), younger Australians are more likely to accept ACC (OR=0.98), while having a tertiary degree is associated with higher odds of accepting ACC (OR=1.8), as is being non-religious (OR=1.6). General trust in others also shows higher odds of accepting ACC (OR=1.5), supporting Hypothesis 2. Similar to Hamilton (2015) in the United States and Tranter in Australia (2020), we find climate-related (i.e. polar) knowledge is associated positively with acceptance of ACC (OR=1.15; $p=.087$), although only at the 90% level of significance, partially supporting Hypothesis 4. However, self-rated knowledge of climate change is significantly associated with accepting ACC (OR=1.7), supporting Hypothesis 4. The worldviews scale estimate is also statistically significant. Collectivists are more likely than individualists to accept ACC, even after controlling for social and political background (OR=1.19), supporting Hypothesis 5b.

Furthermore, the results show that after controlling for social background, interpersonal trust and worldviews, coalition identifiers (OR=0.4) are *less* likely than Labor, Greens or the politically non-aligned to accept that climate change has anthropogenic causes (Model 1), supporting Hypothesis 6. However, when trust in IPCC projections is included in Model 2 as a mediator variable, the magnitude of the odds for coalition identifiers is reduced considerably (OR=0.7), and is no longer statistically significant at the 95% level, even with our relatively large sample.

Mediation analysis. We conducted mediation analysis using the STATA command *medeff* (Hicks and Tingley, 2011) using variables from Model 2, Table 3, where coalition party ID is the independent

Table 3. Social and political background of accepting anthropogenic climate change (odds ratios).

Model	1	2
Women	1.3	0.97
Age (years)	0.98***	0.98**
Bachelor's degree or higher education	1.8**	0.99
No religious affiliation	1.6**	1.3
Income \$100K+	1.2	1.1
Working class (self-identified)	0.9	1.5
Most people can be trusted	1.5*	1.03
Polar knowledge scale (0–3)	1.15	0.95
Self-rated climate knowledge	1.7**	1.4
Worldviews scale (4–20)	1.19***	1.08*
Coalition party identification	0.4***	0.7
Trust in IPCC scale (2–10)	–	2.82***
Pseudo R^2	.18	.48
<i>N</i>	(1049)	(1049)

Source: Australian Survey of Social Attitudes (2019).

IPCC: Intergovernmental Panel on Climate Change.

Accept anthropogenic CC = 1; other responses = 0. Controls for survey waves not shown.

* $p < .05$; ** $p < .001$; *** $p < .0001$.

variable (X), the IPCC trust scale is the mediator variable (M), with the binary-dependent variable accepting ACC (Y). The mediation analysis indicated that the ‘path a’ ($X \rightarrow M$) regression coefficient was negative and significant ($b = -1.098$; $p < .0001$). The ‘path b’ ($M \rightarrow Y$) association was positive and significant (log odds = 1.0357; $p < .0001$). However, the direct effect ‘path c’ ($X \rightarrow Y$) coefficient was negative and non-significant at the 95% level (log odds = -0.3537 ; $p = .110$). The indirect effect ($X \rightarrow M \rightarrow Y$) was negative and significant (-1.138 ; bootstrap bias-corrected CI: $[-1.519$ to $-0.7562]$). On average, 76% of the total effect of coalition party identification on accepting ACC was mediated by trust in IPCC projections, supporting Hypothesis 7. These findings indicate that when trust in IPCC projections is held constant, partisan differences over the acceptance of human caused climate change are attenuated substantially.

5. Discussion

It has been estimated that between 90% and 100% of scientists agree that climate change has mainly human causes (Anderegg et al., 2010; Cook et al., 2013, 2016; Doran and Zimmerman, 2009; Oreskes, 2004; Powell, 2015), while only two-thirds of Australians agree that climate change has anthropogenic causes (Tranter, 2020, 2021). Yet, data from a nationally representative sample show that only a slim majority (approximately 55%) of Australians trust two operationalised projections from the IPCC. The IPCC projections we model refer to estimates of 1.5° warming occurring between 2030 and 2052, and that coral reefs will decline in size by between 70% and 90% at 1.5° warming. We also found that approximately one-quarter of all respondents were unsure whether they trusted these IPCC projections or not, while approximately 20% had little or no trust in them.

Over a third of those who had little or no trust in these IPCC projections believe scientists stand to benefit by overstating the impact of climate change, while close to one third claimed climate

models were not reliable enough to predict the climate of the future. A further 17% of those with low trust believed human activities do not cause global warming or that global warming does not cause climate change.

In line with previous studies from the United States, Australia and elsewhere (e.g. McCright and Dunlap, 2011a; Tranter and Booth, 2015), we found political party affiliations to be one of the strongest correlates of accepting ACC. Coalition party identifiers (i.e. Liberal or National Party) were far less likely than Labor, Greens or non-aligned Australians to accept that climate change is occurring, and that it has human causes. However, we were particularly interested in the extent that trust in climate science is associated with acceptance of ACC, and the extent that trust in science mediates the influence of political partisanship on accepting ACC.

While interpersonal, or general trust in others is associated with accepting ACC – the more trust one has in others, the more likely one is to accept ACC – the association is not strong. On the other hand, trusting IPCC projections has the strongest association with accepting ACC of any variable in our regression models (Hypothesis 1 supported). Furthermore, as found previously in Australia (Fielding et al., 2012; Tranter, 2017, 2021), identifying with a conservative political party reduces the odds of accepting ACC substantially (Hypothesis 6 supported). Yet, after controlling for trust in IPCC projections, partisan-based differences over ACC were statistically non-significant at the 95% level. In other words, one's party affiliations have an important influence on accepting or rejecting human-caused climate change, but trust in climate science mediates the impact of party affiliations (Hypothesis 7 supported).

