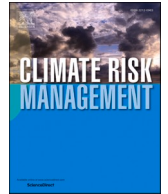




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## Climate Risk Management

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## Organisational perceptions of adapting to a changing climate

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## ABSTRACT

Organisations, in the private, public and third sectors, are critical stakeholders and actors in the governance of climate change adaptation. Understanding organisational perceptions of preparedness, risk and response to climate change is important for effective climate adaptation-focused actions and policy design. Our study focuses on two research questions: what factors influence adaptation actions by organisations?, and what do organisations mean by the term ‘adaptation’? To address these, we developed and analysed a national survey of UK-based organisations’ perceptions of adapting to a changing climate, administered in spring 2021 ( $n = 2,429$ ). Our findings confirm that awareness matters: respondents who reported that their organisation had high levels of concern about climate change risk or threat, and which had greater integration of adaptation within processes, are more likely to take adaptation action. In addition, we find a positive relationship between the occurrence and type of extreme event experienced and increased adaptation action by organisations. However, when asked about specific adaptation measures taken by organisations, examples of mitigation are more frequently mentioned compared to adaptation-type actions. Whether this may signal confusion or conflation of adaptation and mitigation by organisations requires further study. These findings offer critical insights into the perceptions of organisations as pivotal leaders of enacting responses to climate change. A renewed focus on organisational experiences, awareness, attitudes and capacity regarding adaptation can assist in better understanding how organisations can facilitate improved climate-resilient decision-making.

## 1. Introduction

With the impacts of climate change and climate variability increasingly evident, a focus on adaptation i.e., “adjustments in ecological, social or economic systems in response to actual or expected climatic stimuli and their effect,” (UNFCCC, 2023) is now essential. The Paris Agreement leads international policy on adaptation (Lesnikowski et al., 2016; United Nations, 2015) and a Global Goal on Adaptation, agreed upon at COP28 in December 2023, provides targets and a framework. However, to ensure a holistic adaptation approach, this global process should be complemented by national and sub-national policies and initiatives informed by an understanding of stakeholder awareness and factors influencing adaptation actions. Although much of the discussion and

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responsibility of climate action in this national process has centred on the role of governments, the perceptions and capacity of the public and various groups in responding to the societal impacts of climate change are also crucial (Mees et al., 2012; Petzold et al., 2023; Schneider, 2014; United Nations, 2015). Notably, organisations, including the private sector, are critical stakeholders and actors in collective action on adaptation, with climate change and variability having specific impact on organisational structure and operations (Berkhout et al., 2006; Linnenluecke and Griffiths, 2010; Winn et al., 2011). Despite this context, adaptive capacity in organisations is yet poorly understood (Busch, 2011; Herrmann and Guenther, 2017). This research addresses this knowledge gap by examining organisational perspectives on adaptation and related action.

While organisational “responses to climate change will always compete as a priority with other strategic or operational concerns” (Berkhout, 2012, p. 92), there is an imperative need to understand the nature of adaptation by organisations. This is important since there may be blind spots in how some organisations interpret and approach their context of risk and required adaptation measures (Gasbarro and Pinkse, 2016; Goldstein et al., 2018; Zhang and Maroulis, 2021), thereby impeding effective responses. Further, evidence of organisational maladaptation or adaptation that is socially undesirable due to its nature and/or speed requires greater focus, response and governance. Although research on the nature of private sector/corporate adaptation is sparse (Berrang-Ford et al., 2021; Hennes et al., 2024), there has been some consideration of adaptation progress within cities and urban spaces (Klein et al., 2018). As well, the focus on private sector engagement in adaptation as a catalyst for investment in economic development and vulnerability reduction has been reviewed (Biagini and Miller, 2013). Further, the private sector is also recognised to have a role in addressing the climate finance gap (Cao and Zheng, 2016; Crick et al., 2018; Pauw and Pegels, 2013; Pauw, 2015). However, broader research and empirical evidence of the factors which influence organisational adaptation remains limited (Brullo et al., 2024; Linnenluecke et al., 2013).

Historically, the United Kingdom has been at the forefront of climate change adaptation (Dessai et al., 2024). National processes seeking to support and promote broader adaptation include the UK Climate Change Act of 2008, the UK Climate Change Committee (CCC), three Climate Change Risk Assessment (CCRA) reports, three iterations of a National Adaptation Programme (NAP), and three rounds of an Adaptation Reporting Power (ARP) mechanism, all under the responsibility of the UK’s Department for Environment, Food & Rural Affairs (Defra) (Defra, 2022). Despite these policy instruments, continuous funding and capacity to implement adaptation has fluctuated, especially following the financial crisis in 2008 when the UK implemented a series of cuts to local government and services, which eroded the institutional capacity and political will to prioritise long-term climate vulnerabilities (Porter et al., 2015). To an extent, adaptation to climate change has undergone some policy reinvigoration through national level initiatives. For instance, within its campaign bid and ultimate presidency of the 2021 United Nations Climate Change Conference (COP26), the UK (in partnership with Italy) included adaptation (as well as loss and damage) as a key priority (UKCOP26, 2021). As well, there have been extensive climate-related developments in the financial sector with the work of the Task Force on Climate-related Financial Disclosures (TCFD) (succeeded in October 2023 by the International Financial Reporting Standards [IFRS]) (HM Treasury, 2023), the UK’s Roadmap towards mandatory climate-related disclosures (HM Treasury, 2020), the UK’s Green Finance Strategy (HM Government, 2023) and related Roadmap to sustainable investing (HM Government, 2021a), in addition to the UK’s Green Financing Framework (HM Government, 2021b). However, notwithstanding these initiatives, reviews by the CCC identify that “overall progress in planning and delivering adaptation is not keeping up with increasing risk” (CCC, 2021, p. 9), with the UK less prepared for a changing climate in 2021 than it was in 2016.

Comprehensively addressing adaptation requires raising awareness on climate change, recognising the factors influencing engagement and adoption of adaptation options, and understanding perceptions of climate change (Brechtin and Bhandari, 2011; Bruine de Bruin et al., 2021; Capstick et al., 2015; Capstick, 2013; Weber, 2016; Whitmarsh and Capstick, 2018; Wolf and Moser, 2011). There is already extensive literature on UK public (individual and social) awareness and perspectives on climate change risk and impacts (Burningham et al., 2008; Dessai and Sims, 2010; Lorenzoni et al., 2007; Palutikof et al., 2004; Pidgeon, 2012; Taylor et al., 2014b; Whitmarsh and Capstick, 2018). Specifically, research has shown that there is currently a high degree of concern about climate change by the British public (Ipsos MORI, 2022; Steentjes et al., 2020) and insights into public climate change risk perceptions and individual motivation to act on climate change (Tompkins and Eakin, 2012).

Further, a Defra-funded Programme of Research on Preparedness, Adaptation and Risk (PREPARE) that ran between 2012 and 2013 was designed to support the UK Government in developing its strategy on climate change adaptation policy, particularly its statutory programme of adaptation policies under the Climate Change Act (2008). The programme comprised several components relating to household and public perceptions, including research focus on the contribution and role of local and household-level adaptation, climate risk, resilience and adaptation expectations and motivations of the public, and equity and distributional impacts of climate change risks and adaptation options (Harcourt et al., 2019; Porter et al., 2014; Taylor et al., 2019, 2014a). Notably, the programme also offered insights into barriers and enablers to organisational and sectoral adaptive capacity via a survey conducted in 2012/2013 (PREPARE-2), itself built on a 2009/2010 baseline survey (PREPARE-1), targeted at organisational preparedness, adaptation, and risk perception (Evans, 2013; Ipsos MORI, 2010). While the 2012/2013 PREPARE study offered valuable context of how organisations at the time were preparing for climate change, threats and opportunities of climate change, as well as barriers and enablers to adaptation (Evans, 2013), these organisational perspectives of adaptation in the UK are now out-dated. Therefore, given the required investment in national adaptation plans and programmes, an understanding of how adaptation is being implemented by different actors is important for assessing progress and for improving the options and guidance available to support adaptation (Dessai et al., 2022, 2024; Jenkins et al., 2022).

As such, this research builds on past PREPARE research on organisations through an expanded survey, completed in 2021 and labelled ‘PREPARE-3’ (Dookie et al., 2021), to examine the perceptions of adaptation by organisations in the UK, including preparation for future physical risks of climate change and related influences and challenges. As with the previous PREPARE survey, we surveyed

across all four UK nations and retained the definition of ‘organisations’ to include the private sector/businesses, local authorities, public health, public educational establishments and the third/voluntary sector. (An outline of the PREPARE studies, the design and structure of PREPARE-3, and its headline findings are described in the [Supplementary Material](#).) This paper addresses a gap in the current literature on understanding adaptation action at the organisational level through the following two research questions:

- What factors influence adaptation actions by organisations?; and
- What do organisations mean by the term ‘adaptation’?

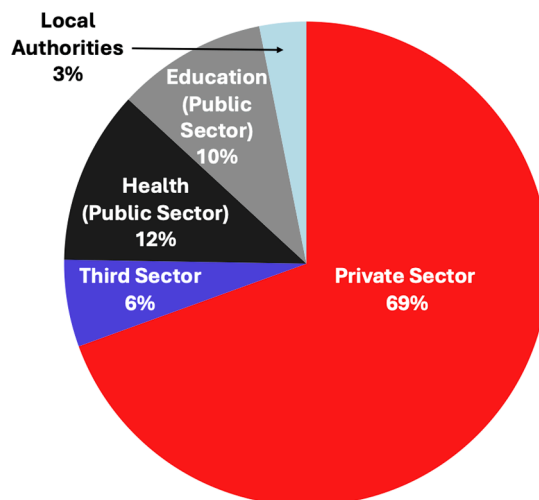
The first question examines a range of influences on adaptation action by organisations, while the second question was prompted by the responses received to the 2021 survey question “What adaptation measures has your organisation adopted or invested in?” and explores how organisations may perceive the concept of adaptation. The paper first describes the survey data and methods used for analysis, then details the results and analysis for each of the research questions. The paper concludes with a discussion of the main results and their contribution to understanding processes of organisational adaptation to climate change.

