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Climate actions by climate and non-climate researchers

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Tackling climate change requires both systemic changes and individual lifestyle changes. Are those best placed to understand the risks and solutions to climate change acting on their knowledge? In a large-scale study of $N = 9220$ researchers across 115 countries, we found that climate researchers reported engaging in considerably more advocacy and activism on climate change and, to a lesser extent, high-impact lifestyle changes than non-climate researchers.

Despite dire warnings about the consequences of continuing on our current path[1], global action on climate change remains woefully inadequate[2,3]. How serious we perceive a situation to be is strongly influenced by whether people with extensive knowledge about it act accordingly[4,5]. In the context of climate change, this suggests that the actions of climate researchers can have a signalling effect on the public about the magnitude of the threat and the adequacy of different responses. Such actions include advocacy or activism to push governments and corporations to enact climate policies that can secure a livable future[6], and lifestyle changes, such as reducing air travel or adopting a plant-based diet[7–9]. Are climate researchers leading by example, engaging in advocacy and activism and making lifestyle changes more than their peers in other research areas?

Previous studies have focused only on the behaviour of climate researchers or investigated single actions. For example, a survey of 92 IPCC authors found that 66% reported engaging in climate advocacy and 21% reconsidered their lifestyle choices due to climate change[10], while another study found that climate researchers may fly slightly more than other researchers, despite taking more steps to reduce flying[11]. Here, we present a survey with a much larger scope, analyzing responses from $N = 9{,}220$ researchers from 115 countries, spanning all disciplines and career stages [for details, see ref. 12]. We examined a range of civic actions, from signing petitions to engaging in civil disobedience, and high-impact lifestyle choices, including reducing flying and switching to a plant-rich diet[7,8]. We were also able to contrast climate researchers with non-climate researchers, which are a useful baseline as climate and non-climate researchers are likely to be very similar (e.g., with respect to income and political orientation) apart from the nature of their expertise.

We found that climate researchers, defined here as researchers who reported that their research is *a great deal* related to climate change ($n = 1{,}565$), reported engaging in considerably more civic actions than non-climate researchers, defined here as researchers who reported that their research is *not at all* related to climate change ($n = 2{,}257$): 57% of climate researchers and only 9% of non-climate researchers reported engaging in advocacy on the issue; 37% of climate researchers reported engaging in legal climate change related protests compared to 14% of non-climate researchers; and a considerable number (18%) of climate researchers also reported engaging in civil disobedience (compared with 4% of non-climate researchers; see also Fig. 1). Overall, climate researchers reported engaging, on average, in twice as many civic actions as non-climate researchers (Fig. S1). Adjusting for background variables does not change the differences between climate and non-climate researchers (Fig. S1). Including researchers whose research was *a little*, *a moderate amount*, and *quite a bit* related to climate change in the analysis (total $N = 9{,}220$), we found that the more their research was related to climate change, the more they reported engaging in climate-related civic actions (Fig. S2).

The difference in lifestyle changes between climate and non-climate researchers was less pronounced (Fig. 1). For example, 57% (45%) of climate (non-climate) researchers said they had reduced their flying; 46% (38%) said they had switched to a mostly vegetarian or vegan diet; and 43% (36%) decided to have fewer or no children. On average, climate researchers reported engaging in about 1.2 times as many lifestyle changes as non-climate researchers (see Fig. S1). The more their research was related to climate change, the more researchers reported making lifestyle changes, except for switching to an electric vehicle and deciding to having fewer or no children (Fig. S2).

All actions are largely positively correlated with each other, which suggests that engaging in civic actions is not used as an "excuse" to avoid lifestyle changes. The exception is having fewer or no children, which shows considerably weaker correlations with the other behaviours (Fig. S3). This suggests that the decision to have fewer or no children is not perceived as a pro-environmental behaviour (or if it is, non-environmental factors dominate in making the decision). Interestingly, within the group of climate researchers differences in engagement exist, with climate researchers from the social and behavioural sciences largely engaging in more civic actions