We suggest that when examining attitudes towards climate change, trust in climate science should be considered as a key variable. Hmielowski et al. (2014: 867) maintain 'many individuals use simple heuristics, such as trust, to make sense of conflicting information and form their opinions about climate change'. Scientists and scientific institutions also tend to be viewed as the most trustworthy sources of information on climate change (Brewer and Ley, 2013; Hagen et al., 2016; Marquart-Pyatt, 2016). Trust in scientists has been shown to be an important correlate of pro-environmental behaviour in a range of countries (Cologna and Siegrist, 2020), while Sanz-Menéndez and Cruz-Castro (2019: 551) argue 'the general public may be willing to believe scientific institutions more than any other actor when reporting scientific issues, even controversial ones'.

Our analyses indicate that trust in climate science is strongly associated with accepting ACC in Australia, even controlling for social background, political party identification and worldviews. We acknowledge that those who accept ACC may also be more likely to trust climate science, although we strongly suspect a causal relationship is extant. Trusting the science of global warming, particularly the 'institutional trust' associated with sources such as the IPCC, provides a coherent rationale for citizens to accept that ACC is occurring. Nevertheless, we are unable to empirically demonstrate the direction of such a relationship here, given our data are cross-sectional. This is an area that requires further research.

Hmielowski et al. (2014: 867) also suggest 'Americans' levels of public trust in scientists and, in turn, beliefs about global warming, are likely to depend on the media sources they use'. The situation is similar in Australia, where according to Bacon and Jegan (2020: 7), 'News Corp publications produce substantial amounts of material that is sceptical about the findings of climate science' while 'commentary items (editorials, opinions, and letters) drove scepticism in all News Corp publications'. Tranter's (2018) Australian study shows that those who look to commercial television or radio for news and information, are more likely than others to believe climate change has 'natural' causes, to be sceptical of the consensus position of climate scientists, or to reject climate change altogether. As Corner et al. (2012: 463) found, culturally biased assimilation occurs in relation to climate change information, with the reliability of newspaper editorials evaluated

differently according to whether people accept or reject ACC. Based upon previous research, it is highly likely that the type of media one consumes has an important influence upon climate change attitudes, and contributes to (mis)trust in climate science, which in turn attenuates acceptance of ACC. As such, our models may be under-specified, as the 2019 AuSSA does not contain questions on media consumption.

Kahan et al. (2012) found those who hold ‘collectivist’ values to be more likely than ‘individualists’ to accept that climate change has anthropogenic causes. We show that worldviews are associated in a similar way with *trust* in climate science, and perhaps more importantly, accepting ACC in Australia (Hypothesis 5a and 5b supported). Similar to previous Australian studies that have examined acceptance of ACC (e.g. Tranter et al., 2020), we also found that women, younger people, tertiary educated and secular Australians more likely than others to trust IPCC projections, controlling for party identification, worldviews and knowledge of climate change (Hypotheses 3a–3d supported). Yet with the exception of age, social background variables and knowledge of climate change-related facts were not significantly associated with accepting ACC after controlling for trust in IPCC projections.

Climate change has been claimed to have greater impact upon the disadvantaged and those in low-income groups, even though they contribute less than others to the causes of climate change (Arndt et al., 2022). In the United Kingdom, not unexpectedly, support for action on climate change varies according to class (Happer, 2019). Our research shows that working class Australians are not less likely than their middle-class compatriots to accept ACC (Hypothesis 3f rejected), but are less likely than the middle class to trust IPCC projections. Due to data limitations we are not able to model class using complex ‘objective’ classes, such as Erik Olin Wright’s class schema, (Wright, 2015). However, our self-assessed class findings suggest that class location may be an indicator of trust in climate science in Australia. Further research is needed to determine if such class-based findings are also apparent in other countries.

This research represents an attempt to more accurately model trust in climate science by operationalising specific projections from the United Nations IPCC. We have shown that while in 2019/2020 around two-thirds of Australian adults accept that climate change is occurring and is mainly caused by humans, only 55% trust the IPCC. In other words, 45% of Australians either have low trust in the IPCC, or are unsure about their projections. This lack of public trust in climate science contributes to public reluctance to act on climate change, to engage in the behavioural changes necessary to attenuate the causes of global warming. The increasing frequency and severity of natural disasters, such as the catastrophic floods and bushfires Australians have experienced in recent years, are influenced by global warming, according to scientists (Canadell et al., 2021; United Nations Environment Programme, 2020). If more Australians come to accept the science underlying the link between climate change and such disaster events, perhaps we will see greater willingness to act on climate change. *If* Australians accept the science! Our research suggests that climate scientists, science communicators, politicians, climate activists and other concerned citizens still have work to do to convince many Australians to first, accept climate change science, and second, to change their attitudes and behaviour. Time is running out.

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Note

1. Job (2005) distinguishes ‘rational’ and ‘relational’ notions of trust. Rational trust is calculative and strategic, related to risk and uncertainty, with the assumption ‘that to trust presupposes consideration of information or knowledge about the other’. So, for example, political trust is based upon a rational response to government performance’ (Job, 2005: 4). On the other hand, relational trust ‘is based on belief or faith in the goodness of others’; equating to a ‘trusting disposition’ that forms early and is relatively stable over time (Job, 2005: 4).

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