## 2. Data and methods

The dataset used in this analysis is compiled from the responses of the PREPARE-3 survey. Using our sample protocol, a contracted market research company was tasked with targeting respondents with functions/titles related to organisational planning (e.g., Planning or Risk Manager, Environmental Manager) using screening questions to identify suitable people. The survey was administered using the online platform Decipher. After piloting and quality control checks, post-survey screening and removals, the full sample was 2,429 individuals: 48 % identified as women, 52 % identified as men and 0.1 % opted not to indicate a gender. As shown in [Fig. 1](#), of the 2,429 total qualified completed surveys across all four UK nations, 69 % of the sample (1,687 individuals) indicated that they were based within the private sector, 12 % (282 individuals) within the public health sector, 10 % (243 individuals) within the public education sector, 6 % (141 individuals) within the third/charitable sector, and 3 % (76 individuals) from local government. Most of the sample were located in England (89 %), 6 % of respondents (142 individuals) in Scotland, 4 % (84 individuals) in Wales, and 2 % (39 individuals) in Northern Ireland. Within England only, a large proportion of the respondents indicated a location in the London area (26 % of the entire sample, or 29 % of the England sample). A selection of the relevant 2021 survey questions and description of characteristics of the respondents are offered in the [Supplementary Material](#).

Considering the limited research on organisational adaptation, we first sought to test and understand the relationship between various influences on adaptation actions taken or planned by organisations within the UK, through **Research Question 1: What factors influence adaptation actions by organisations?** Analysis for this question is based on statistical testing of the relationship between what we define as ‘adaptation action’ and different plausible influential factors. Adaptation action or (adaptation) action variables in this paper is based on the responses to three questions in PREPARE-3 regarding actions taken by organisations which relate to adaptation:

- Q18: *As far as you are aware, is your organisation generally taking any measures to deal with the physical risks of future climate change?* which we indicate as “taking general measures” in the analysis.
  - o This question was answered by all 2,429 respondents, with 543 (22 %) indicating “Yes”, 1479 (61 %) indicating “No”, and 407 (17 %) indicating “Don’t know”. We focus on those that only answer “Yes” or “No”.



**Fig. 1.** Pie Chart showing total survey respondents by sector.

- Q33: *Has your organisation allocated any budget and/or staff time to plan for and manage the risks of a changing climate?* (categorical variable) which we indicate as “allocating staff/budget to climate preparedness” within the analysis.
  - o All 2,429 respondents in the survey were first asked whether their organisation had thought about the kinds of risks or opportunities a changing climate could present (Q22), which we indicate as different levels of climate change planning. For those that indicated a minimum level of “We have looked at present and future threats and opportunities and thought about what to do about them”, they were then asked about their allocation of budget and/or staff time. This follow-up question was answered by 1,063 organisations who indicated that their organisation was advancing on planning for climate change, with 169 (16 %) indicating allocations to budget, 201 (19 %) indicating allocations to staff time, 480 (45 %) indicating allocations to both budget and staff time, 164 (15 %) indicating “No”, and 49 (5 %) indicating “Don’t know”.
- Q35: *Does your organisation have a climate change adaptation plan?* which we indicate as “having a climate adaptation plan” within the analysis.
  - o This question was answered by all 2,429 respondents with 393 (16 %) indicating “Yes”, 889 (37 %) indicating “No, but we are developing one”, 343 (14 %) indicating “No, but we have another climate/risk management plan which covers adaptation”, 662 (27 %) indicating “No”, and 142 (6 %) indicating “Don’t know”.

For these and other variables, we recoded binary and categorical variables using STATA and R before employing inferential statistics to test relationships between these adaptation action variables and factors of influence. Our selection of influential factors that may be related to adaptation action is focused on risk concern (Hennes et al., 2024; Patterson, 2021), awareness of climate risks and responses (Brullo et al., 2024; Patterson, 2021; Weber, 2016), exposure to and experiences of climate risks, in particular extreme events (Hennes et al., 2024; Patterson, 2021), key personnel’s (climate) awareness and risk perception (Hennes et al., 2024), as well as the general integration of risk management into corporate processes (Hennes et al., 2024). Here and throughout the analysis, we note that all references to statistical significance represent associations significant at the standard 95 % confidence level.

Analysis for **Research Question 2: What do organisations mean by the term ‘adaptation’?** stemmed from a primary analysis of the survey question *What adaptation measures has your organisation adopted or invested in?* (Q39), which was answered by 1,625 respondents. For this, we used content analysis to understand the responses ahead of coding. Content analysis in this paper refers to the “systematic and objective means to make valid inferences from verbal, visual, or written data in order to describe and quantify specific phenomena” (Bengtsson, 2016, p. 9). We first reviewed the open-ended responses to Q39 to identify the general content of the response. We then used deductive reasoning based on our pre-understanding of the climate change terms ‘adaptation’ (referring to developing solutions and implementing actions to respond to current and future climate change impacts) and ‘mitigation’ (referring to preventing or reducing greenhouse gas emissions) to code the text responses into the following themes:

- *Adaptation*, where responses were mostly related to adaptation-type terms including weather, flood, rain/water storage, heating, and air conditioning;
- *Mitigation*, where responses were mostly related to mitigation-type activities such as carbon, solar, energy, and recycling;
- *Adaptation & mitigation*, where responses were a mix of both adaptation and mitigation-type activities;
- *None/Don’t know/Unsure*, where the respondent indicated as such; and
- *Unclear*, when the response was vague.

We then cross-analysed these responses with respondents’ indication of climate change planning to get a sense of how different types of adaptation measures may be associated with different levels of climate change planning (as per Q22, which asked for the selection of how much the organisation had thought about the kinds of risks or opportunities a changing climate could present).

We also undertook exploratory analysis of barriers to adaptation as selected from a list of seventeen options in response to survey Q45 (see [Supplementary Material](#)) and evidence of adaptation action (taking general measures to deal with the physical risks of climate change (Q18), allocating any budget and/or staff time (Q33), and having a climate adaptation plan (Q35)). While certain barriers had a statistically significant association with more adaptation action, the interpretation of exactly what is meant by some of the ‘barriers’ was unclear. We also considered whether organisational climate adaptation actions, where taken, align with government support but found coefficient and effect sizes were mainly insignificant. We do not present these results here but note the importance of identifying barriers to adaptation action and therefore suggest further study or data collection would be worthwhile.

### 3. Results and analysis

The headline findings of the PREPARE-3 survey confirm that climate change is of concern to organisations, with most respondents mentioning that their organisations had been significantly affected by extreme weather events during the previous three years (the two most mentioned events were “a heavy downpour causing localised flooding” and “an intense heatwave lasting a week”.) While many of the impacted organisations (45 %) followed a pre-designed plan to deal with the extreme weather event, less than a quarter (22 %) of all respondents mentioned an awareness that their organisation was taking adaptation measures, i.e., to deal with the physical risks of future climate change. Further, a large majority (65 %) in the private sector said their organisation was likely not taking any measures to deal with the physical risks of future climate change. This paper further explores levels of association between various indicators representing respondents’ risk perceptions, experience of impacts and factors influencing responses to these impacts, as well as respondents’ understanding of reported ‘adaptation measures’, as presented below.

3.1. Research Question 1: What factors influence adaptation actions by organisations?

In this section we analyse the relationship between what we define as adaptation action and a variety of plausible and known influential factors: concerns about risks and threats, previous extreme weather event experience, previous extreme weather event impact, respondents' personal awareness of climate change, and integration of adaptation within organisational activities.

3.1.1. Factor 1: Concerns about risks and threats

Respondents were asked to indicate their current level of concern around 12 current and potential threats facing the UK. Four of the threats related to the economy: the economic downturn; the effects of Brexit; competition from organisations abroad; and competition from local or national organisations (the latter two were only presented to private sector-based respondents). Two of the threats related

