Reg Environ Change
DOI 10.1007/s10113-016-1001-8

ORIGINAL ARTICLE

Pacific Islanders' understanding of climate change: Where do they source information and to what extent do they trust it?

Bridie Scott-Parker[1] · Patrick D. Nunn[1] · Kate Mulgrew[1] · Don Hine[2] · Anthony Marks[2] · Doug Mahar[1] · Lavinia Tiko[3]

Received: 22 December 2015 / Accepted: 2 June 2016

Abstract The experience of environmental stress and attitudes towards climate change was explored for 1226 students at the University of the South Pacific, the foremost tertiary institution serving the independent nations of the Pacific. Students sourced information regarding climate change from media including television, radio, and newspapers; the community (typically via their village, church, and extended family); the University and their friends; and in addition to regional agencies such as the Pacific Community. Most students concluded that they could not believe all of the informations provided by these sources. The findings demonstrate that most students—the future elite of the region—rank global environmental change as the highest future risk. Although nearly all respondents believed that climate change was happening, more than half of respondents believed that the risk was exaggerated and only one-third believed that science would find an answer, suggesting a lack of trust in scientific sources of information. Results also showed that these attitudes varied across demographic factors such as age, region, and gender. The understanding of contemporary attitudes towards global environmental change among a cohort that is likely to include future national leaders in the Pacific Islands region presents unique opportunities for long-range planning of intervention and support strategies. Of particular note for effective intervention and support is the breadth and trustworthiness of various information sources including Pacific Island leaders.

Keywords Pacific Islands · Climate change · Knowledge · Attitudes · Information · Trust · Adaptation

Introduction

Spread across almost one-third of the Earth's surface, the Pacific Ocean contains comparatively few land areas: around 0.34 % of its total area. If the Hawaiian Islands and that of New Guinea are included, the Pacific Islands region is home to around 10.8 million people, 70 % of whom live in Papua New Guinea. The remainder live mostly on oceanic islands, including 12 independent nations (including Tokelau, a territory of New Zealand) that together own the University of the South Pacific, the region's premier tertiary institution on whose students this study focuses (see Fig. 1).

The likely pace and impact of twenty-first-century climate change have become increasingly better known over the last decade, particularly as a result of the IPCC's 5th Assessment Report (2013–2014). Small islands—more numerous in the Pacific than any other ocean—have long been identified as special cases by the IPCC owing to their uncommonly high exposure to global change (Mimura et al. 2007; Nurse et al. 2014).

Even allowing for potentially exaggerated media reports, it is abundantly clear that over the next few decades, most people living on Pacific Islands will be detrimentally affected by various aspects of climate change (Hay 2013). While temperature rise and changes in

Electronic supplementary material The online version of this article (doi:10.1007/s10113-016-1001-8) contains supplementary material, which is available to authorized users.

