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Local-level managers' attitudes towards natural hazards resilience: the case of Texas

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ABSTRACT

Prior research on natural hazards resilience demonstrate that citizens favor immediate and direct solutions to disasters, and are less supportive of future-oriented prevention strategies. These perceptions create incentives for politicians to adopt similar views. In this study, we explore the views of an intermediate group of stakeholders – public and professional managers who play a role in the process of designing disaster relief and prevention policies. Using a survey of professional stakeholders in Texas, we map their views on the causes and policy solutions for the damages following Hurricane Harvey (Summer 2017). Overall, we find that professional stakeholders hold fairly similar views to the public. Yet, they differ from citizens as they are less supportive of distributing direct payments, instead preferring to allocate funds towards long-term prevention solutions, and creating a regulatory environment to reduce the risks. Also, our results indicate that having personal experience of hazard events further enhance those views, and stakeholders in government positions prefer even less direct governmental involvement in disaster resilience. Our findings expand existing knowledge regarding individual perceptions and policy preferences facing natural hazards by discussing the views of professionals who play important roles in designing solutions to mitigate the growing risks from climate change.

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Introduction

In February 2020, the City of Houston released 'Resilient Houston' – a strategic plan intended to reduce the risks of climate change events such as severe flooding by enacting actions like removing structures from waterways, transitioning to renewable energy and more. The plan, supported by disaster experts, presents a first step towards preventing damages from future hazard events.¹ Despite the appeal of such plan, it took a major event such as hurricane Harvey to motivate public officials to adopt a future-oriented approach that addresses Houston's severe flooding issues. Unlike this long-term plan adopted in Houston, many other Gulf Coast governments and local officials tend to

focus on enacting short-term recovery and relief policies that place less emphasis on future prevention of natural hazards becoming disasters (Dunning, 2020).²

With the increase in climate-related damaging events, two important questions are how do public officials view the threats of natural hazards, and what are their preferred ways to accommodate them and support public safety? A substantial amount of research explains the lack of incentives for politicians to endorse long-term prevention plans. Instead, primarily due to electoral incentives, policymakers focus on relief and recovery efforts in the aftermath of disasters (Chen, 2013; Egan & Mullin, 2017; Gailmard & Patty, 2019; Healy & Malhotra, 2009).

One under-explored area in this literature is the layer of mid-level officials (which we term ‘professional stakeholders’). These professional stakeholders are decision-makers who hold key positions in a variety of private and public organisations, some of which have direct influence on environmental policy (Larson & Fowler, 2009). Most of the literature credits top-level officials in developing and carrying out hazard mitigation policies. Yet, the opinions and actions of professional stakeholders are critical in shaping local policies when it comes to reducing current and future risks, and expediting recovery from natural hazards in their communities (McCormick, 2016). Since professional stakeholders are less susceptible to electoral pressures, they should be less concerned about the political costs that accompany their preferred approach to disaster resilience and recovery (Boin & Hart, 2003). With many experts’ calling local and national leaders to favour future-oriented mitigation plans to reduce risks from natural hazards, one may expect these intermediate-level stakeholders to be more inclined to push towards a long-term prevention strategy.

To investigate the views of this segment of the population, we collect responses from a unique survey of stakeholders conducted in early 2020. The survey focuses on questions related to causes of the damages, as well as the effectiveness and degree of support for a variety of policy solutions. Our objective is to complement the current literature studying public opinion on natural hazards by exploring the views of mid-level stakeholders, and identify key themes in their approach regarding the proper expenditure of resources following extreme events like hurricanes and coastal floods.

Addressing natural hazards

One of the central concepts in the literature of natural hazards is *resilience*. From a sociopolitical standpoint, resilience refers to the capacity of a social system or organisation to anticipate, prepare, adapt, and recover from adverse events and disturbances that are unexpected. It also describes the ability of a system, community or a society to accommodate and resist the effects of hazard events through the preservation and restoration of essential basic structures and functions (Comfort et al., 2010; McClymont et al., 2020; Rus et al., 2018; Sharifi & Yamagata, 2016). In the realm of public policy, resilience reflects governmental responses to disaster events by enacting different policies (Cutter & Derakhshan, 2020; Kousky & Kunreuther, 2018; Perry et al., 2001; Platt, 1999).³

Overall, governments have a large supply of possible policies to adopt in response to natural hazards. We fit these alternatives into two broad (not mutually exclusive) categories. First, recovery and relief efforts involve actions that help communities in the immediate aftermath of disaster events and focus on fixing damages and providing

relief and temporal housing solutions to victims and those in-need (Dunning, 2020; Wenger, 2017).

A second set of alternatives highlight prevention-type strategies to reduce the risks from future hazard events. This category can be further unpacked to monetary and regulatory actions. Monetary policies include investment of government funds with the objective of minimizing the damages from natural hazards. Some of these actions include the construction of additional solutions or barriers to prevent future damages (dams, water systems). Those investments reflect a long-term strategy to mitigate the risks of hazardous events (Govindarajulu, 2020). Another type of monetary action revolves around incentivising residents who live in risk-prone areas to relocate to less dangerous areas by offering money transfers, buying damaged property from residents, and types of other benefits (Thaler & Fuchs, 2020).

In order to address the risks from hazard events, governments may also pursue regulatory type strategies. These include a variety of regulations and restrictions to prevent future damages in risk-prone areas (Jones & Vasvani, 2017; Krimgold, 2011). For example, limiting construction of private and public developments in areas that suffered severe floods (Cutter & Derakhshan, 2020; Orabi et al., 2009). Another regulatory solution is adjusting the design standards for new developments to ensure better capacity to deal with the risks of extreme weather (Spence, 2004).