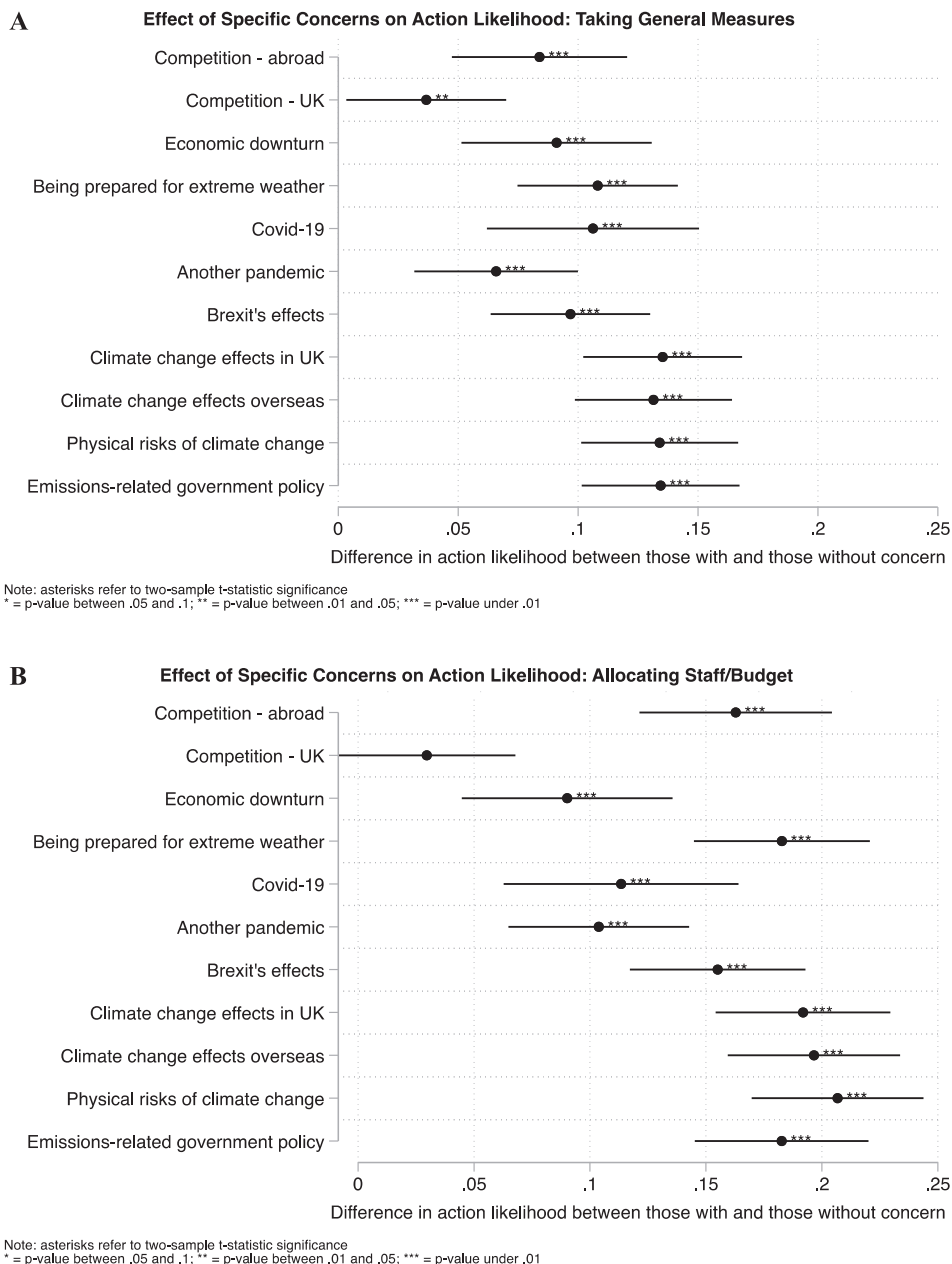
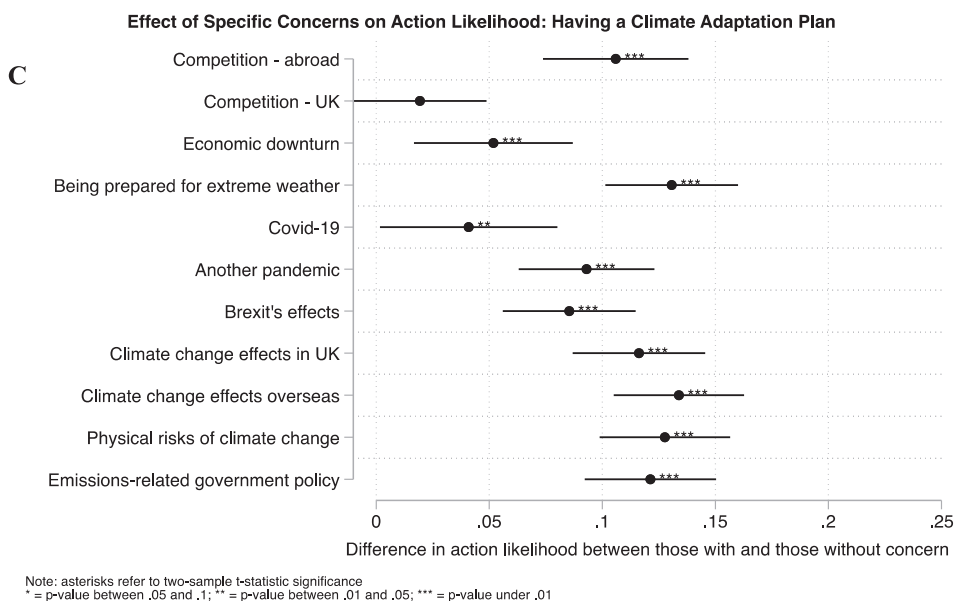


Fig. 2. Association between Risk/Threat Concern and Adaptation Action. Points & error bars represent the difference in the proportion reporting concerns listed in Q1, and those who did not, according to action variables as indicated by Q18 (panel A), Q33 (panel B) and Q35 (panel C). The statistical test used is a two-sample t-test. N=2429.

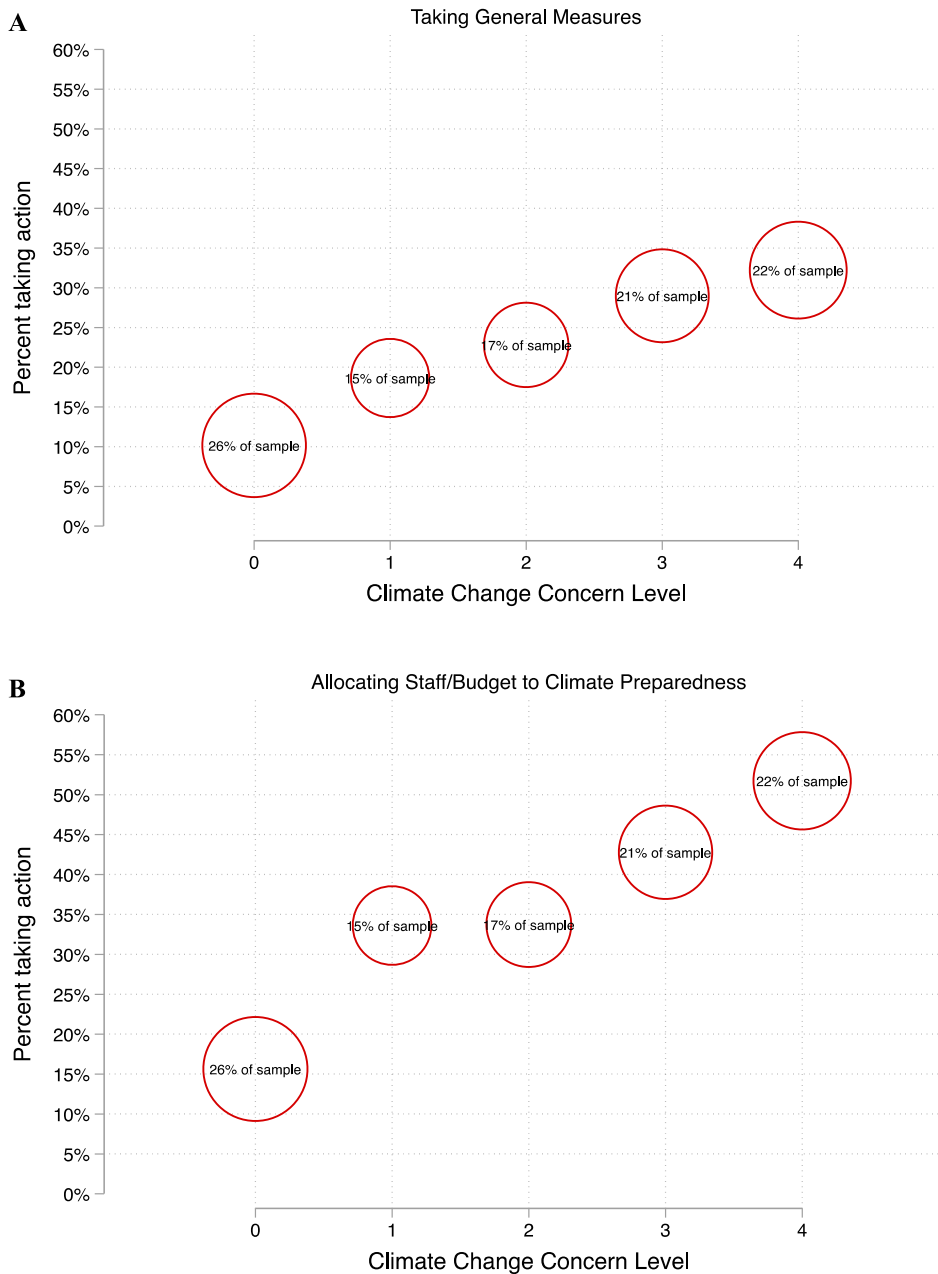


**Fig. 2.** (continued).

to the pandemic: the current situation and the possibility of another flu pandemic affecting staff. Five of the threats were climate-related: one focused on the effects of government policy to reduce greenhouse gas emissions (e.g., Net Zero targets) and the remaining four related to climate impact concerns, i.e. being prepared in case of extreme weather; the effects of climate change on the UK; the effects of climate change overseas on the UK; and the ability to withstand the physical risks of climate change (e.g., flooding and heat).

Fig. 2:A-C show tests of the 'difference in means', indicating that respondents with any of the concerns that relate to climate change have a higher statistically significant association with more adaptation action compared with respondents without these concerns, and those with non-climate change related concerns. For instance, Fig. 2:A depicts the difference in likelihood of taking general measures to deal with the physical risks of future climate change between respondents with and without an expressed risk/threat concern. As such, those concerned about the effects of climate change in the UK, climate change risks overseas, the ability to withstand physical risks of climate change, and emissions-related government policy are generally more likely to have taken some form of climate change adaptation-related measures. Fig. 2:B and 2:C show the difference in likelihood of allocating staff and/or budget to climate preparedness between those with and without the indicated risk/threat concern, and the difference in likelihood of having an adaptation plan between those with and without the indicated risk/threat concern, respectively. These plots show that those who are concerned about the physical risks of climate change, as well as climate change in the UK and overseas, are generally more likely to have taken some form of adaptation action in the form of staff/budget allocation and have an adaptation plan. These results also highlight that concern for being prepared for extreme weather has a higher statistically significant likelihood of adaptation action being taken.