✉ Bridie Scott-Parker
bscottpa@usc.edu.au

[1] The University of the Sunshine Coast, Sippy Downs, Australia

[2] The University of New England, Armidale, Australia

[3] The University of the South Pacific, Suva, Fiji

Published online: 27 June 2016

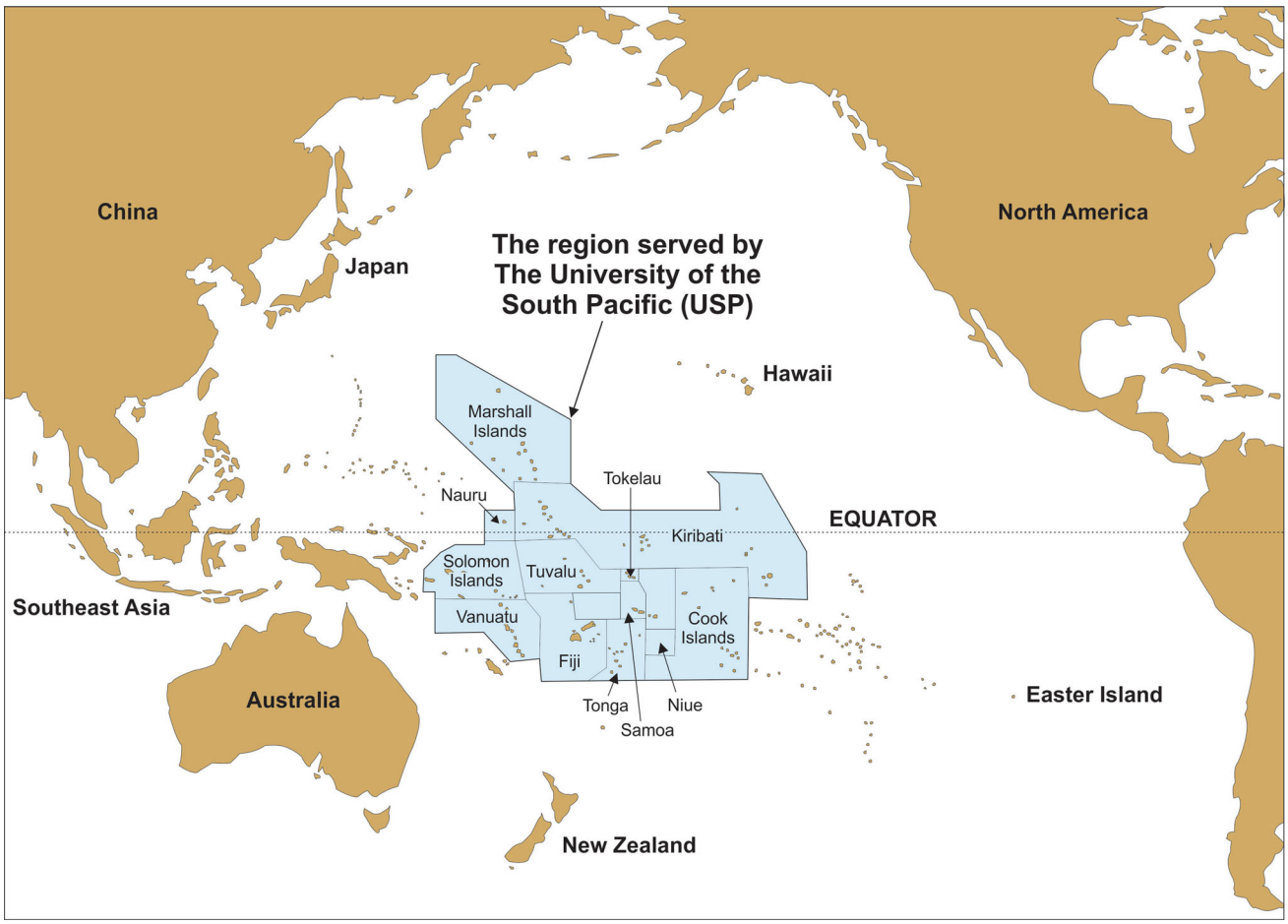

Fig. 1 The region served by the University of the South Pacific

cyclogenesis pose particular threats, the most wide-ranging impacts come from sea level rise (Nunn 2013). They include the erosion of soft-sediment shorelines, and the increased flooding and groundwater salinization of coastal lowlands. It is likely that many lowland areas, currently densely populated, will become uninhabitable, while in some instances, entire islands may have to be abandoned.

Minimising the impacts of such changes on Pacific Island peoples is best achieved by engaging them in the design of adaptive solutions in order to ensure that these are effective and sustainable (Nunn 2009; van Aalst et al. 2008). Key priorities include understanding what Pacific peoples know about climate change and how that knowledge might become better informed and more relevant to the precise nature of the challenges they will shortly confront. To this end, this paper reports on a study of future decision-makers in the Pacific Islands region and seeks to understand from where they obtain information about climate change and the sources in which they place most trust. Such issues are key to the optimal design of future adaptive planning, especially those involving outside interventions, in the Pacific Islands region.

Methods

The University of the South Pacific (USP), an international university serving 12 Pacific Island nations, is the largest and most prestigious university in the Pacific Islands region, educating the greatest numbers of its decision-makers—a trend likely to continue in the future. Using Qualtrics^{TM}, a sample of 1226 Pacific Island students at USP volunteered to complete an online survey in which they were asked a series of questions regarding climate change, where they accessed the information, and how much they trusted various sources. All USP students were invited to participate. On the basis of country of origin, gender, year, and faculty of study, the sample is broadly representative of the student body at USP in 2013 when the survey was conducted (Nunn et al. 2016). Most questions paralleled those in similar surveys to facilitate inter-sample comparisons (Hine et al. 2014; Hmielowski et al. 2014; Leiserowitz et al. 2015).

Analyses were conducted using the Statistical Package for the Social Sciences (SPSS) Version 22. Responses were treated as categorical and thus mostly percentages are reported. Chi-square analyses (χ^2) were used to test

relationships between measures exploring beliefs and perceptions regarding the environment, climate change, and self-efficacy, from where information regarding climate change was sourced, and to what extent this information was trusted, and a range of demographic factors including age (50th percentile split; ≤22 years vs. >22 years), gender, year of study (first, second, third, postgraduate), and their birthplace (atoll vs. higher islands). Responses were also examined according to whether the participant trusted a range of sources, including Pacific Island leaders, media, and scientists. Statistical significance was assessed at $p < .05$. Additional methodological comments are given in the Online Supplement.

Results

Overall findings

Table 1 summarises the overall findings for the 1226 participants.

Perceptions regarding environment, climate change, and self-efficacy

The majority of participants reported that the natural environment was in a bad or very bad condition, with approximately half of participants stating that their birthplace was also in such a state. While nearly every participant thought that climate change was happening and that it was important or extremely important for Pacific Islanders (perhaps something biased by participant self-selection), only one-third of participants thought that people elsewhere in the world were adequately aware of climate change challenges in the Pacific region, and fewer than one-third of participants agreed that scientists could find a satisfactory solution to the challenges of climate change in the Pacific Islands. Despite this, one-third of participants thought that climate change was not as serious a problem as it is generally purported to be. While the majority of participants thought they knew more about climate change than other people in the Pacific, and that they personally could make a difference—and indeed had a responsibility to make a difference—with regard to climate change, only 7 in 10 participants thought their country's leaders were adequately aware of the climate change challenges confronting the Pacific region.

Sources of information regarding climate change

The majority of participants had accessed—either online or in print—one or more sources of information regarding climate change, with newspaper article(s), television programme(s), material(s) produced by the University of the South Pacific, and radio discussions the most common sources of information in descending order. Approximately half of participants reported sourcing information from the Pacific Community (formerly Secretariat of the Pacific Community—SPC), the Secretariat of the Pacific Regional Environment Programme, and the Pacific Islands Forum Secretariat. One-third of participants reported sourcing information from the South Pacific Applied Geoscience Commission (now SPC GeoScience Division) and the Forum Fisheries Agency; while one in eight participants reported the Pacific Conference of Churches as a source of information.