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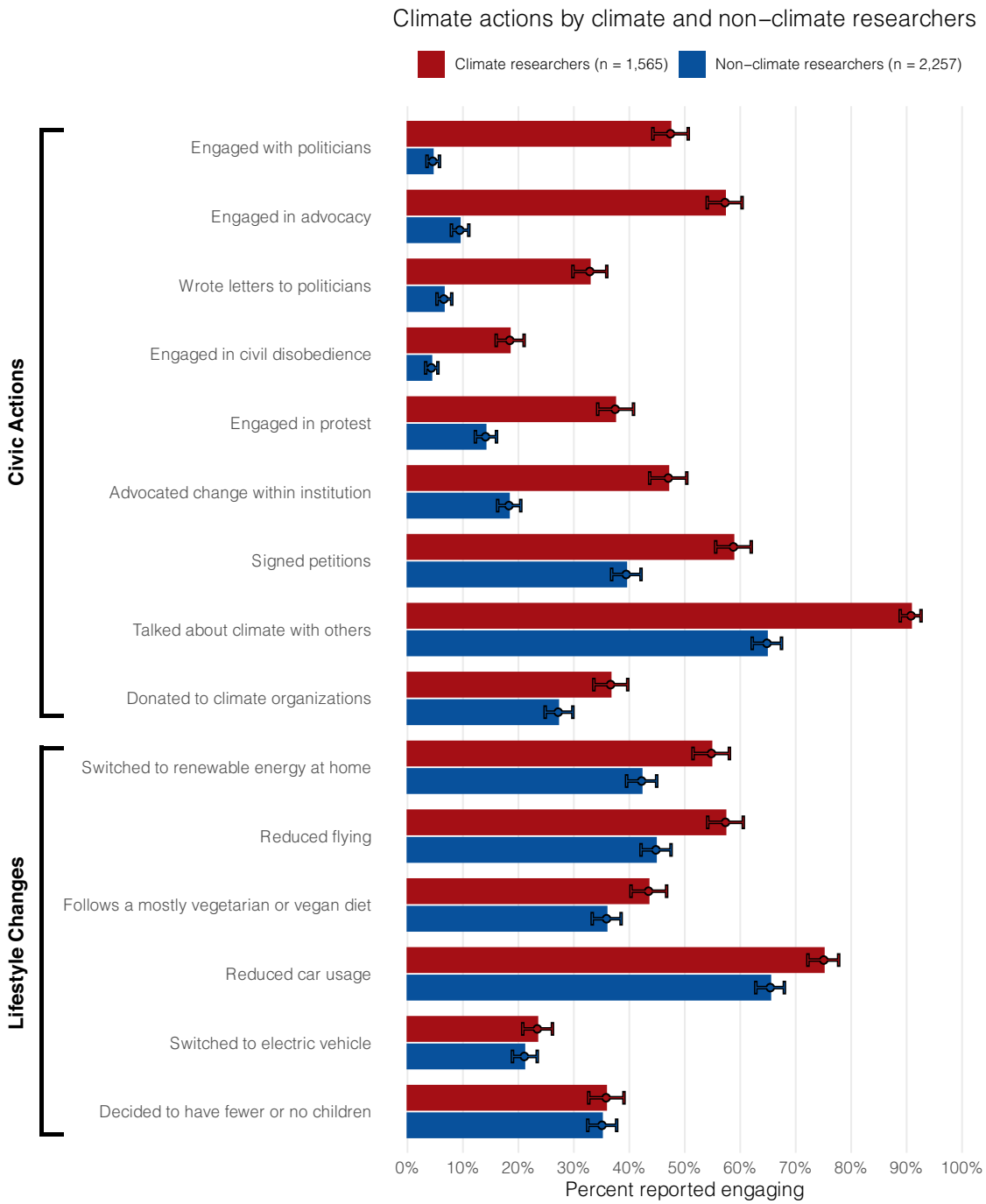

Fig. 1 | Climate actions by climate and non-climate researchers. Percentage of researchers who reported having engaged in a particular behaviour for researchers whose research is *a great deal* related to climate change (red) and researchers whose research is *not at all* related to climate change (blue). Points and error bars indicate posterior means and 99% credible intervals (see Methods). The actions are ordered according to the largest multiplicative difference between types of researchers.

and making more lifestyle changes than their peers from the natural sciences and those from professions and applied sciences (Fig. S4).

The large difference between climate and non-climate researchers in advocacy and activism and the much smaller difference in lifestyle changes can likely be explained as follows. First, note that taking action requires at least the intention and the opportunity to act. Climate researchers likely have a stronger intention to act than non-climate researchers given their knowledge about (the severity of and solutions to) climate change. Similarly, the opportunities to engage in some civic actions are much higher for climate researchers given their position in society. For example, it is not only easier for climate researchers to engage with policymakers or in climate advocacy, it may also be expected of them professionally. However, climate researchers also engage more in civic actions which are arguably not connected with their work commitments, such as protest and even civil disobedience. Non-climate researchers may lack the relevant knowledge or feel that it is not their role to engage[12]. However, the opportunities (and resources) to make lifestyle changes are likely very similar for both groups; for example, switching to a plant-based diet does not become easier when knowing about carbon budgets, and electric cars are equally expensive for all types of researchers. This line of reasoning is supported by the fact that the differences in lifestyle changes between climate and non-climate researchers largely disappear when taking into account how well informed researchers

perceive themselves to be about climate change, while this is not the case for civic actions (Fig. S1). Second, some of the lifestyle changes (e.g., switching to a plant-rich diet, having fewer or no children) are significant personal decisions that are more difficult to implement and require more sustained effort than many of the civic actions, and so we might generally expect smaller differences in the lifestyle domain.