Fig. 3:A-C shows climate adaptation action across respondents with varying climate concern levels based on the responses to four climate impact concerns (being prepared in case of extreme weather, the effects of climate change on the UK, the effects of climate change overseas on the UK, and the ability to withstand the physical risks of climate change, e.g. flooding and heat). The values indicated on the x-axis correspond to the count of climate impact concern items selected by each respondent, within a range of 0 (no climate impact concerns selected) to 4 (all 4 climate impact concerns selected). We find that those who selected more climate impact concerns, i.e., respondents that we consider having the highest level of climate concern, were six times more likely to mention their organisation having an adaptation plan compared to respondents who did not report any climate concern (Fig. 3:C). Respondents with more counts of climate impact concerns were over three times more likely to allocate further staff and/or budget as needed (Fig. 3:B), and three times more likely to take general measures (Fig. 3:A), compared to those who did not express concerns about climate change impacts.



**Fig. 3.** Comparing respondents with high and low levels of concerns about climate impacts and likelihood of taking adaptation action. The variable “Climate Change Concern Level” represents the total number of the four climate impact concerns in Q1 that a given respondent selected. Points on the x-axis correspond to the percentage of respondents for each concern level taking adaptation action. Bubble sizes correspond to what percent of the sample exhibited a given level of climate impact concern, with the centre of the bubble indicating the plotted coordinate. Action variables are indicated by Q18 (panel A), Q33 (panel B), and Q35 (panel C), respectively. All action likelihoods rise steadily with concern levels. For instance, maximally concerned respondents are approximately six times more likely to have a climate change adaptation plan than are minimally concerned respondents. N=2429.

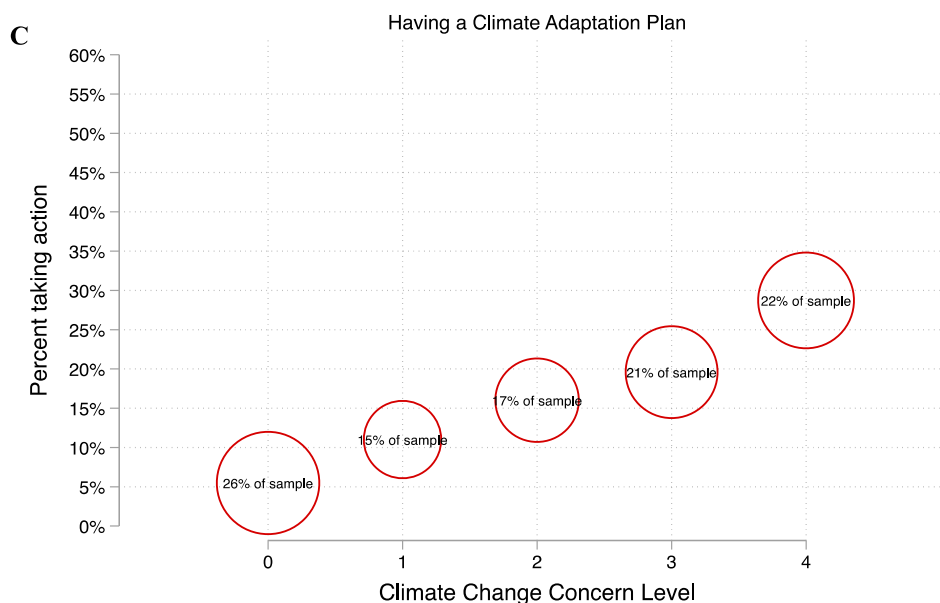


Fig. 3. (continued).

### 3.1.2. Factor 2: Previous extreme weather event experience

The PREPARE-3 survey asked respondents whether, in the last three years, their organisation had been significantly affected by extreme weather events including; a particularly warm summer, a particularly dry summer, an intense heatwave lasting a week, a very mild winter, a very wet, rainy winter, a heavy downpour causing localised flooding in their area lasting a few days, and/or severe coastal flooding. As shown in Fig. 4:A, through a test of the difference in means, we find that respondents with recent experience of certain types of events had a higher statistically significant association with more adaptation action compared with respondents without these experiences. Notably, respondents recording experiences of coastal flooding tend to have higher likelihood of taking more adaptation action, including general measures (Fig. 4:A), allocating staff and/or budget to climate preparedness (Fig. 4:B), and having a climate adaptation plan (Fig. 4:C).

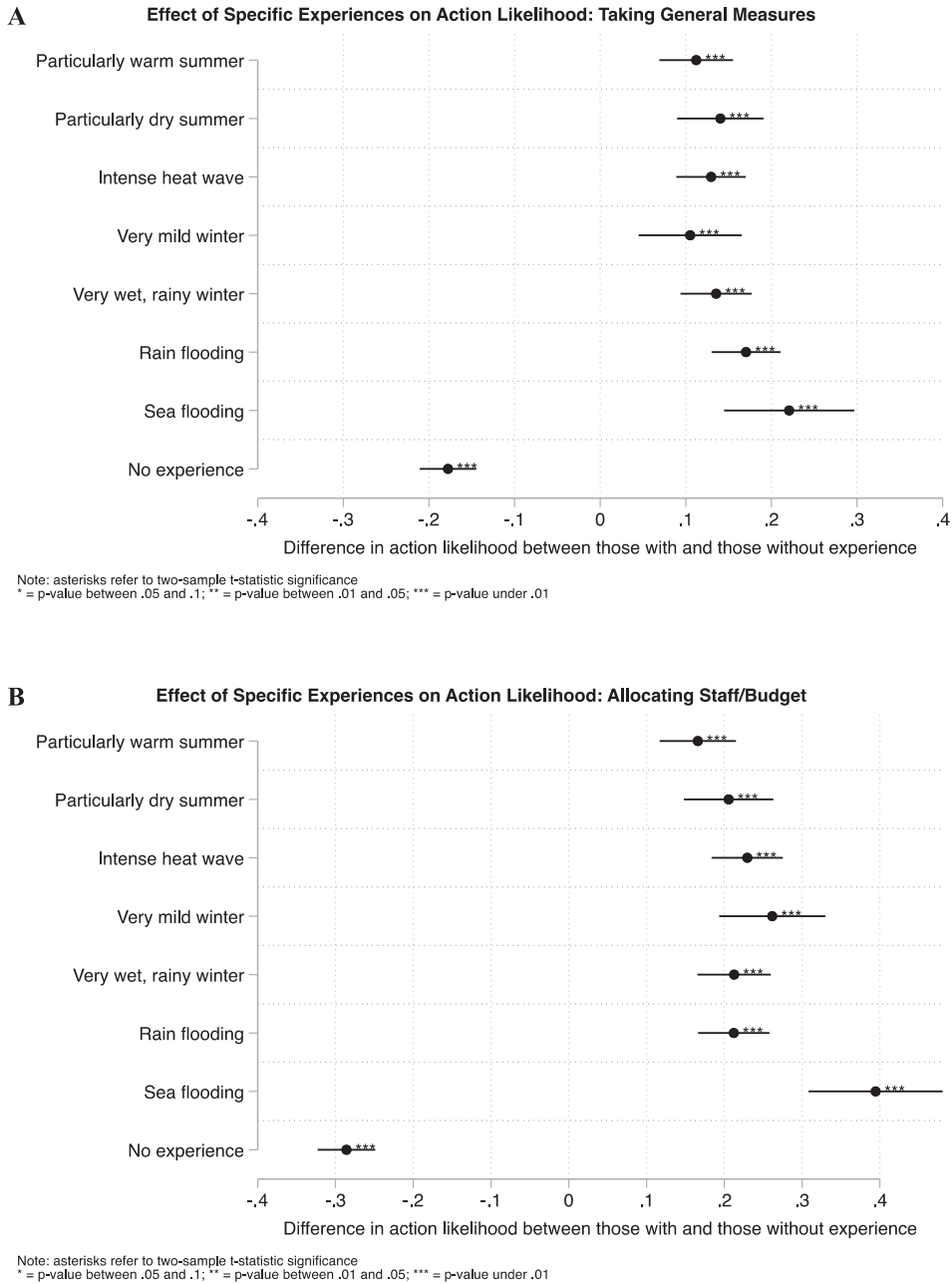
### 3.1.3. Factor 3: Previous extreme weather event impact

Following on from respondents' experiences of different types of extreme weather events, we asked those who reported being affected to indicate the impact of these events on various aspects of organisational function. These aspects included organisational logistics (e.g. supply chains, utilities, and transport), premises (e.g. maintenance, facilities management, or buildings), people (e.g. workforce or customers), processes (e.g. production or service delivery), finance (e.g. investment and stakeholder reputation), and/or markets (e.g. changing demand for goods and services). Fig. 5 illustrates the results of a test of the difference in means in the adaptation action of respondents who reported impacts of extreme weather events on their organisation and those who did not. In general, respondents that indicated impacts to organisational logistics and market demand were more likely to have taken adaptation action compared to others. There was also a positive and statistically significant association between the financial impacts of extreme weather events and the organisation's levels of staff/budget allocation to climate adaptation (Fig. 5:B) and presence of a climate adaptation plan (Fig. 5:C). However, statistically significant results were not found between the financial impacts of a previous extreme weather event and general measures taken to deal with the physical risks of future climate change (Fig. 5:A).

### 3.1.4. Factor 4: Personal awareness of climate change

Since the PREPARE-3 survey was only offered to persons who self-identified as having key functions/titles related to organisational planning, we valued their indication of personal awareness about climate change, with the options; 'a great deal', 'a fair amount', 'not very much', and 'nothing' (Q3). We cross-analysed these responses with the different organisational adaptation action indicators, as shown in the bar chart plots and associated chi-squared test of independence in Fig. 6. It highlights that those with a high personal awareness of the term climate change are more likely to be within organisations which have taken adaptation action.





**Fig. 4.** Association between Previous Experiences of Extreme Weather Events and Adaptation Action. Points & error bars represent the difference in the proportion who reported previous experience of extreme weather events (as identified in Q9), and those who did not (or, in the case of “No experience”, this represents the difference in the proportion who did not report previous experience compared to those who did), according to action variables as indicated by Q18 (panel A), Q33 (panel B) and Q35 (panel C). The statistical test used is a two-sample *t*-test. N=2429.