It is noteworthy also that in our preparations for this survey, which informed its design, we found no evidence that students accessed online sources of information regarding climate change from sources other than those mentioned above; since we wish to compare the results of this survey with those from Pacific Island communities without internet access, we did not ask our target group specifically about other sources. In addition, the majority of participants remembered their home community discussing climate change, with a mix of views, primarily worry. Perhaps unsurprisingly considering the participants were USP students, the majority reported that climate change had been discussed in at least one lecture or tutorial at the University. Finally, most participants reported that they discussed climate change with their friends, one-third doing so frequently.

Trust in sources of information

Reflecting the ambivalence surrounding the belief that science will find an answer to climate change, only one in four participants reported that they completely trusted what was said by scientists. Despite accessing a breadth of media as discussed above, again only one in four participants reported that they completely trusted what was said by the media regarding climate change in the Pacific Islands. While participants generally agreed that they trusted their Pacific Islander leaders to take the right action against climate change, just one in five participants reported they completely trusted what their government leaders said regarding climate change. One in three participants completely trusted what church leaders said about climate change in the Pacific Islands although it is also noteworthy that a considerable 11.2 % of participants selected the 'I don't know' response to this item, a 3–11 fold greater proportion than for the previous 'trust' items (see footnote Table 1).

Table 1 Summary of the proportion of responses to questions exploring perceptions regarding environment, climate change and self-efficacy, sources of information regarding climate change, and the extent of trust in these information sources

Item	Response (proportion)		
Perceptions regarding environment, climate change, and self-efficacy	Bad/very bad (%)	Neutral (%)	Good/very good (%)
How would you rate the condition of the natural environment in the world today?	68.1	22.3	9.6
How would you rate the condition of the island/place that you came from?	52.4	23.2	36.9

	Strongly disagree/disagree (%)	Neutral (%)	Agree/strongly agree (%)
I am certain that climate change is happening	1.0	0.7	98.0
The seriousness of climate change is exaggerated[a]	34.0	8.4	55.9
Science will find an answer to climate change before it becomes a big problem	37.1	31.4	31.5
I can personally help reduce climate change by changing the way that I live	3.9	6.4	88.3
I feel that I can make a difference with regard to climate change[b]	3.1	7.7	87.5
I have a responsibility to help do something about climate change[c]	0.9	2.5	96.0

	A lot (%)	Quite a bit (%)	Not very much (%)
Compared to other people in the Pacific, how much do you know about climate change?[d]	30.0	58.2	11.7

	Unimportant (%)	Important (%)	Extremely important (%)
How important do you regard climate change for Pacific Islanders?[e]	0.5	16.1	83.2

	Yes (%)	No (%)	Unsure (%)
Do you believe that your country's leaders are aware of the challenges that face their people this century?	69.1	14.2	16.7
Do you believe that people in the rest of the world are aware of the challenges that face Pacific people at the moment?	33.5	38.3	28.3
Sources of information regarding climate change			
Ever watched a television programme about climate change?	88.3	11.7	
Ever read a newspaper article about climate change?	95.1	4.9	
Ever listened to a discussion on the radio about climate change?	78.8	21.2	
Ever read anything produced by Forum Fisheries Agency (FFA)?	33.9	66.1	
Ever read anything produced by Pacific Conference of Churches?	12.6	87.4	
Every read anything produced by Pacific Islands Forum Secretariat?	47.8	52.2	
Every read anything produced by Secretariat of the Pacific Community?	56.1	43.9	
Ever read anything produced by Secretariat of the Pacific Regional Environment Programme?	52.9	47.1	
Ever read anything produced by the University of the South Pacific?	81.3	18.7	
Ever ready anything produced by the South Pacific Applied Geoscience Commission?	35.5	65.5	
Have read none of these	7.1	92.9	
When you are in your home country, do you ever remember you community (village, church, extended family) discussing climate change?	70.4	29.6	

	Not worried (%)	Different views (%)	Worried (%)
When your community last discussed climate change, what was the general feeling?	7.6	49.5	42.9

	Never (%)	1–20 times (%)	>20 times (%)
Since you have been studying at the University of the South Pacific, in how many lectures/tutorials has climate change been discussed?	19.6	53.9	26.4

Table 1 continued

	Never (%)	Sometimes (%)	A lot (%)
Do you and your friends ever discuss climate change outside the classroom?	10.4	55.2	34.4
Trust in sources of information	Strongly disagree/ Disagree (%)	Neutral (%)	Agree/Strongly agree (%)
Trust Pacific Islander leaders to take right action against climate change?	9.9	13.0	74.4

	Do not trust (%)	Middle (%)	Trust completely (%)
How much do you trust what government leaders in the Pacific Islands say about climate change?[f]	7.5	67.7	21.5
How much do you trust what the media (television, newspapers, radio) say about climate change in the Pacific Islands?[g]	3.1	54.7	41.3
How much do you trust what scientists say about climate change in the Pacific Islands?[h]	2.9	50.4	44.3
How much do you trust what church leaders say about climate change in the Pacific Islands?[i]	8.4	49.1	31.3

[a] I don't know: 1.8 % of responses

[b] I don't know: 1.6 % of responses

[c] I don't know: 0.6 % of responses

[d] Nothing: 0.1 % of responses

[e] Not at all important: 0.8 % of responses

[f] I don't know: 3.4 % of responses

[g] I don't know: 1.0 % of responses

[h] I don't know: 2.4 % of responses

[i] I don't know: 11.2 % of responses

Findings by demographic characteristics

Table S1 (Online Supplement) summarises the participant responses, examined by the key demographic characteristics of age, gender, year, and birthplace.