Experts and researchers argue that in order to address the threats of natural hazards, and climate change as a whole, more priority should be given to approaches that promote long-term sustainability (Casado-Asensio & Steurer, 2014; Portney, 2015; Steurer & Hametner, 2013).⁴ To bolster long-term sustainability, we should adopt a more holistic approach to resilience by assessing communities' strengths and weaknesses in the realms of finance, politics, society and infrastructure capacity (Atreya & Kunreuther, 2020). However, substantial investment in innovative solutions and educating the public on the threats associated with natural hazards are not as common as strategies that provide relief following disasters, as well as implementing actions to fix and strengthen existing solutions (Bohensky & Leitch, 2014; Dunning, 2020; Kim & Marcouiller, 2018; Nohrstedt et al., 2021; Wenger, 2017).

Why do governments focus primarily on short-term recovery strategies? The origins of this approach are to be found in both public preferences and politicians' reactions. While some research suggests that citizens penalise leaders for extreme events such as natural hazards (Achen et al., 2017; Heersink et al., 2017), most studies have shown that despite the negative political effects of hazard events, the response policies enacted by the administration are critical and can outweigh the criticism, thus reducing substantial electoral costs following hazard events (Cole et al., 2012; Gasper & Reeves, 2011). In other words, voters' 'punishment' depends on the type of response policy implemented following natural hazards, and that provides government with strong motivation to adopt certain types of policies.

Healy and Malhotra (2009) examine how voters reward politicians for the types of policies they implement in this context and find that relief spending, in the form of direct payment to eligible citizens, is supported while preparedness policies are not, despite the clear societal benefits of the latter (see also Bechtel & Hainmueller, 2011; Bechtel & Mannino, 2020). Chen (2013) uses data on disaster aid distribution in Florida and shows that it provides substantial political benefits for the incumbent. Disaster declarations,

which reflect a direct relief response and distribute compensation to victims, are powerful and have shown to mitigate the negative political effects of hazards (Gasper & Reeves, 2011; Stout, 2018). In another study, Reeves (2011) investigates presidential disaster declarations and shows that swing states were more likely to receive disaster declarations even when accounting for damage caused by the weather event. In other words, politicians have strong incentives to provide benefits via direct relief policies and downplay the potential upside of prevention strategies.

Two mechanisms explain the incentives for governments to enact direct relief-type policies. First, observability – citizens are not well-informed about the details of many public policies (Lupia, 2016). Therefore, relief actions such as reconstruction of damages or direct payments to victims present clear (and observed) benefits to citizens, compared to abstract social benefits that may materialise in the future due to better preparation for disasters (Healy & Malhotra, 2009). Gailmard and Patty (2019) focus on citizens' information gaps and show how information deficiencies with respect to the usefulness of prevention-type strategies lead voters to favour relief and recovery actions, and punish politicians who spend more on future-oriented hazard prevention.

Second, myopia or shortsightedness. Relief payments are realised in the present or near future and voters who receive these benefits can reward politicians in the upcoming elections. On the other hand, preparedness policy provides future benefits and the political rewards are likely to materialise to future leaders. As a result, politicians seeking reelection have no incentive to invest in long-term preparations. As evidence, scholars show that the decision to declare a federal emergency, a prerequisite to the availability of funds, is motivated by political considerations (Sobel & Leeson, 2006). Furthermore, Healy and Malhotra (2009) posit that political accountability is more powerful after events and not with any preparation in-advance.

One of the primary challenges of conceptualising the risks of natural hazards, and climate change as a whole,⁵ is that for most people these are abstract and distant threats which may only be realised in the future, and thus are much less of a concern (Pidgeon, 2012a, 2012b; Spence et al., 2012). However, hazards events become more salient and concerning when individuals experience them in-person, and their willingness to act shifts. As a result, personal experience of natural hazards is a central driver of public attitudes (Akerlof et al., 2013; Capstick & Pidgeon, 2014; Spence et al., 2011). Brody et al. (2008) combine measures of risk attitudes and physical GIS data, and find the former as powerful predictors for climate change risks levels. At the same time, disaster vulnerability (partially based on past events) displayed a relatively weaker effect, suggesting these measures may be bounded in terms of the duration of their effect. A similar pattern is apparent in the work of Egan and Mullin (2012) who find that recent changes in weather (the week prior to attitude measurement) led to changes in public perceptions.

In a recent study, Baccini and Leemann (2021) use micro-level geospatial data on natural hazards in Switzerland and find sizeable effect for personal experience on pro-climate votes. Jones et al. (2017) employed a more comprehensive approach to measuring individuals' threat perceptions and find that making hazard events more relevant, by reducing their psychological 'distance' and having some form of personal experience, heightened concerns and increased support for preventive action (but see Brügger et al., 2015).

The literature on personal experience of natural hazards demonstrates that citizens may be motivated to support future-oriented preventive strategies. Yet, these effects tend to have short duration as publics shift their attention rather fast to other issues, creating challenges for governments in adopting resilience strategies for the long-run.

While public preferences are an important driver of governmental responses to natural hazards, policy solutions are advocated and implemented by policymakers and professionals. Therefore, we focus our analysis on one sub-group of these policymakers ('professional stakeholders'), and seek to determine if they adopt a more future-oriented approach than the public (and top politicians), and whether they are as sensitive to personal experience as members of the public.

Professional stakeholders: effects on disaster policy, organisational challenges and their approach towards natural hazards

Studies of disaster resilience views stakeholders as those who have an interest in the issue at hand. The classic definition describes stakeholders as a group or an individual who can affect, or can be affected by, the accomplishment of organisational goals (Freeman, 1984). Our definition of stakeholders slightly diverges from this approach as we focus on the management/professional side, primarily individuals from public and private organisations that experienced hazard events such as hurricane Harvey, and have some role in the decision-making processes with regard to disaster recovery and prevention.