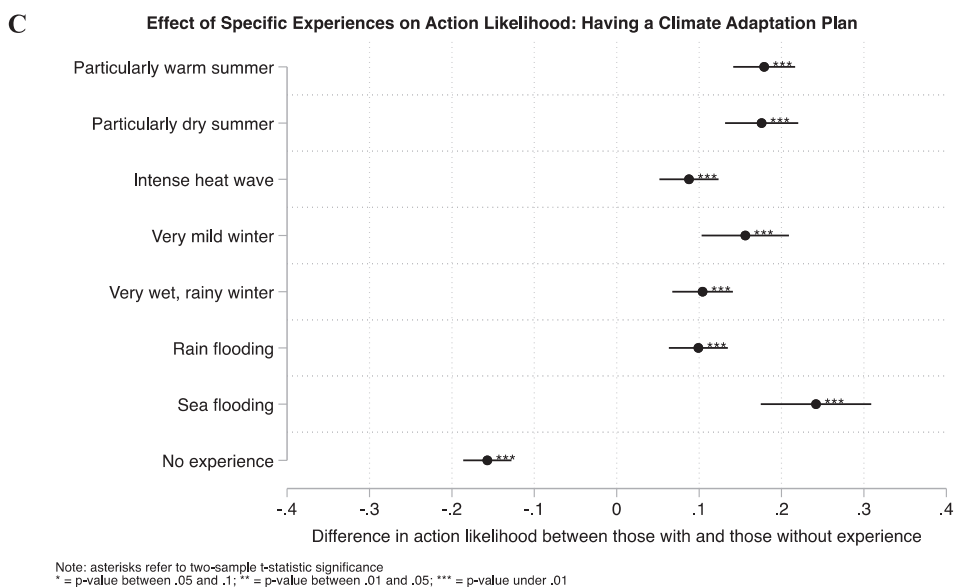


Fig. 4. (continued).

### 3.1.5. Factor 4: Integration of adaptation into organisational activities

The survey asked respondents about their organisation's approach to climate change by indicating the degree to which climate change adaptation was integrated with or separated from other activities (Q34). As shown in Fig. 7, there is a higher likelihood of an organisation taking adaptation actions (i.e., through having an adaptation plan, allocating staff/budget to adaptation and taking general adaptation measures), if the organisation had greater integration of adaptation in their activities.

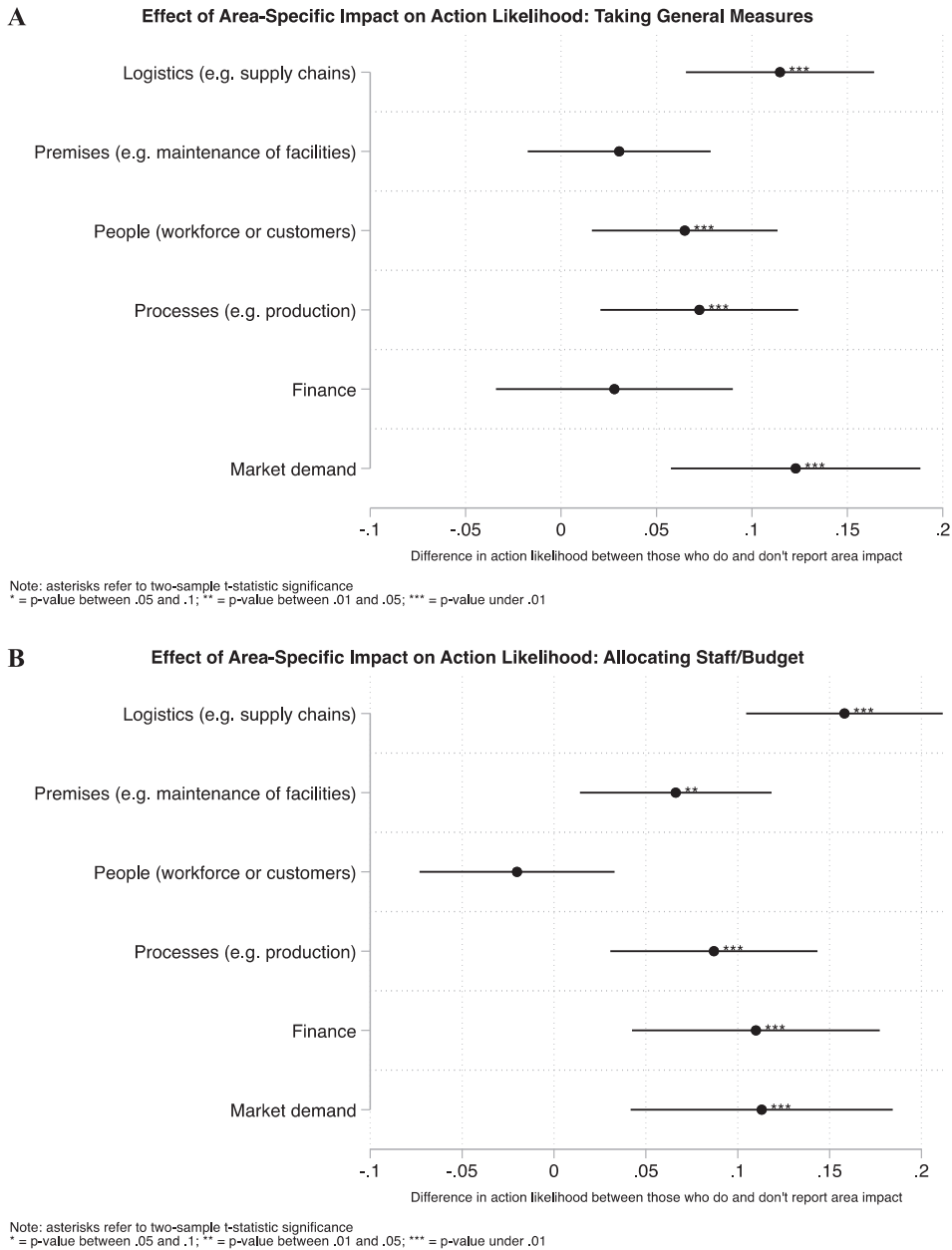
### 3.2. Research Question 2: What do organisations mean by 'adaptation'?

In the survey, while all respondents answered the question "Does your organisation have a climate change adaptation plan?" (as described in Section 2), the follow-up open-ended question "What adaptation measures has your organisation adopted or invested in?" (Q39) was presented to only respondents who indicated that their organisation either had an adaptation plan (393 respondents, or 16 % of the total sample of 2,429 respondents), were developing one (889 respondents, or 37 % of the total sample), or had another climate/risk management plan that covered adaptation (343 respondents, 14 % of total sample). As such, this question was answered by a total of 1,625 respondents. As described in Section 2, we first employed content analysis to code the text responses into themes:

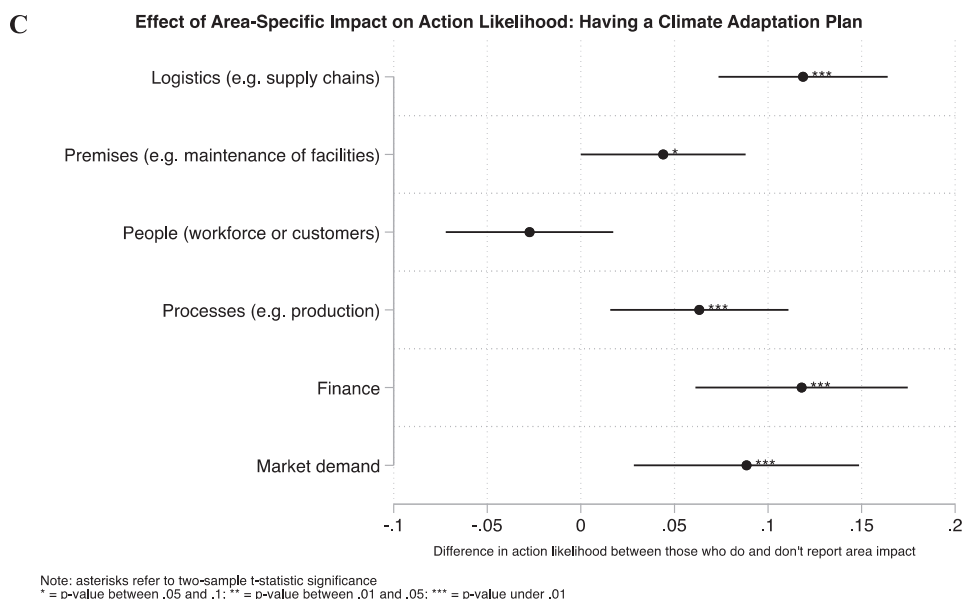
- *Adaptation*, where responses were mostly related to adaptation-type terms including weather, flood, rain/water storage, heating, and air conditioning.
- *Mitigation*, where responses were mostly related to mitigation-type activities such as carbon, solar, energy, and recycling;
- *Adaptation & mitigation*, where responses were a mix of both adaptation and mitigation-type activities;
- *None/Don't know/Unsure*, where the respondent indicated as such; and
- *Unclear*, when the response was vague.

As shown in Fig. 8, which indicates the 'adaptation measure' that their organisation had adopted or invested in, 26 % of respondents described the measures using terms which mostly related to adaptation-type activities, and a further 12 % of responses included a mix of both adaptation and mitigation-type activities. However, 34 % of the responses included terms which mostly related to mitigation-type activities and 11 % responded that they did not know or were unsure. 17 % of the responses were unclear due to the response being too vague.