Perceptions regarding environment, climate change, and self-efficacy

Age: As shown in Table S2, a significantly larger proportion of older students (≥22 years) rated the natural environment, and the environment of their birthplace, as good, than younger students (<22 years) (10.5 vs. 8.7 %; 39.7 vs. 34.2 %, respectively). A larger proportion of older students claimed they knew 'a lot' about climate change compared to other people in the Pacific (34.7 vs. 25.2 %) and that others in the world are generally unaware of the problems currently facing Pacific people (34.2 vs. 32.5 %).

Gender: A significantly larger proportion of females compared to males rated their environment birthplace as in bad condition (43.3 vs. 35.5 %) and disagreed that climate change was exaggerated (37.6 vs. 30.6 %).

Year: In general, fourth-year students differed from undergraduate/other students in the nature of their responses. To illustrate, a considerably *smaller* proportion of fourth-year (postgraduate) students agreed that they trust Pacific leaders to take action against climate change (4th year 68.4 %, 1st year 83.6 %), that the seriousness of climate change is exaggerated (4th year 33.1 %, 1st year 65.8 %), that science will find an answer to climate change (4th year 27.6 %, 1st year 41.5 %), and that their leaders were adequately aware of the challenges facing their country (4th year 62.1 %, 1st year 70.8 %), while a considerably *larger* proportion of fourth-year students believed that they knew more about climate change than other people in the Pacific (4th year 40.1 %, 1st year 26.8 %) and that others around the world were adequately aware of the challenges facing their country (4th year 39.7 %, 1st year 34.5 %).

Birthplace (high island (islands) versus low island (atolls) countries): While caution is warranted given the small sample of participants from atolls (low islands), it appears that these participants (compared to those living on high islands) are considerably more likely to report that their birthplace is in bad condition (71.8 vs. 37.3 %), that the seriousness of climate change is exaggerated (84.5 vs. 56.5 %), that science will 'find an answer' (54.8 vs. 34.9 %), that they know more about climate change than other people in the Pacific (67.6 vs. 27.8 %), and that their country's leaders were adequately aware of the climate change challenges facing their people this century (90.5 vs. 68.3 %). In contrast, a slightly larger proportion of participants from high islands believed that climate change is happening (98.6 vs. 95.8 %), while a considerably larger

proportion of this group were unsure whether their country's leaders were sufficiently aware of the challenges facing their people this century (17.1 vs. 9.5 %).

Sources of information regarding climate change

Age: A significantly larger proportion of older students reported reading materials supplied by all sources as noted in Table S2. Consistent with this finding, a significantly smaller proportion of older students reported they had read none of these resources (5 vs. 8 %). A larger proportion of older students reported they had been to many lectures and/or tutorials in which climate change was discussed (34.6 vs. 17.9 %) and that they discussed climate change with their friends outside the classroom (41.7 vs. 26.7 %).

Gender: There were no significant differences regarding the sources of reading materials, by gender, as shown in Table S2.

Year: There were consistent differences in responses between fourth-year (postgraduate) students and undergraduate/other students in the nature of their responses pertaining to sources of information regarding climate change. To illustrate, fourth-year students consistently reported the greatest engagement with a breadth of media, including television (4th year 95.2 % vs. 1st year 87.6 %) and newspapers (97.6 vs. 93.0 %), and climate change-specific reading materials provided by the variety of sources (e.g. Pacific Islands Forum Secretariat 62.4 vs. 41.6 %) in Table S2.

Birthplace (high island (islands) versus low island (atolls) countries): Notwithstanding sample size differences, a significantly larger proportion of participants from atolls than islands reported reading materials about climate change produced by the Pacific Community (7 in 10 participants), the Forum Fisheries Agency (5 in 10 participants), and the Pacific Conference of Churches (3 in 10 participants). In addition, a significantly larger proportion of participants from atolls reported that they discussed climate change with their friends outside the classroom (55.6 vs. 33.5 %), that climate change had been discussed in the community in their birthplace (87.3 vs. 69.6 %), and that the majority of the community felt worried about climate change (65.1 vs. 42.7 %).

Trust in sources of information

Age: There were no significant differences by age regarding the extent of trust in the various sources of information summarised in Table S2.

Gender: There was a significant difference in the extent to which participants trusted statements about climate change issued by scientists, with a larger proportion of males (49.2 vs. 42.5 %) trusting while a considerably larger proportion of females (4.1 vs. 1.5 %) not trusting this information.

Year: A significantly smaller proportion of fourth-year students reported trusting the media statements regarding climate change (4th year 27.4 % vs. 1st year 51.7 %) and trusting statements regarding climate change by church leaders (33.3 vs. 44.4 %). Unsurprisingly, these students also reported the greatest exposure to climate change in classes at USP (50.4 vs. 12.2 %) and the most discussion with their friends outside the classroom (50.4 vs. 27.4 %). The majority of fourth-year students reported community members experienced mixed feelings in recent discussions regarding climate change (60.0 vs. 45.9 %).

Birthplace (high island (islands) versus low island (atolls) countries): Notwithstanding the large sample size differences, a considerably larger proportion of participants from atolls trust what is said about climate change by Pacific Island government leaders (51.6 vs. 20.9 %).

Findings by amount of trust in sources of information

Table S3 summarises the participant responses to perceptions regarding environment, climate, and self-efficacy, examined by the key demographic characteristics of age, gender, year, and birthplace. While sample sizes are small by comparison, with the majority of participants showing some ambivalence ('middle' response options) regarding whether they trust or do not trust, the results will be discussed with a focus on participants who *do not trust* these important sources of information as an important insight into potential avenues of intervention.