The literature on bureaucracies and public policy present an important role for mid-level managers in influencing policy through agenda-setting, policy formulation, and managing the implementation of recovery and mitigation strategies (Tosun & Howlett, 2021). For example, managers and bureaucrats provided the knowledge to develop tools and strategies for managing coastal hazards in New Zealand (Lawrence et al., 2018). In Israel, the chief scientists play an important role in developing policy tools to address climate change (Schmidt et al., 2018).

Others explore how certain organisations or local governments dealt with disasters, and which implications can be drawn from these cases. Burnside-Lawry and Carvalho (2016) study disasters in Portugal and find that strong leadership and coordination between local departments improve the implementation of multiple initiatives and increase overall engagement with natural hazard risks in terms of citizens' awareness and governmental capacity to implement risk reduction strategies. A related area of government action is drafting regulation to redefine building standards or restrict construction in risk-prone zones. Research suggests that when implemented properly, these policy tools are effective in limiting damages during extreme events (Spence, 2004).

Despite the appeal and evidence for successful government regulation to manage the risks of natural hazards, research in disaster management and public administration discuss at length the limitations that agencies face in implementing relevant regulations or efficient prevention policies (Rouhanizadeh et al., 2020). Primarily, bureaucracies set barriers by creating unwanted red tape that prevents timely action and can reinforce inertia (Nohrstedt et al., 2021) as well as rigid organisational routines and procedures. The tendency of large organisations to be more averse to risk and uncertainty, which characterises many hazard events policies, leads managers to implement 'linear' solutions that focus on immediate delivery of services (Biesbroek et al., 2018). This type of strategy

works to maintain the existing systems (Wenger, 2017) rather than experimenting with innovative solutions that may be needed to tackle severe climate-related challenges and the associated hazards (Biesbroek et al., 2013; Oberlack, 2017).

While much of the source of these issues is structural, i.e. a function of organisational routines and procedures, it is also important to investigate the behavioural and attitudinal aspect of key stakeholders – members of public organisations that have a role in shaping policy choices. Unlike senior policymakers, who are subject to political pressure due to electoral dynamics, mid-tier managers ('our' stakeholders) are mostly professionals or career bureaucrats who face substantially less public pressure to enact certain courses of action. As a result, managers have longer time horizons (Dahlström & Lapuente, 2022), and it is possible that they will adopt a different view and promote prevention-type mitigation actions that can help reducing future damages (Biesbroek et al., 2018; Tosun & Howlett, 2021). We investigate this question by adopting a bottom-up, individual-level approach that focuses on mapping stakeholders' risk perceptions and exploring their views regarding the main causes of severe damages, and what are the preferred policies in response to natural hazard events.

Methodology

One of the central contributions of our work is the focus on a specific group of stakeholders. We recruited a sample that consists of senior members of public, private and non-governmental organisations that work on issues of recovery and resilience in the Coastal Bend area of Texas.⁶ The survey was in the field from January to March, 2020.⁷ The final sample size is 217 participants.⁸ Figure 1 below presents the different organisational affiliations of our stakeholders. The number at the bottom of each bar is the proportion that stakeholders working in this category represents of the total sample. It is clear

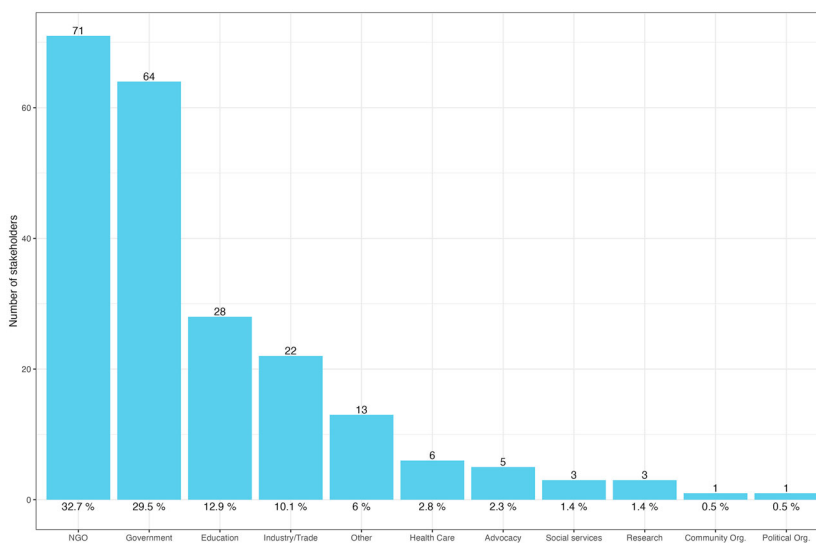


Figure 1. Stakeholders organisation affiliations.

that the vast majority of survey respondents are members of different NGOs (almost a third of the sample) or work in governmental organisations (about 30%).

In terms of demographic and individual characteristics, our sample consists of 47% men and 48% women (10 declined to respond), the average age is 52 years old (most respondents are between 43 and 61 years old, the IQR). The educational background of our respondents is varied as 46 percent hold a graduate degree (master's or doctoral), 30 percent have an undergraduate degree, and the remaining 23% have either an associate degree or high school education. Lastly, there is variation in the extent of experience of stakeholders in their current position. For the largest group, NGOs, the mean experience in current position is almost 9 years (8.7). Stakeholders in governmental organisations are in their position for an average of 7.5 years. The longest tenured stakeholders are in the industry and trade category with an average of 18 years, and stakeholders in the education sector have a mean experience of 10 years in their current role. The break-down of these characteristics reflect a rather diverse sample with different individuals who have substantial experience in their managerial positions.

Survey items and measures

We explore a multitude of aspects of stakeholders' views of natural hazards and their preferred solutions. We list these variables below.