Our observational study necessarily has a number of limitations. First, although our sample is reasonably well matched to the target population on a number of indicators such as h-index, number of citations, and number of publications [for details, see ref. 12], we did not have complete control over who responded to our survey. This implies that our sample is unlikely to be a representative sample of the international academic community. It is possible that researchers who are already engaged with climate change were more likely to respond to our survey, thereby inflating the absolute proportions of climate action. However, estimates of the relative differences in engagement between climate and non-climate researchers are less subject to this concern. Second, some items relate to reducing a climate-harmful behaviour, such as reducing air travel or car use. Even if climate researchers report having reduced such behaviours, this does not imply that they engage in less climate-harmful behaviour than their peers in other research areas [see e.g., ref. 11, for the case of flying]. Future research can improve on this by directly measuring the number of times the harmful behaviour is performed.

In the largest study of climate action by researchers to date, we found that climate researchers are much more engaged in civic action and, to a lesser extent, lifestyle changes than non-climate researchers. Our results thus suggest that a large part of the climate research community is trying to lead by example and address climate change beyond engaging in academic research. Differences were particularly pronounced for advocacy and activism, suggesting that there may be considerable scope for increased civic engagement by researchers who are not directly working on climate change but are still concerned about it. The specific type of civic engagement is important: researchers without relevant expertise should not advise policymakers on climate-related issues [e.g., refs. 13,14], but there are no obvious reasons why non-climate researchers should be less engaged than climate researchers in, for example, protest or advocacy for institutional change. However, there are significant barriers for researchers to engage in advocacy or protest[12] and more support is needed[15,16]. Importantly, although climate change advocates are perceived as more credible if they have made lifestyle changes[17,18], the difference between climate and non-climate researchers was considerably smaller for lifestyle changes and disappeared when adjusting for how informed researchers are about climate change. This points to the importance of structural barriers: the ability to adopt lifestyle changes such as reducing flying and switching to a plant-rich diet is strongly influenced by the dominant practices and structures of the academic workplace[19,20] and wider society[21]. Researchers from all disciplines can help change these practices and structures to secure a better future.

Methods

In this section, we include details on the data collection and the statistical inference. Tables S1 and S2 in the supplementary materials show frequencies and percentages for demographic and background variables for researchers whose research is *not at all* and *a great deal* related to climate change. Table S3 in the supplementary materials describes the item formulations used in the survey and the shortened name that is used to refer to them in the main text. Fig. S1-4 show additional analyses referred to in the main text.

Data collection

The study has been approved by the ethics committee of the University of Amsterdam (Netherlands), with protocol number FMG-925. All participants gave informed consent. For a complete description of the sample and the data collection methodology, see Dablander et al.[12].

Statistical inference

For statistical inference, we use the R package *brms*[22] to estimate Bayesian logistic regressions using weakly informative default priors[23]. The estimates from models with only one predictor (whether one is a climate researcher or not) are used in Fig. 1. Estimates from these models, and models with additional predictors, are also used in Fig. S1, which shows average predicted differences calculated via the R package *marginaleffects*[24,25]. Bayesian binomial regression models also using weakly informative default priors are used to estimate the number of civic actions and lifestyle changes for climate and non-climate researchers. Estimates from these models are reported in Fig. S1. For the statistical inference reported in Fig. S2, we used the *BayesFactor* R package[26]. We specified the following hypotheses:

$$\mathcal{H}_0 : \vartheta_1 = \vartheta_2 = \vartheta_3 = \vartheta_4 = \vartheta_5$$
$$\mathcal{H}_1 : \vartheta_1 \neq \vartheta_2 \neq \vartheta_3 \neq \vartheta_4 \neq \vartheta_5$$
$$\mathcal{H}_r : \vartheta_1 < \vartheta_2 < \vartheta_3 < \vartheta_4 < \vartheta_5 \ ,$$

where ϑ_i with $i \in \{1, \ldots, 5\}$ indicates the proportion of researchers whose research is *not at all* (ϑ_1), *very little* (ϑ_2), *a moderate amount* (ϑ_3), *quite a bit* (ϑ_4), and *a great deal* (ϑ_5) related to climate change. $\mathcal{H}_0$ and $\mathcal{H}_1$ are standard null and alternative hypotheses, while $\mathcal{H}_r$ expresses the belief that the proportion of researchers who engage in a particular action is increasing with increasing relatedness of one's research to climate change. We used an independent multinomial sampling scheme with uniform priors[27]. This estimation approach is also used for Fig. S4 (and would be virtually indistinguishable if we had used Bayesian logistic regressions using *brms* with weakly informative default priors). For all analyses, we ran two chains with 500 burn-in samples and 4,000 final samples each. Convergence using the R-hat statistic was established[28].

Data availability

All data and code to reproduce the analyses reported in this paper are available at https://osf.io/ju57g/?view_only=70226d341c324d3eb1936bc265bd5def.

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Author contributions

F.D. conceptualised the study with the help of M.S. and J.H., analysed the data, and wrote the original draft. F.D., M.S., and J.H. contributed to the methodology of the study, formal data analysis, and validation. F.D. and J.H. contributed to the data visualisations. F.D., M.S., and J.H. reviewed and edited the original draft.

Competing interests

The authors declare the existence of a non-financial competing interest. All authors have engaged in climate change advocacy or activism.

Additional information

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