Trust in government leaders: A significantly smaller proportion of the participants who stated that they *do not* trust government leaders report that climate change is exaggerated (40.7 vs. 67.5 %) and that science will find an answer (21.6 vs. 48.8 %), compared to those who stated that they *do* trust government leaders. A significantly smaller proportion of these participants, compared to those who do trust their government leaders, reported that they can make a difference themselves (85.4 vs. 94.1 %), that climate change is important for Pacific Islanders (96.4 vs. 99.6 %), and that the rest of the world is aware of the challenges facing Pacific people at the moment (22.9 vs. 38.2 %), and believed that their country's leaders were aware of the challenges that face their people this century (44.6 vs. 84.1 %).

Trust in media: A significantly smaller proportion of participants who stated that they *do not* trust the media stated that the natural environment was good (2.9 vs. 10.5 %), in comparison with those who *do* trust the media. A significantly smaller proportion of participants who do not trust the media agreed that climate change was

exaggerated (42.4 vs. 64.5 %), that science will find an answer (21.4 vs. 41.9 %), and that they can (71.9 vs. 89.7 %)—and indeed had a responsibility to (90.9 vs. 97.4 %)—make a difference with respect to climate change. These participants also felt they knew less about climate change than participants who trusted media (82.3 vs. 89.1 %) and did not feel as strongly regarding the importance of climate change for Pacific Islanders ('extremely important' 54.58 vs. 91.2 %), while a significantly greater proportion of these participants believed that their country's leaders were unaware of the precise nature of the climate change challenges facing their people (27.3 vs. 9.0 %).

Trust in scientists: Of the participants who stated that they *do not* trust scientists, a significantly larger proportion of participants were ambivalent regarding the condition of the natural world (43.8 vs. 19.5 %), and only one in seven participants believed that science will find an answer (compared to one in two participants who do trust science). These participants also reported they had less knowledge regarding climate change compared to other people in the Pacific ('know a lot' 28.1 vs. 34.1 %) and ranked climate change as generally less important ('extremely important' 68.8 vs. 89.5 %) than participants who do trust scientists.

Trust in church leaders: Of the participants who stated that they *do not* trust church leaders, a significantly larger proportion of participants were neutral regarding whether climate change is happening (3.2 vs. 0.3 %), disagreed that climate change is exaggerated (53.8 vs. 25.4 %), disagreed that they could make a difference with respect to climate change (14.1 vs. 1.5 %), rated climate change as of less importance ('extremely important' 75.8 vs. 90.4 %), and that their country's leaders were not aware of the precise challenges that face their people (28.3 vs. 9.6 %) than participants who reported that they trusted church leaders.

Discussion

Perceptions regarding environment, climate change, and self-efficacy

In rating the condition of familiar (home) environments better than that of the world as a whole (Table 1), respondents demonstrate a common spatial optimism bias found in similar surveys (Gifford et al. 2009). The overwhelming belief that climate change is happening is no surprise given the disproportionate amount of attention the Pacific has received and the general negativism of climate change stories in local media (Dreher and Voyer 2015). Yet our finding that more than half (56 %) of respondents believe the seriousness of climate change to be exaggerated is less expected. It may be that this reflects spiritual beliefs, acknowledged as extremely important in Pacific Islanders' responses to climate change (Nunn et al. 2016), but perhaps also scepticism arising from individual observations of island (coastal) environments and media reports of their apparent state.

The observation (in Table S2) that older students are more likely to rate the global environment as bad and their birthplace as good shows that the spatial optimism bias in this sample is amplified with age. This bias is less pronounced in females who also were less prone to believing that climate change was exaggerated, a significant gender difference implying that females are more realistic about the condition of the environment and the challenges that face it than males. A similar effect is found with level of study, with more experienced students less likely to believe that climate change is exaggerated, a likely and expected outcome of time exposed to university curricula which specifically discuss climate change and its implications for Pacific Islanders. Respondents born on atolls (rather than high islands) were more likely to rate their home environments as being in a 'bad' condition, perhaps an effect of both the vulnerability of atoll islands to sea level rise and the manifest problems associated with their growing population densities (Connell 2011). Inconsistent with this finding, however, atoll islanders were much more likely to believe the seriousness of climate change is exaggerated, a surprise outcome considering their observations of recent environmental change as well as media representation of atoll islands as being on the 'front line' in terms of experiencing climate change impacts (Connell 2015).

A pessimism regarding the ability of science to deal with climate change (only 31.5 % of respondents [Table 1] agree that science will find a solution) is suggestive of an underlying fatalism, possibly also strengthened by faith in divine providence, about the long-term challenge posed to Pacific environments and livelihoods by climate change. This finding highlights an opportunity for adaptation policy development namely that more optimistic messaging may encourage the adoption of solutions. The belief that science will find an answer to climate change attenuates from Year 1 to Year 4 students, likely to be an effect of increasing exposure to the complex nature of the challenge. Atoll islanders were far more likely to believe that science will succeed in finding an answer than respondents from higher islands, who may be exhibiting some degree of complacency, a reflection of a psychological distancing from reality (Jones et al. 2016; Nunn et al. 2016; Spence et al. 2012). A high degree of self-efficacy (88–96 % of respondents feel personally responsible for acting) may seem to contradict the inference of an underlying fatalism, but this may also reflect the dichotomy that many western-educated Pacific Islanders face between traditional beliefs that defer responsibility to deity and/or community, and

science-grounded beliefs that support adaptive action as part of a global effort (Lauer et al. 2013).