First, what are the prime causes for the storm-related damages in Texas? The survey asks respondents to evaluate eight potential causes for the damages their communities suffered as a result of hurricane Harvey. Responses are ranked on a scale of 1–6 ('No impact' to 'Very strong impact', including an option to mark 'Not sure').⁹ The different causes include building in areas prone to flooding, inadequate/degraded flood protection infrastructure, and ineffective government action in terms of plans or funding.¹⁰

The second category of variables asks respondents about the degree of effectiveness of several policy actors and governmental units addressing hazards. Responses are ranked on a 1–6 scale ('Very ineffective' to 'Very effective', including an option to mark 'Not sure'), and include actions related to inter-governmental and regional coordination of recovery efforts and preventive strategies, removing regulatory constraints on disaster relief processes, and setting priorities for actions after hazard events.

The third category of variables details possible policy solutions. We listed 13 items in the survey and ask respondents to evaluate specific policy actions to improve recovery and resilience following the damages caused by hurricane Harvey. Responses are ranked on a 1–5 scale ('Strongly oppose' to 'Strongly support'). Policy solutions include strengthen building and infrastructure standards, limit/prevent development in risk prone areas, build/strengthen existing flood protection barriers and financial solutions for relocation of residents of danger areas.

We build on the existing literature, and consider personal experience as a primary explanatory variable for individual risk perceptions and policy preferences facing natural hazards. We account for this factor by using measures of direct experience of the damages from hurricane Harvey. Finally, we collect information about respondents' organisations, role and experience in their positions, as well as demographic level information with respondents' age, gender, race and level of education.

Results

The empirical assessment relies on analysing multiple items from the stakeholders' survey to map their views about natural hazard events and the different response strategies. It is important to note that due to the nature of our sample, we are limited in conducting an advanced statistical analysis that will allow to derive inferences about causal relationships. Nevertheless, we believe that our sample consists of unique portion of the relevant population for this topic. As such, our main objective is to leverage this unique data of professional managers and identify key themes and trends in their views with regard to natural hazard events and potential policy responses.

Mapping stakeholders' views

We begin by presenting variations in the perceptions of survey respondents with regard to the specific causes of the damages, potential solutions and response unit effectiveness.

We ask respondents to evaluate eight potential causes for the damages incurred from the floods and extreme weather during hurricane Harvey. We cluster the potential causes to three categories: (1) land-use flaws such as allowing building and developments in vulnerable areas. (2) Infrastructure deficiencies (insufficient flood protection, both natural and man-made), and (3) Government planning limitations including ineffective emergency and recovery plans, and inadequate funding. In addition, since the response scale includes a 'Not Sure' option, we recode the data along a trichotomous variable in which no or weak impact are coded as 1, not sure is coded as 2, and somewhat, strong, and very strong impact are coded as 3. [Figure 2](#) displays the proportion of responses for the three clusters of causes.

Overall, we find that stakeholders see factors in all three categories as contributing to the damages. However, land-use aspects such as building in flood-prone areas and inadequate infrastructure protection are rated as more powerful causes (66–67% of respondents) compared to insufficient government preparation (about 55%).

Further evidence for the variation of views is based on the difference between the rating of each of the three groups of causes and the overall mean of all perceived causes. For this comparison, we rely on the original measure but remove the 'Not sure' option before calculating the average rating for each group (on a 1–5 scale).¹¹ The results show that the overall average rating of causes is 3.54. The rating of land-use flaws category is approximately 3.5% higher than this average, and rating of government planning limitations category is 4% lower than the average. While those differences are not too great, they point to an overall perception according to which structural factors are more to blame than government actions. This analysis complements the results in [Figure 2](#) and suggest that stakeholders place more emphasis on existing structural conditions and less so on governmental action as direct causes of the severe flood damages.

In the next analysis, we investigate respondents' perceptions of the projected effectiveness of various government policies and units to improve community resilience facing natural hazards. The survey presents seven categories of government actions and asks respondents to rate their effectiveness. Similar to the causes items, there is a 'not sure' option. For this analysis, we remove these responses and calculate the average level of projected effectiveness across all alternatives. The results are depicted in [Figure 3](#).

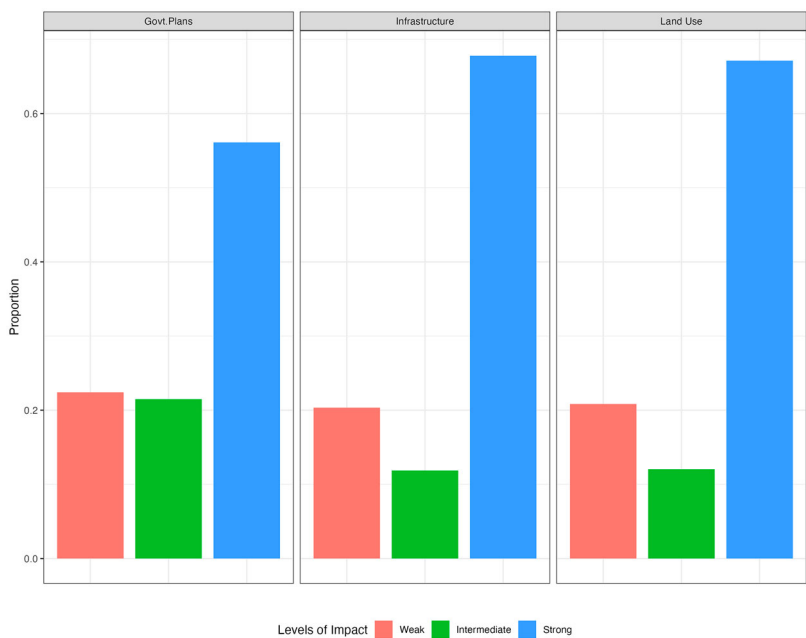


Figure 2. Causes of damages – proportion of responses.