A sectoral analysis of these 'adaptation measure' responses is shown in Fig. 9. Overall, this plot shows how the different organisational sectors offered 'adaptation measure' responses, reflecting how different organisations perceive adaptation in responding to the physical risks of climate change. As illustrated, those in the third/voluntary and public health sectors offered more adaptation-type activities than mitigation-type activities, although there is also a high degree of unclear responses from these sectors. The private sector



**Fig. 5.** Association between adaptation actions and experiences of previous extreme weather event impact. Points & error bars represent the difference in the proportion who reported previous impacts of extreme weather events (as identified in Q11), and those who did not, according to action variables as indicated by Q18 (panel A), Q33 (panel B) and Q35 (panel C). The statistical test used is a two-sample *t*-test. N=1406.



**Fig. 5.** (continued).

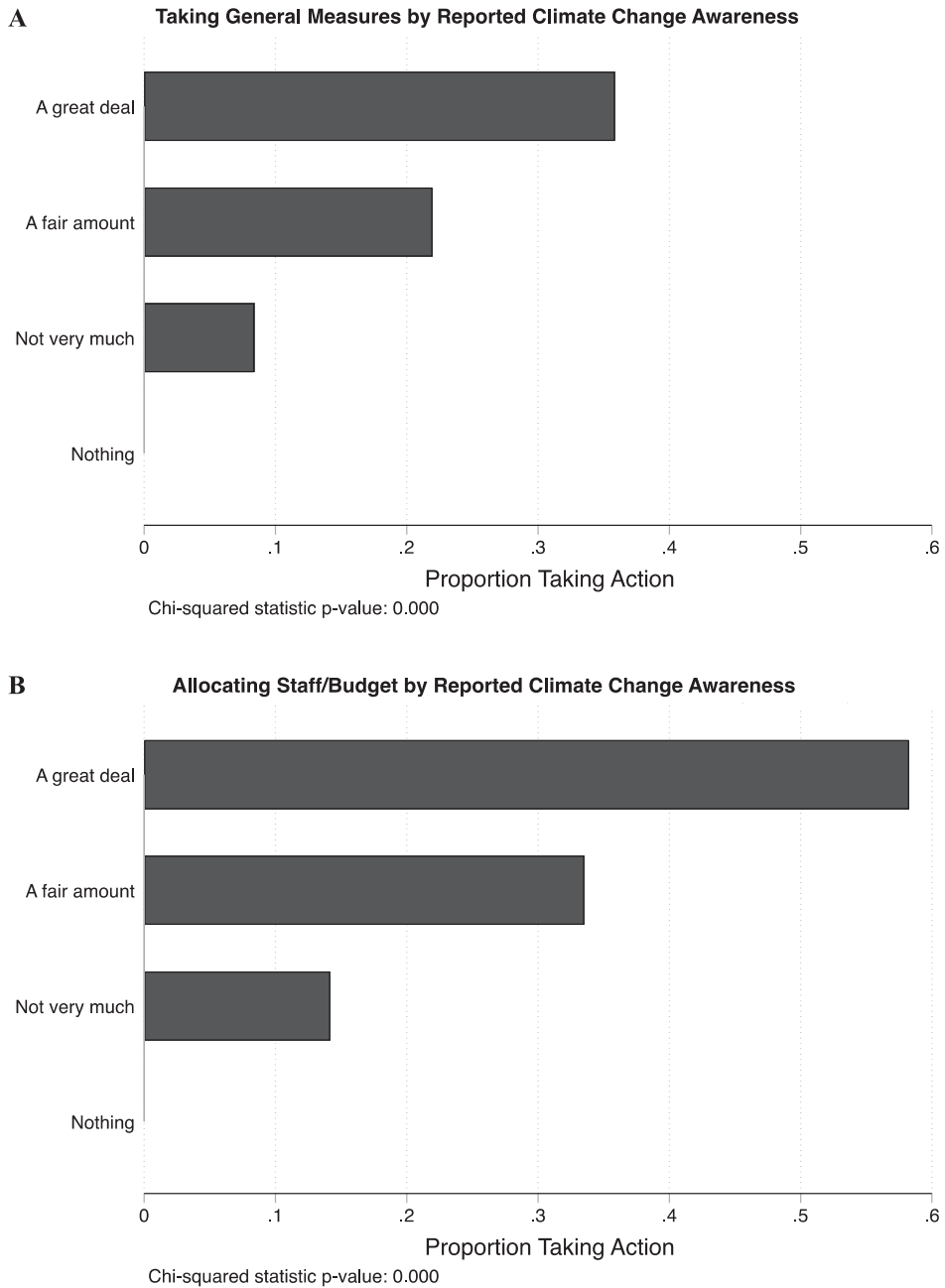
and local authorities were more likely to state mitigation-type activities when asked about their organisation's adaptation measures. We also reviewed sectoral-based responses to this question for respondents who affirmatively indicated that their organisation was generally taking actions to deal with the physical risks of future climate change and found slight differences including a high proportion of adaptation-type activities from local authorities (see [Supplementary Material](#)).

We then looked at the extent to which organisations are thinking about the kinds of risks or opportunities a changing climate could present, i.e., planning for climate change adaptation, as specified in Q22. There were seven options for this question, as described below alongside the percentage of respondents at each level and an indication of the 'highest' and 'lowest' levels of climate planning:

7. **Highest Level:** We have comprehensively assessed present and future threats and opportunities, have fully planned and taken action, made it part of how we plan and systematically monitor and implement our actions (3 %)
6. We have comprehensively assessed current and future threats and opportunities, and have fully planned actions, are taking action on priorities and made this part of the way we plan generally (8 %)
5. We have looked at present and future threats and opportunities, identified priorities, and have started acting on these (15 %)
4. We have looked at present and future threats and opportunities and thought about what to do about them (17 %).
3. We have begun looking at it, but are just getting started (23 %).
2. We haven't thought about it, but plan to in the future (19 %)
1. **Lowest Level:** We haven't thought at all about climate change, and don't plan to (10 %)

A further 4 % of respondents said they didn't know, and the remainder is due to rounding.

Given that those who offered 'adaptation measures' either had or were developing some form of adaptation plan (Q39), we investigated their type of reported measures alongside their reported level of climate planning (Q22). The swarm plot in [Fig. 10](#) illustrates the extent to which reported adaptation measures (Q39) are associated with these different levels of climate change planning (Q22). As illustrated within the plot, those who responded with adaptation-type activities were more likely to have looked at present and future threats and opportunities and had either thought about what to do about them (Level 4) or went further to identify and start action on priorities (Level 5). Those who responded with mitigation-type activities were relatively more represented at lower levels of climate planning, such as just having begun some form of climate change planning (Level 3). There was also a large subset (38 %) of persons mentioning mitigation-type activities at Level 2, indicating that they had not thought about climate change, but planned to in the future.



**Fig. 6.** Levels of climate awareness of respondents and their organisations' adaptation action. Horizontal bars represent proportion of respondents of different degrees of personal awareness of climate change (as identified in Q11), according to action variables as indicated by Q18 (panel A), Q33 (panel B) and Q35 (panel C). The statistical test used is a chi-squared test of independence. N=2429.

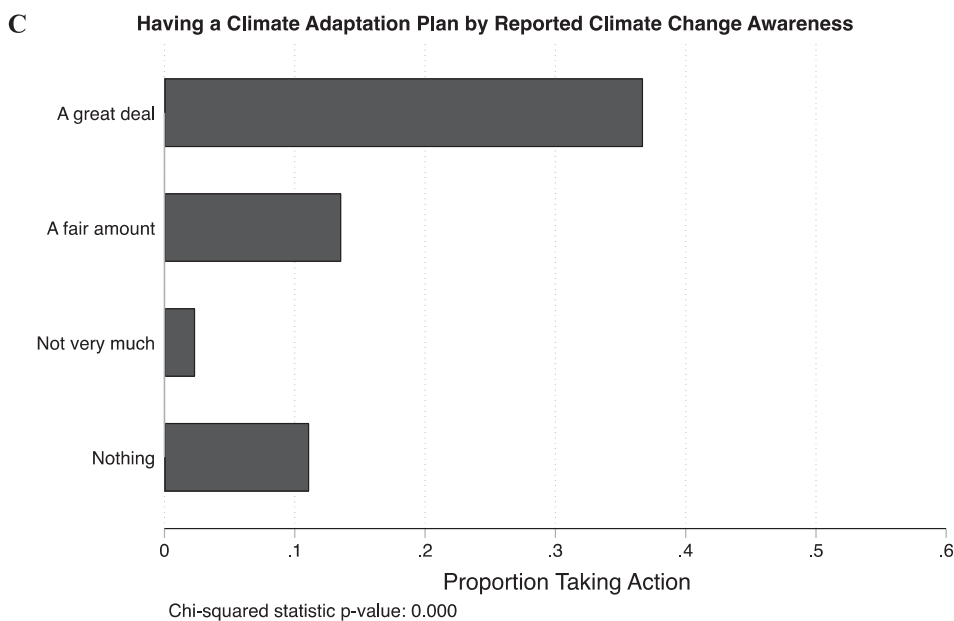


Fig. 6. (continued).