The finding of a superior knowledge of climate change compared to other Pacific Islanders is expected, given respondents' exposure to university curricula, as is the assessment of the overwhelming importance of climate change. The fact that almost 70 % of respondents thought that national leaders of Pacific Island countries were adequately aware of the challenges their people faced from climate change is likely a reflection of the publicity generated by leaders in international contexts (Farbotko and McGregor 2010; Robie 2014). However, based on the information presented in Table S2, respondents' belief in their leaders' awareness reduces from Year 1 to Year 4, implying that education may increase cynicism about national leaders' awareness. The idea that people elsewhere in the world are mostly unaware of what is actually confronting Pacific people from climate change may reflect the disparity which has been recognised between international and domestic messaging and responses about climate change in Pacific Island countries (Farbotko and Lazrus 2012).

Sources of information and trust

Most respondents have been exposed to climate change issues through various media sources (television, newspaper, radio) and only a small minority (3 %) completely distrust media messages. This represents another opportunity for intervention, namely improving the balance and the quality of climate change messaging in Pacific Island media, given the fact that 'few Pacific [Island-based] journalists provide adequate background or … the context that is needed to make sense of a news or current affairs development' (Robie 2008: 224). This has resulted in a situation where 'the voices of Pacific Islanders are rarely heard … and climate change impacts in the Pacific are usually framed in ways that centre the interests and concerns of more powerful countries' (Dreher and Voyer 2015: 59).

With the exception of the university where respondents are studying, only around half have read climate change materials published by regional agencies charged with disseminating accurate information on the subject. This finding suggests that these agencies need to examine the efficacy of their dissemination methods. Such methods are likely to be much less effective with rural people in the Pacific in particular, yet their uptake with this group could perhaps be enhanced through the production of published materials in vernacular languages (Nunn 2009). Such an intervention is also likely to benefit the evidence-based discussion of climate change in (rural) Pacific communities, a subject often discussed yet characterised by a range of views. It is noteworthy, however, that participants may have exposure to information from other sources—particularly online—that were not captured in the survey, and as such, additional sources of information merit exploration in future research. Notwithstanding this limitation, as would be expected, more senior students have seen more television programmes about climate change and read more materials produced by regional agencies on the topic (see Table S2). In addition, it is not simply a matter of identifying the best channels for reaching different audiences, but also crafting messages that resonate with those audiences (Hine et al. 2014, 2016).

A high level of trust in Pacific Island leaders' (elected national leaders including politicians and church leaders) ability to take appropriate action in the face of climate change is positive yet does not apply to 'government leaders' (unelected career civil servants), meaning those in government charged with enacting and enforcing climate change policies are less trusted by the very people they are trying to protect from the impact of climate change. This finding undoubtedly reflects the inability of most Pacific Island governments to effectively communicate these policies to every community in the nation, especially ones that are archipelagic in nature, something that has led to calls for future capacity building by external (donor) partners to focus on empowering community decision-makers rather than central government (Nunn et al. 2014). An increasing distrust in Pacific leaders' commitment to take appropriate action is shown with year of study (Table S2), probably reflecting increased respondent exposure to materials challenging this commitment. The significantly higher level of trust in atoll nation leaders compared to those from high island countries (52 % compared to 21 % in Table S2) may reflect the way that the former group has led island nations in international fora as well as their focus on practical solutions, such as negotiations with other island leaders for resettlement of exposed populations (Connell 2012).

Our analyses also show that scientists and church leaders are generally more trusted when it comes to climate change messaging than any other group. It is no surprise that university students are impressed by scientists' views because they encounter them often; just 20 % of respondents stated that they had never done so since they had been studying at university. The trust in church leaders, which might have been suspected to differ from trust in scientists, is likely to reflect the fact that the respondents remain spiritually engaged while studying at university; over 80 % reported that they attended religious services at least weekly (Nunn et al. 2016).

Owing to its cross-cutting nature, the discussion of Table S3 is kept separate from that of Tables 1 and S2 above. Looking only at the statistically significant relationships in the 'do not trust' categories in Table S3, it can

be seen that respondents who do not trust media information about climate change are less likely to judge the global environment as being in a 'good' condition, something that reflects the generally negative media messaging on this topic (see above). Similarly, respondents lacking trust in scientists are less likely to rank the global environment as 'good', perhaps because of heightened dependence on media (or other less evidence-based) information sources. In relation to the rating of home environments, respondents lacking trust in media are more likely to rank these environments as 'good', which is likely to be a reaction to perceived media negativity as well as observations of little-impacted environments. In addition, the minority of respondents (8 %) who do not trust church leaders' climate change messaging are more likely to question whether climate change is actually happening, perhaps a transference of doubt from the spiritual to the environmental.

Respondents lacking trust in national/government leaders are far more likely to believe that the threat of climate change is not exaggerated. Although the level of mistrust was very low, some general trends may be noteworthy. For example, respondents who did not trust their government leaders, church leaders, or the media were much more likely to disagree that climate change reports had been exaggerated, compared to those respondents who reported some trust. Conversely, respondents who did place trust in these sources were much more likely to agree that climate change reports had been exaggerated. The roots of these analyses are likely to lie in a belief across the respondent population that governments exaggerate the seriousness of climate change, an interpretation that is consistent with the growing comment on the sidelining of indigenous Pacific resilience—which has allowed people to survive in these comparatively marginal situations for millennia—in the expression of the climate change 'problem' and the development of future adaptive strategies (Campbell 2009; Farbotko 2005; McMillen et al. 2014; Schwarz et al. 2011).