Overall, all proposed government unit actions are viewed as fairly effective (the red dashed line displays the average of 4.2 on a 5-point scale) and the differences among respondents’ assessments of government unit actions are not large. Nevertheless, actions that offer immediate relief and recovery in the wake of a disaster are viewed as more effective (on average, those are rated about 3.2% higher than the mean score) compared to mitigation-type actions that are intended to prevent severe damages in future events (about 2.5% lower than the mean).¹²

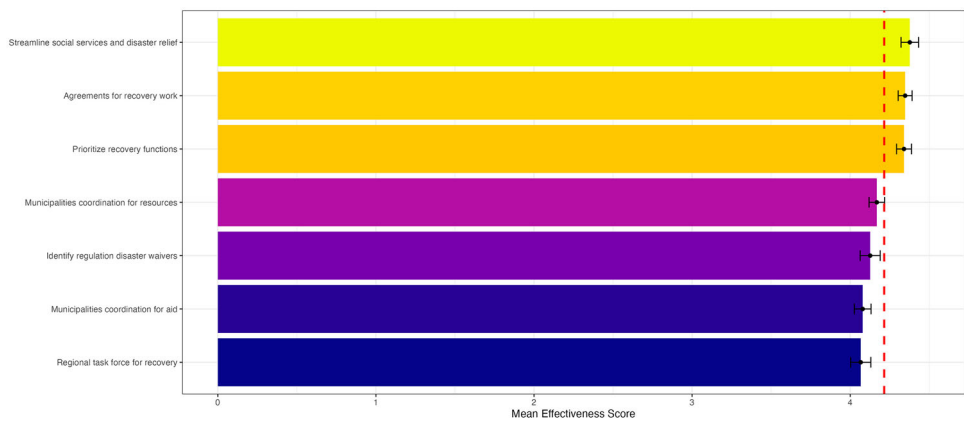


Figure 3. Effectiveness scores for government strategies.

A potential explanation for these differences is that relief-oriented actions are directed at immediate solutions and are aimed towards victims' needs, compared to options such as establishing regional task force for recovery. Two of the central mechanisms suggested by the literature are observability and shortsightedness (Healy & Malhotra, 2009), and the actions viewed as more effective to stakeholders fit these mechanisms. In addition, while professional stakeholders do not necessarily face extensive political pressure to prioritise immediate solutions (Tosun & Howlett, 2021), when it comes to assessing the effectiveness of solutions, there is little difference between professional stakeholders and senior policymakers.

Our third examination maps stakeholders' views about potential policy solutions. The survey includes 13 alternatives and respondents rate them on a 1–5 scale. In Figure 4, we plot the average degree of support for each of these options, and add the mean support across all policy options using the dashed red line (overall mean support is 3.89).

The policy solutions detailed in the survey fit along three general types of resilience strategies (separated by different colours in Figure 4). Support is highest for observable actions such as strengthening existing flood protections (more than 11% higher than average score). The category of regulatory strategies also garners increased support among stakeholders. That strategy relates to both construction regulations such as improving building and infrastructure standards (approximately 8% higher than average), as well as restrictions on public and private developments in flood prone areas (on average, rating is about 4.6% higher than the overall mean policy score).

On the other hand, strategies that fit to an investment approach and future-oriented prevention including plans to elevate buildings or conduct additional construction of flood protections solutions, attract only average levels of support (the former is 1% higher, the latter is 4% lower than the average rating).

The least popular 'group' of actions revolves around different types of direct payments collected or distributed by the government. The strategies of providing financial incentives to residents to relocate are relatively less popular among professional stakeholders (mean score is 7.3% lower than average rating of all policies). While the difference is not too big, this finding is still surprising considering the vast support for direct payments

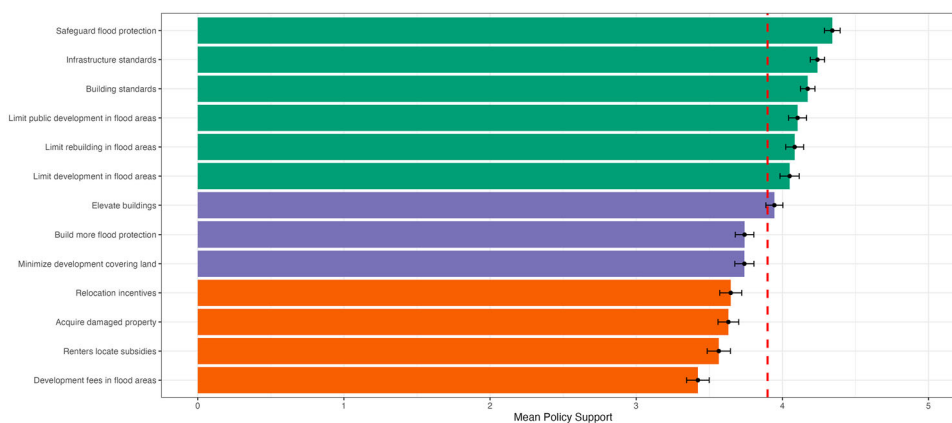


Figure 4. Support for response policies.

preferred by the public, and points to one area of policymaking where there is a gap between citizens and mid-tier managers and executives. The logic of this gap is that public and private managers, unlike politicians, do not gain much from providing citizens with aid and financial incentives to prevent further damages. Therefore, these individuals may prefer to allocate more funds to strategies that mitigate damages on a wider scale rather than paying directly to residents of at-risk areas.