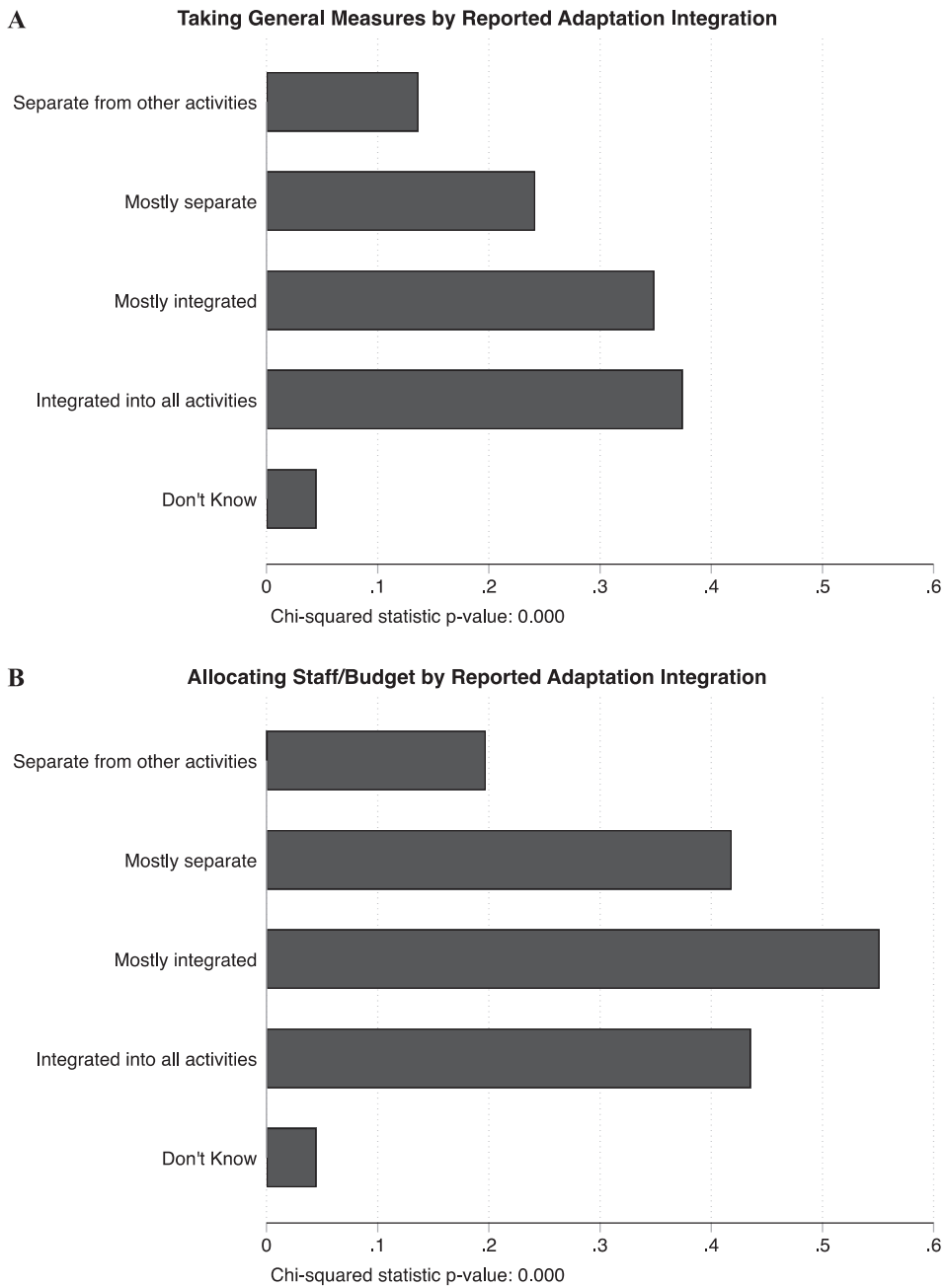
#### 4. Discussion and conclusions

Our results highlight evidence of an association between adaptation action and having climate change related concerns (Section 3.1.1), which matches general expectations that organisations with palpable concern of risk or threat of climate change would be more likely to take measures to respond to these risks. Such an insight also relates to a central conclusion by Hennes et al. (2024) that a key predictor of a company's engagement in adaptation is related to its climate risk exposure and managerial awareness. Further, we find that respondents from organisations who mentioned concern about multiple climate change threats to have been more likely to take adaptation action compared to respondents in organisations who reported having fewer climate change concerns. This further signals the value of organisations utilising their knowledge and awareness of climate risks and threats to make decisions relating to responding to the physical risks of climate change.

We also find evidence that experiences of extreme climate events do matter when considering adaptation action. Specifically, it seems that the type of event experienced – and the related context and location – likely play a crucial role in adaptation action, with respondents within organisations which experienced coastal flooding events indicating the highest likelihood to act compared with respondents in organisations which did not have these experiences (Section 3.1.2). Further, our results show that the type of impact of the event could also play a role, with impacts to organisational logistics and market demand showing association with adaptation action (Section 3.1.3). These insights contextualise findings from Zhang and Maroulis (2021) who note that “experience is not enough” when reviewing deficits in adaptation by public organisations, despite repeated extreme weather and some catastrophic consequences. The relatively high reference to and association of flooding experiences to adaptation action by the organisational community can also be seen to support research findings that individual flood victims may be more concerned about climate change than others (Whitmarsh, 2008). Our findings on the type of impact connects to traditional perspectives of organisational adaptation due to the physical impacts of climate change on firm operations, resource access and distribution (e.g., Linnenluecke et al., 2013; Winn et al., 2011). We also considered the role of climate awareness in influencing the process of adaptation action. Organisations with respondents with higher levels of personal climate awareness (Section 3.1.4) and with higher levels of consideration for adaptation integrated into organisational activities (Section 3.1.5) were more likely to be associated with taking adaptation action.

One of the novel findings of this paper is the possible confusion or conflation of the term ‘adaptation’ with mitigation, as indicated in Section 3.2. As shown, only 26 % of respondents offered typical adaptation-type activities as an ‘adaptation measure’ being undertaken by their organisation, while many respondents offered core mitigation-type activities as an adaptation response. An analysis of these ‘adaptation measure’ responses by the type of organisation sector highlights concerns particularly in the private sector and local authorities, even for those respondents who indicated that their organisation was taking actions to deal with the physical risks of future climate change. The swarm plot highlights that organisational respondents who indicated adaptation-type activities were more likely within organisations with higher or more advanced levels of climate change planning and action, compared to those who reported different types of activities (particularly mitigation).

Such mixed responses of ‘adaptation measures’ could, on the one hand, possibly reflect a misunderstanding or confusion of the differences between adaptation and mitigation. There is evidence in the literature of the need for improved awareness on climate change and adaptation needs (Jenkins et al., 2022; Linnenluecke et al., 2013) and clearer communication about the role and nature of



**Fig. 7.** Levels of adaptation integration and types of adaptation action. Horizontal bars represent proportion of respondents in organisations with different levels of adaptation integration (as identified in Q34), according to action variables as indicated by Q18 (panel A), Q33 (panel B) and Q35 (panel C). The statistical test used is a chi-squared test for independence. N=2429.

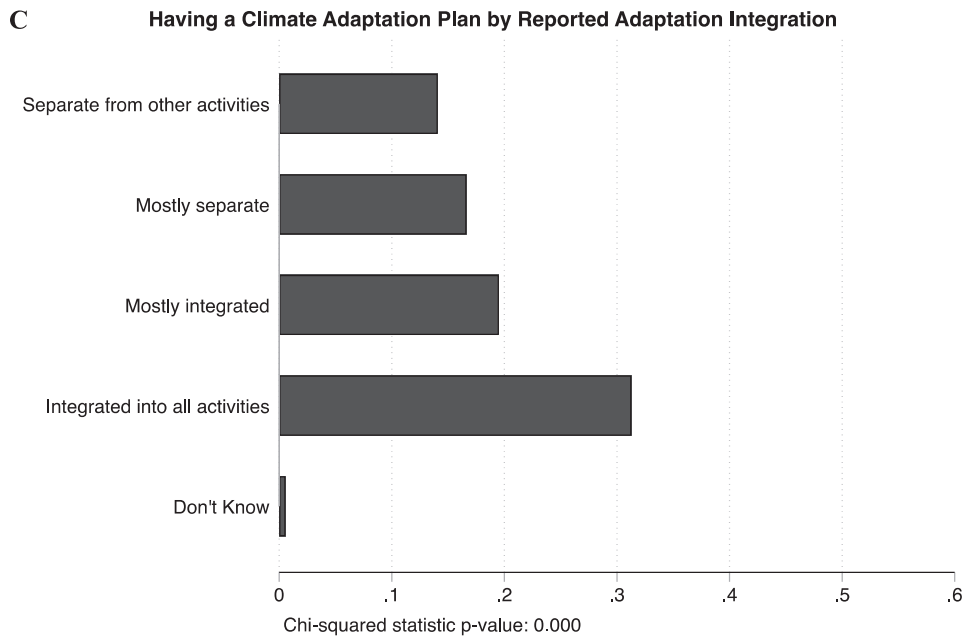


Fig. 7. (continued).

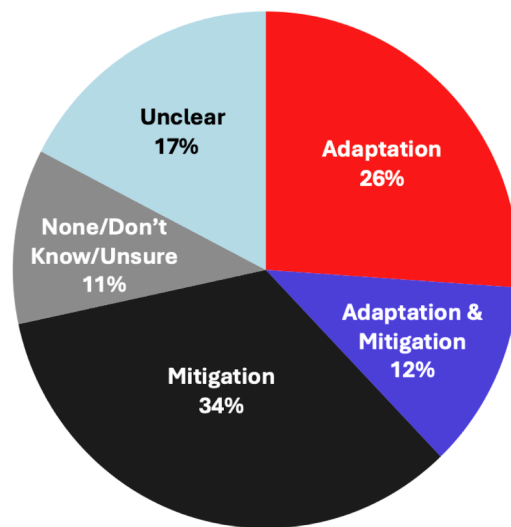


Fig. 8. Categorisation of 'adaptation measure' terms from open-ended responses. Q39 was an open-ended question in which respondents were asked to describe adaptation measures taken by their organisation. Their responses were subjected to content analysis by the authors and thereby categorised into the above categories. N=1625.

adaptation may be required for some organisations. Such insights need not be interpreted solely as an 'information deficit', but rather signalling the need for sectoral specific strategies to actualise adaptation options in a cost-optimal way. However, it is quite possible that explicit or implicit conflation is present, including recognition of the interlinkages between adaptation and mitigation. Indeed, numerous studies indicate that an integrated focus on adaptation and mitigation in policy and practice is urgently needed as it may offer cost-effectiveness of options, improve multidimensionality and complexity, and may even minimise maladaptation and unintended consequences (e.g., Klein et al., 2007; Howarth and Robinson, 2024). While there are different goals and opportunities for implementation of mitigation and adaptation policies, there are similar drivers and interrelated solutions for both (Grafakos et al., 2018). Although planning of integrative policies may be desirable, it is challenging, requiring further information, capacity, and policymaking (Howarth and Robinson, 2024; Klein et al., 2005; Wilbanks and Sathaye, 2007). However, whether organisations are in fact making conscious decisions to integrate mitigation and adaptation strategies is difficult to confirm from our results and requires further research.