With all four sources of messaging shown in Table S3, there are statistically significant relationships between the numbers of respondents who disagree/agree with the statement that science will find an 'answer' to climate change. For those who do not trust government/media/science messaging, the results are similar; a majority does not believe science will find an answer before climate change becomes a big problem. This result suggests a lack of faith in secular messaging, particularly, when examining the responses of those who *do* trust these sources: the overwhelming majority agreeing that science *will* find an answer to climate change.

In terms of the self-efficacy questions, it is clear that the lower degree of personal commitment to 'reducing' climate change among those who do not trust church messaging (and the concomitant higher degree by those who do) speaks to the strength of 'church as community' that is such a dominant characteristic of Pacific Island Christianity (Thornley 2008; Winch-Dummett 2010). Relatedly, there are two sets of statistically significant relationships in the answer to the question that self-assesses knowledge about climate change in Table S3. Respondents who do not trust scientists are twice as likely as those who do not trust the media to state that they do not know much about climate change compared to other people in the Pacific. This implies that scientific messaging is more consistent, as would be expected, than media messaging; in other words, if you do not trust scientists, then the diversity of views available from other sources (especially media) is bewildering. This underlines the point, made earlier, that there is room for more evidence-based media messaging in the Pacific.

In Table S3, it is interesting to note that a majority of respondents—irrespective of whether or not they trust particular information sources—believe climate change to be 'extremely important' for Pacific Islanders, demonstrating that there is a background belief in the importance of climate change within the sample population that cannot be dislodged by any particular messaging source. It would be interesting to explore whether such a background view exists in other populations in the Pacific Islands, which might mean it was cultural, or whether it is confined to this elite group, suggesting it may be a result of education. Within the analyses relating to this question, the figures for those rating climate change as an extremely important issue and yet who do not trust the media are much lower than for other information sources; just 54.5 % compared to 75.9 % for government, 69 % for scientists, and 76 % for church. This again speaks to the comparative diversity of media messaging compared to other information sources, something that in this instance does not convince people of the importance of the issue.

Not surprisingly, respondents who distrust government messaging about climate change have less faith in government leaders' awareness of the associated challenges; 45 % compared to 55 % for those who distrust media, and 54 % for those who distrust church messaging. In the next question in Table S3, for respondents who distrust government messaging, there are significant differences between those who believe people elsewhere in the world are aware of climate change challenges in the Pacific and those who are not. Respondents who distrust government sources are much more likely to state that people beyond the Pacific do not understand the challenges facing its inhabitants than respondents who trust government messaging; the difference for the former group is 54 % (No) and 23 % (Yes) compared to the latter group which is 36 % (No) and 38 % (Yes). A plausible interpretation of this is that respondents who distrust government messages consider that they do not communicate the actual state of the

Pacific to the outside world, whereas those who trust government messages are evenly split, a situation perhaps more attributable to the reception of those messages than their content.

Concluding remarks

While impossible to demonstrate conclusively, we believe our survey to have captured views about climate change that are representative of students at the University of the South Pacific in 2013, future Pacific Island leaders and decision-makers, and to some extent Pacific Islanders more generally. The sample is proportional to the USP student population at time of survey in terms of country of origin, gender, level, and faculty of study. If there is sample bias, it probably favours future leaders if it is assumed that they would be more interested than others in participating. Perhaps the weakest link is between our sample (highly educated, urban-dwelling, and globally exposed) and Pacific Islanders as a whole.

The perceptions regarding environment, climate change and self-efficacy, and the nature and extent of trust in multiple sources of information including media, scientists, government leaders, and church leaders have revealed important considerations for effective intervention which supports Pacific Islanders efforts to adapt and minimise the impacts of climate change. Climate change messaging needs to reach all Pacific Islanders, with materials provided by trusted sources in vernacular languages. The finding that female Pacific Islanders were more realistic regarding the condition of their environment and the challenges facing their nations suggests that interventions should support the perceptions of females while attempting to scaffold more realistic appraisals by male Pacific Islanders. The finding that a significantly smaller proportion of female Pacific Islanders do not trust scientists highlights the inherent complexity of climate change intervention. In addition, adaptation policy could feature optimistic messaging to encourage adoption of solutions proffered by multiple sources in the Pacific Islands region.

Acknowledgments Special thanks to Research Assistant Ms Jamie Caldwell for her assistance with the analysis of the data. The first author is supported by a National Health and Medical Research Council Research Fellowship. This research was funded by both the University of the Sunshine Coast and the University of New England.

References

Campbell JR (2009) Islandness: vulnerability and resilience in Oceania. Shima Int J Res Isl Cult 3:85–97

Connell J (2011) Elephants in the Pacific? Pacific urbanisation and its discontents. Asia Pacific Viewpoint 52:121–135. doi:10.1111/j.1467-8373.2011.01445.x

Connell J (2012) Population resettlement in the Pacific: lessons from a hazardous history? Aust Geogr 43:127–142. doi:10.1080/00049182.2012.682292

Connell J (2015) Vulnerable Islands: climate change, tectonic change, and changing livelihoods in the Western Pacific. Contemp Pac 27:1–36

Dreher T, Voyer M (2015) Climate refugees or migrants? Contesting media frames on climate justice in the Pacific. Environ Commun J Nat Cult 9:58–76. doi:10.1080/17524032.2014.932818

Farbotko C (2005) Tuvalu and climate change: constructions of environmental displacement in the Sydney Morning Herald. Geogr Ann Ser B Hum Geogr 87B:279–293. doi:10.1111/j.0435-3684.2005.00199.x

Farbotko C, Lazrus H (2012) The first climate refugees? Contesting global narratives of climate change in Tuvalu. Glob Environ Change Hum Policy Dimens 22:382–390. doi:10.1016/j.gloenvcha.2011.11.014