The analysis above maps the views of professional stakeholders on a variety of strategies that address damages from natural hazards. From a general standpoint, all strategies score positively. Yet, assessing options in comparison to one another, and to the overall mean offers a more nuanced view of how stakeholders approach disaster response. One take-away from this investigation is that stakeholders support strategies and regulations that offer return to normalcy but also mitigation options aimed at preventing additional damages. At the same time, alternatives that focus on prevention and require substantial investment of public or private funds receive relatively much lower support. The one clear difference between most of the literature on public perceptions and our findings is that stakeholders do not favour solutions that provide direct payments to residents or victims as much as the public does. This finding can be a result of the low incentive of mid-tier managers to cater to public pressures and provide immediate response.

Experiencing disasters

One prominent factor that many scholars have shown as important for perceptions of natural hazards is personal experience. We explore stakeholders' personal accounts of hurricane Harvey and how it may have affected their policy views. To measure personal experience, we use a survey item that asks respondents to rate the amount of damages occurred to different structures/infrastructures as a result of hurricane Harvey. We focus on residential property (described as 'Single and multi-family housing units') and create a binary indicator coded 1 for any stakeholders that rated damages as significant; otherwise the variable is coded as 0 (little or no damages, or a 'Not sure' response). According to this measure, about 60% of our respondents had a personal account of hurricane Harvey. The logic behind this coding scheme is that those who witness and report severe damages in their communities are more likely to have a personal experience of the threat.

Using our personal experience indicator, we investigate the proposed strategies and how respondents' support is distributed. The results are depicted in [Figure 5](#) below. From an overall perspective, having a personal account of a natural hazard such as hurricane Harvey increased the support across all potential policy options by more than 6 percent (mean is 4.01 for those with personal experience and 3.77 for those without experience). Those differences are not too big, but they still point to the effect, albeit a limited one, of personal experience on the policy preferences of stakeholders.

We find more interesting patterns among groups of alternatives. First, even for the least supported alternatives, the ones that are centred on providing financial incentives to residents, stakeholders who have first-hand experience of the damages rate this option higher (average score is about 8% higher across all proposed solutions).

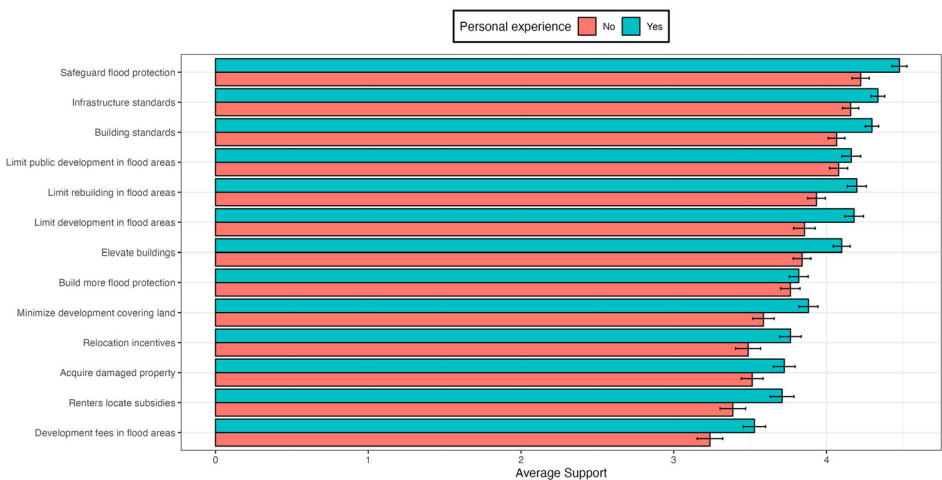


Figure 5. Support for response policies – by personal experience.

Second, personal experience seems to shape the degree of support for strategies that are less clear. For instance, ‘elevate buildings’ receive a rating that is almost 7% higher among those with personal experience (the difference is 8.5% for the option of ‘limit development in flood areas’).

The differences are more profound when we consider the proportions of support or non-support for each policy response category in the survey. In Table 1, we present three of the proposed policies and detail the proportions of responses along three categories: oppose, support, and neutral.¹³

The proportion of support for ‘elevate buildings’ is over 20% higher among those with personal account of the event (this is also reflected in the proportion of neutral responses which decreases from 33% for no experience, to 10% among those with personal experience). The differences for ‘limit new developments’ are not as large, but still substantial.

An interesting policy in this context is ‘build additional flood protection’ (which reflects a future-oriented prevention approach). For our purposes, the effect of personal experience is positive in the sense of increased support for this solution. The proportion of support for ‘build additional flood protection’ is more than 15% higher, and the proportion of neutral is much lower (18% vs. 32%) for respondents having had storm experience.

Public policy views: government officials

Investigating the views of professional stakeholders is important for an additional reason. The vast majority of response strategies are public policies, and many of these stakeholders represent an important part of the ‘chain’ that designs and implements them.

Table 1. Proportion of support – by personal experience (selected strategies).

Policy Responses	Elevate building			Limit new developments			Build flood protections		
	Oppose	Neutral	Support	Oppose	Neutral	Support	Oppose	Neutral	Support
Personal experience	3%	10%	86%	2%	13%	84%	7%	18%	75%
No personal experience	4%	33%	63%	11%	18%	72%	9%	32%	60%

In our sample, almost 30 percent reported as working in government or political organisations. To test the significance of government employees, we analyse the data by creating a binary variable coded 1 for all government-related stakeholders, and 0 otherwise. When studying the proposed policy options, the views of stakeholders who work in government positions clarify and extend some of the general results we reported earlier, in particular for strategies that require the allocation of public funds. For instance, the proportion of support for policies that provide residents with monetary incentives is about 14% lower among those who work in government positions compared to the rest of the sample.

Another type of funds allocation policy is ‘build additional flood protection’. This policy requires substantial investment with high immediate costs. For this option, proportion of support among those with a government position is almost 14% higher than all others (it is about 8% higher for the option of ‘elevate buildings’ which also requires significant public investment). These findings point to the important role of funding in the design of these policies, and the need to clearly define priorities for mitigation solutions.