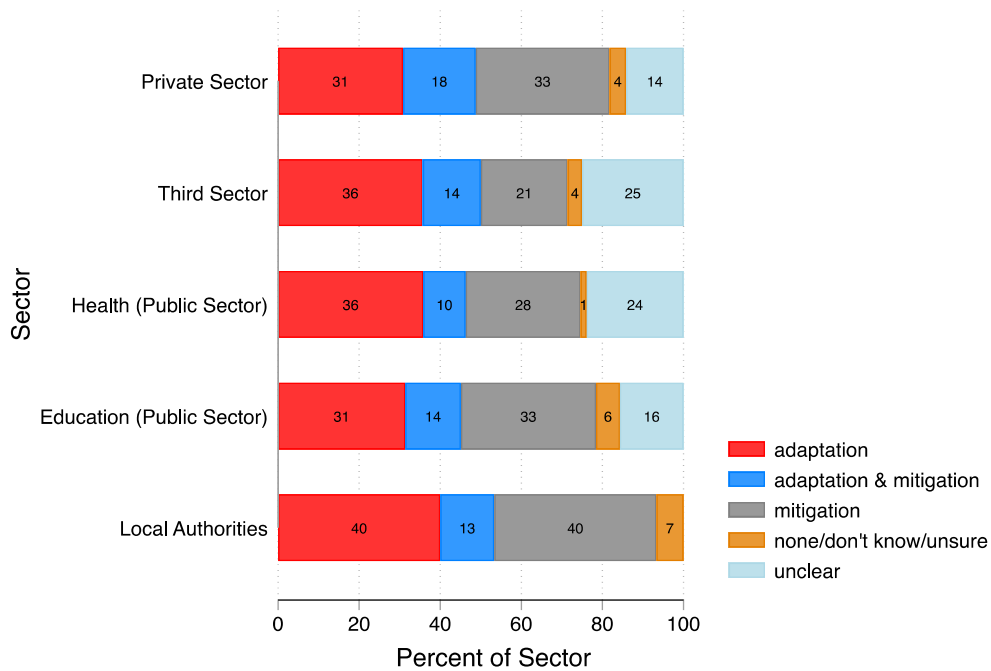


Fig. 9. 'Adaptation measures' by organisational sectors. Stacked bar segment lengths correspond to share of respondents in each sector giving an answer corresponding to each category of Q39 response, manually coded by authors. N=1625.

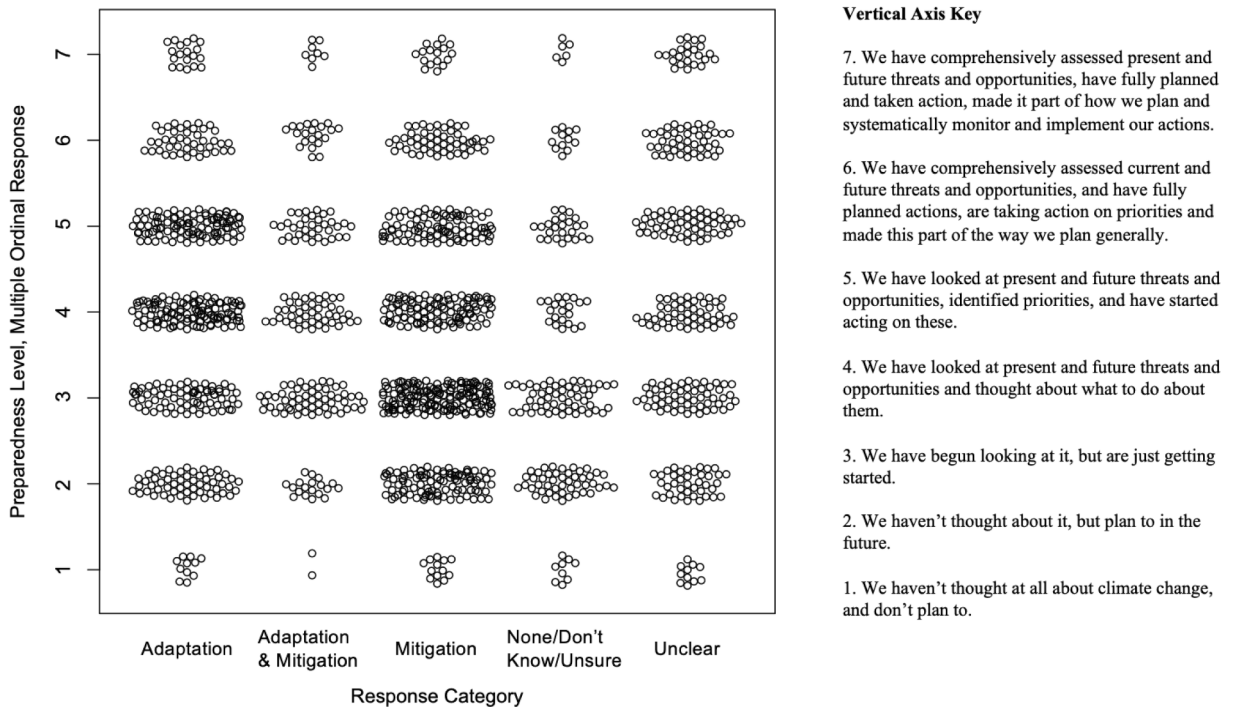


Fig. 10. Swarm plot of coded 'adaptation measures' taken by level of climate change planning. Points assigned to swarm based on the coordinate of the represented respondent's answer to Q22 as per the 7 levels of planning (not including responses to "Don't know") and Q39, with each circle representing a respondent and larger clusters indicating a greater subset of respondents. Q39 open-ended responses manually coded by authors. N=1606.

As well, additional study should also consider how organisations are approaching and identifying maladaptive practices. While the open-ended responses on ‘adaptation measures’ indicated that respondents mentioned the strategy of using more air-conditioning during heatwaves, likely as an adaptation response, there were only few instances of this and no opportunity for follow-up or further context of this action. Nevertheless, noting that maladaptation could further create more vulnerable conditions, there is a need for further understanding of how organisations understand and navigate the fine line between adaptation and maladaptation (Barnett and O’Neill, 2010; Reckien et al., 2023; Schipper, 2020). Another additional area of research would be to further contextualise organisational behaviour factors that may motivate organisations to adapt, both endogenous and external via economic and institutional context (Berkhout, 2012; Berkhout et al., 2006). As well, it would be interesting to understand how framings of climate change adaptation and mitigation in the media, for example, may play a role in improving adaptation action (Brito et al., 2020; Howell et al., 2016).

While this study primarily offered an overall focus of UK-wide considerations of adaptation, the considerable differences between sectors suggests the need for follow-up on disaggregated data collection and analysis, alongside better understanding the specific context of private sector adaptation, noting action drivers and barriers (Averchenkova et al., 2016; Gasbarro and Pinkse, 2016; Goldstein et al., 2018; Surminski, 2013; Tompkins and Eakin, 2012; Winn et al., 2011), and the importance of business networks and dynamics (Canevari-Luzardo, 2020; Canevari-Luzardo et al., 2020). Further, additional focus on the perceptions and use of climate information by organisations could be helpful to contextualise the finding of an association between the type of recent climate events experienced and the types of adaptation actions taken and underscore the need for improved risk communication. As well, considering the increasing intensity of climate events, widely experienced disruption and lack of mitigation action globally, there is a need to establish longer-term adaptation analysis and processes, including tracking through periodic surveys for longitudinal analysis on how, where and by whom is adaptation occurring and the effectiveness of the adaptation process.

We note several caveats to this analysis, most of which stem from the context of the survey. One concern is the cogency of responses from an online survey instrument, although we took measures to ensure confidence in our survey dataset. For instance, we excluded answers from those who reported that they were *not* a “suitable person to talk to about threats and opportunities facing their organisation”. We did retain those who selected the answer, “Not really, but there’s no one with that specific function/I don’t know anyone else”, which made up 20 % of respondents. Respondents were asked to self-assess their confidence in their responses at the end of the survey, with 61 % offering that they felt very confident (only 2 % of the base expressed low confidence). Some of the survey questions could have been phrased differently, but we decided to retain the wording from previous surveys to enable comparison over time. There is inherently a degree of uncertainty about how accurately an individual’s responses reflect their personal and organisational perspectives (Kahan et al., 2012). We also note the broader socio-economic context at the time of the survey in April/May 2021, during which the impacts of the Coronavirus pandemic and the climate conditions, being colder and drier conditions than usual, could have impacted the responses offered. Lastly, it should be noted that although the survey offers details regarding the organisational sector and location, this analysis only offers overall UK-level results.

This research contributes to a limited literature on adaptation by organisations in the context of public (individual and community/social) perceptions of climate risk and adaptation. Although UK-focused, such insights on organisational perspectives have wide-ranging implications given the key role of organisations in responding to the societal impacts of a changing climate and offer lessons that could assist other nations to better design whole-of-society adaptation policy instruments.

### **CRedit authorship contribution statement**

**Denyse S. Dookie:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Declan Conway:** Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Suraje Dessai:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Evan Oliner:** Visualization, Software, Resources, Methodology, Investigation.

### **Declaration of competing interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### **Data availability**

Data supporting this publication will be openly available at ReShare at <https://doi.org/10.5255/UKDA-SN857353>.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.crm.2024.100637>.

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