Farbotko C, McGregor H (2010) Copenhagen, climate science and the emotional geographies of climate change. Aust Geogr 41:159–166. doi:10.1080/00049181003742286

Gifford R, Scannell L, Kormos C, Smolova L, Biel A, Boncu S, Corral V, Guentherf H, Hanyu K, Hine D, Kaiser FG, Korpela K, Lima LM, Mertig AG, Garcia Mira R, Moser G, Passafaro P, Pinheiro JQ, Saini S, Sako T, Sautkina E, Savina Y, Schmuck P, Schultz W, Sobeck K, Sundblad E-L, Uzzell D (2009) Temporal pessimism and spatial optimism in environmental assessments: an 18-nation study. J Environ Psychol 29:1–12. doi:10.1016/j.jenvp.2008.06.001

Hay JE (2013) Small island developing states: coastal systems, global change and sustainability. Sustain Sci 8:309–326. doi:10.1007/s11625-013-0214-8

Hine DW, Reser JP, Morrison M, Phillips WJ, Nunn P, Cooksey R (2014) Audience segmentation and climate change communication: conceptual and methodological considerations. Wiley Interdiscip Rev Clim Change 5:441–459. doi:10.1002/wcc.279

Hine DW, Phillips WJ, Cooksey R, Reser JP, Nunn P, Marks ADG, Loi NM, Watt SE (2016) Preaching to different choirs: how to engage audiences that are dismissive, uncommitted or alarmed about climate change. Glob Environ Chang 36:1–11. doi:10.1016/j.gloevncha.2015.11.002

Hmielowski JD, Feldman L, Myers TA, Leiserowitz A, Maibach E (2014) An attack on science? Media use, trust in scientists, and perceptions of global warming. Public Underst Sci 23:866–883. doi:10.1177/0963662513480091

Jones C, Hine DW, Marks ADG (2016) The future is now: reducing psychological distance to increase public engagement with climate change. Risk Anal. doi:10.1111/risa.12601

Lauer M, Albert S, Aswani S, Halpern BS, Campanella L, La Rose D (2013) Globalization, Pacific Islands, and the paradox of resilience. Glob Environ Change Hum Policy Dimens 23:40–50. doi:10.1016/j.gloenvcha.2012.10.011

Leiserowitz A, Maibach E, Roser-Renouf C, Feinberg G, Rosenthal S (2015) Climate change in the American mind: March, 2015. Yale University and George Mason University, New Haven

McMillen HL, Ticktin T, Friedlander A, Jupiter SD, Thaman R, Campbell J, Veitayaki J, Giambelluca T, Nihmei S, Rupeni E, Apis-Overhoff L, Aalbersberg W, Orcherton DF (2014) Small islands, valuable insights: systems of customary resource use and resilience to climate change in the Pacific. Ecol Soc 19:article 44.doi:10.5751/ES-06937-190444

Mimura N, Nurse L, McLean RF, Agard J, Briguglio L, Lefale P, Payet R, Sem G (2007) Small islands. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE (eds) Climate

change 2007: impacts, adaptation and vulnerability. contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge, pp 687–716

Nunn PD (2009) Responding to the challenges of climate change in the Pacific Islands: management and technological imperatives. Clim Res 40:211–231. doi:10.3354/cr00806

Nunn PD (2013) The end of the Pacific? Effects of sea level rise on Pacific Island livelihoods. Singap J Trop Geogr 34:143–171

Nunn PD, Aalbersberg W, Lata S, Gwilliam M (2014) Beyond the core: community governance for climate-change adaptation in peripheral parts of Pacific Island Countries. Reg Environ Change 14:221–235. doi:10.1007/s10113-013-0486-7

Nunn PD, Mulgrew K, Scott-Parker B, Hine DW, Marks ADG, Mahar D, Maebuta J (2016) Spirituality and attitudes towards Nature in the Pacific Islands: insights for enabling climate-change adaptation. Clim Change. doi:10.1007/s10584-016-1646-9

Nurse L, McLean R, Agard J, Briguglio LP, Duvat V, Pelesikoti N, Tompkins E, Webb A (2014) Small islands. In: Barros VR et al. (eds) Climate change 2014: impacts, adaptation, and vulnerability. Part B: regional aspects. Contribution of working group II to the fifth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge

Robie D (2008) Frontline reporting, ethos and perception: media challenges in the South Pacific. Asia Pac Viewp 49:213–227. doi:10.1111/j.1467-8373.2008.00371.x

Robie D (2014) 'Carbon colonialism': pacific environmental risk, media credibility and a deliberative perspective. Pacific J Rev 20:59–76

Schwarz A-M, Béné C, Bennett G, Boso D, Hilly Z, Paul C, Posala R, Sibiti S, Andrew N (2011) Vulnerability and resilience of remote rural communities to shocks and global changes: empirical analysis from Solomon Islands. Glob Environ Change 21:1128–1140. doi:10.1016/j.gloenvcha.2011.04.011

Spence A, Poortinga W, Pidgeon N (2012) The psychological distance of climate change. Risk Anal 32:957–972. doi:10.1111/j.1539-6924.2011.01695.x

Thornley A (2008) Globalization and the Re-shaping of Christianity in the Pacific Islands. J Pac Hist 43:126–128

van Aalst MK, Cannon T, Burton I (2008) Community level adaptation to climate change: the potential role of participatory community risk assessment. Glob Environ Change 18:165–179. doi:10.1016/j.gloenvcha.2007.06.002

Winch-Dummett C (2010) Christianity and cultural reconfigurations in South West Pentecost. Oceania 80:78–101