A complementary finding for this analysis is related to the views of stakeholders regarding the causes of the damages from hurricane Harvey. One cause is prominent for this analysis – shortage of funding to build additional flood protection. Among stakeholders who work in governmental agencies and political organisations, the proportion that rated inadequate funding as having a strong impact is more than 25% higher than other survey respondents (81% and 56% respectively, including respondents that answered ‘Not sure’). This result joins the views of these individuals regarding the proposed solutions and amplify that the design of any strategies to deal with natural hazards begins with questions about ‘where do we send the money?’.

Discussion

Resilience in the face of natural hazards requires a myriad of policy actions. Current practices include primarily recovery and relief strategies as well as allocation of direct payments to victims. Less prevalent are prevention-oriented solutions which require substantial investment with few immediate benefits (yet greater future resilience).

The main problem with the common recovery approach is that it serves as a ‘band-aid’ solution and does little to address the core of the problem. In Texas, a history of severe damages from floods and extreme weather led public officials to call for more forward-looking solutions including limiting development in danger areas. For example, in 2006, the city of Houston issued an ordinance that bans construction on vacant lands in floodways. However, a local lawsuit led the city council to revise the language and remove most barriers for further development.¹⁴ Also, despite public officials’ announcements of plans to study the risks and prevent future floods,¹⁵ not much has been done in reality. Our analysis of the stakeholders’ survey data reveals that while respondents (individuals in managerial positions) support forward-looking, prevention-type, solutions, they prioritise recovery and regulatory strategies.

We map the views of stakeholders and find that they consider government as having an important role in designing a regulatory ‘environment’ that can mitigate further damages by restricting land-use development in risky areas. When we directly ask about the effectiveness of different governmental actions, higher marks are assigned to

functions that are critical to recovery and relief operations. At the same time, professional stakeholders are less in favour of direct solutions such as distributing financial incentives for residents to relocate (see [Figures 3 and 4](#)). These views are also evident in their classification of the causes of damages. Primarily, the causes for damages following hurricane Harvey are due to infrastructure and land-use deficiencies, not as much due to faulty government planning (see [Figure 2](#)).

Our findings mirror most of the literature of how public members approach natural hazards resilience (Bechtel & Mannino [2022](#); Friedman, [2019](#); Healy & Malhotra, [2009](#)). Nevertheless, one area where stakeholders diverge from the public is with regard to distributing direct payments to victims/residents. Mid-tier managers are less in-favour of such options and prefer to enact different regulatory strategies.

While overall views of most policy options are positive, we investigate two central mechanisms that contribute to variations in respondents' views. First, having a personal experience of hazard events. Our analysis reveals that having a close account of the damages of hurricane Harvey intensifies the support for recovery type actions, findings that are consistent with the literature (Akerlof et al., [2013](#); Baccini & Leemann, [2021](#); Brody et al., [2008](#); Jones et al., [2017](#)). We also find that having experienced the damages from Harvey made some of the less clear policies, such as 'build additional flood protection', more appealing. This finding suggest that personal experience may serve a role in 'bridging the information gap' (Gailmard & Patty, [2019](#)), and increase the popularity of these alternatives, many of them fit the future-oriented prevention approach. Our findings that personal experience matter for the views of professional stakeholders add to the existing literature on public opinion of hazard events and further emphasise it as an important factor that explains why individuals favour recovery actions, regardless of their professional role.

Second, we investigate how the organisational affiliation of stakeholders shape their views. In particular, how those that are associated with government positions view natural hazards resilience. The analysis shows government employees are sensitive to the allocation of public funds when addressing hazard events. They are more in favour of investing in preventive-type solutions that may take longer to materialise, and less supportive of immediate solutions as distributing monetary incentives for residents' relocation. These results strengthen our argument that stakeholders are less in favour of government as direct problem-solver of natural hazard issues, and should instead focus on executing long-term prevention strategies. In addition, as employees of the public sector, they view an important and effective role for the government in setting the regulatory environment when it comes to recovery and mitigation of natural hazards risks (Cutter & Derakhshan, [2020](#); Jones & Vasvani, [2017](#); Spence, [2004](#)).

Finally, a unique feature of our work is the focus on a different type of stakeholders. These individuals serve as managers and executives in public and private organisations and thus have an impact on decisions related to the design of policies and actions initiated to enhance natural hazard resilience in Texas. Previous work showed that these individuals can serve an important role in facilitating better preparation that can reduce severe future damages from natural hazards (Burnside-Lawry & Carvalho, [2016](#); Tosun & Howlett, [2021](#)). Others suggest that public bureaucracies (where many of those stakeholders' work) create barriers that limit the adoption of prevention-type approach, and focus on 'linear' recovery actions.

Our findings point to an additional restriction that emerges from a behavioural aspect – despite their role in the policymaking process, managers do not necessarily prefer solutions that benefit society in the long term. Biesbroek et al. (2018) suggest that the ‘bureaucratic DNA’ is part of the problem in adapting to climate-related changes. Our results hint that this ‘DNA’ also has a behavioural component with which managers, who work and lead such organisations, cannot overcome the focus on short-term solutions and thus do not ‘push’ strong enough to get past organisational barriers towards investing in preventive-type policies. At the same time, an alternative explanation may be that even if mid-level managers endorse a different approach, policy is dictated from ‘above’ and their role is primarily to implement the policy, and resolve any execution problem (Burnside-Lawry & Carvalho, 2016). Under such conditions (when political decision-makers dictate a relief-type approach), it may be too much to ask of these individuals to ‘lead the charge’ in altering the existing public policy approach towards natural hazard mitigation.

Conclusions

In the wake of serious natural hazards, elected public officials rush to present grand solutions that are framed as policies that can prevent severe damages following such events. An example is the overhaul of FEMA by the Bush administration following the crises of hurricanes Katrina and Rita in 2005–2006.¹⁶ On a slightly smaller scale, not long after hurricane Harvey (August 2017), several Texas politicians rushed to present a variety of policy alternatives that were intended to deal with the damages, but also prevent future disasters.

Despite these public proclamations, most of the literature suggest that due to public opinion and political calculus, senior decision-makers have few incentives to invest in prevention-type plans in comparison to relief efforts. Our study complements these insights by exploring the views of professional stakeholders. These are mid-level managers and executives who play a role in the process of designing and implementing relevant policy actions. This study relies on a unique survey investigating how these managers perceive the risks of natural hazards and the potential alternatives to respond.

We present a rather discouraging picture for future resilience facing such events. Professional stakeholders have an overall positive view towards prevention-type strategies, yet they prioritise recovery type actions, and view the role of government as designing a regulatory environment to prevent future damages, but not as much in terms of direct investment in preventive policy actions. Most policy alternatives that require financial investment are less appealing, further highlighting stakeholders’ view that the government should play a limited role in direct disaster response.

Our focus on professional managers offers an important contribution to the literature by expanding the notion of stakeholders (Burnside-Lawry & Carvalho, 2016; Freeman, 1984) and showing consistency in attitudes with all those associated with disaster resilience (Healy & Malhotra, 2009). Second, we strengthen the existing work on individual attitudes in the context of natural hazards. Our findings demonstrate that recovery policy is prioritised (Baccini & Leemann, 2021; Bechtel and Mannino 2022; Friedman, 2019; Wenger, 2017). The important role that personal experience serves as shaping individual attitude suggest that the psychological angle is an important one as fear, personal account of

disasters and the need to solve problems as soon as possible (with direct financial benefits for example) are all rooted in our psychology and drive our perceptions and preferences.

Third, while work in public administration and bureaucracy emphasise organisational procedures and routines as setting barriers on adopting more innovative solutions than the existing linear, relief-focused policies (Biesbroek et al., 2018), we show a behavioural angle that enhances this process. The lower level of support for investment in future-oriented solutions is not impeded only by bureaucratic red-tape, but also due to the views of executives and managers who see recovery plans as more effective, and centre their prevention approach on regulatory actions intended to restrict land-use in risk-prone areas.

This study offers important findings about the views of a particular segment of the population regarding natural hazards. Nevertheless, our work has several limitations. First, due to the nature of our target population and difficulty to recruit elite respondents (for an extended review, see Kertzer and Renshon (2022)), our sample consists of a convenient sample of managers and executives in Texas. There is a need to replicate this survey among other stakeholders in multiple locations to get a more precise estimate of the views of this population. Second, our sample is also limited in the capacity to run complex statistical analysis and draw strong causal inferences. Recruiting larger samples can help alleviate some of these concerns. Third, our data collection relies on reactions to a severe type event such as hurricane Harvey and thus it is possible that respondents were more aware of such risks. At the same time, this concern may be less pronounced considering our timeline in terms of data collection is early 2020, two and a half years after the event. Despite studies showing that respondents' sensitivity tends to decay over time, our findings still present distinct effect. Nevertheless, scholars need to explore other, perhaps less extreme, hazard events (floods, tornados, hailstorms, etc.) and ascertain the views of stakeholders in this context.¹⁷ Finally, our survey design asks respondents to rate their support for different hazard mitigation and relief solutions. This approach allows us to identify the general patterns in stakeholders' views but is more limited in finding clearly preferred policies. Future work can identify these preferences more clearly by designing a survey in which stakeholders compare pairs of alternatives, thus offering more direct ranking of multiple mitigation and relief strategies.

In the summer of 2021, a UN panel on climate change warned of severe, irreversible damages from natural hazards associated with climate change as soon as 2030.¹⁸ There is a growing need to enact a wide array of policies that, while offering relief to victims, focus on reducing and preventing the losses from calamities such as hurricanes Harvey, Katrina and Ida. Adding our findings to the existing literature projects a dire view about human perceptions of global hazard action and emphasise the need for a more direct governmental action, as well as expanding public and elite education about the growing risks of not addressing these issues with an eye towards the future.

Notes

1. <https://www.houstonpublicmedia.org/articles/shows/houston-matters/2020/02/13/360473/houston-sets-once-in-a-generation-goals-in-disaster-resilience-plan/>
2. The long-term approach was adopted elsewhere in the US. In 2012, the state of Louisiana introduced a Comprehensive Master Plan for Sustainable Coast with the objectives of

preventive flood risks and restore the damages to coastal communities in the ‘coming decades’ (Groves & Sharon, 2013).

3. Studies also explore questions related to the measurement of resilience (across various dimensions) using different indicators, see for example Cutter (2016), Cutter and Derakhshan (2020).
4. For a more specific application in infrastructure development see Thacker et al. (2019). Also, the IPCC 2022 Climate change report (Link)
5. Natural hazards are one of several outcomes of climate change (Trenberth, 2018)
6. Organizations included in this study were broadly selected from local, regional, state and national governmental units, and more locally centered businesses, health providers, advocacy groups and nonprofit organizations within the 11 counties that make up the Coastal Bend Council of Governments.
7. The survey instrument and the sample methodology were designed by the Institute for Science, Technology and Public Policy (ISTPP) at Texas A&M University. The survey was administered by Public Policy Research Institute (PPRI) at Texas A&M University. The survey was approved by the Texas A&M university IRB (IRB ID: IRB2018-1679M).
8. Stakeholders sample recruitment procedures: we contacted via email an initial list of 2000 potential respondents. Email reminders were sent to those who did not complete the survey. 460 phone calls were initiated for nonresponses of the initial email invite. Additional reminders were sent to respondents who did not complete the entire questionnaire. When the survey closed on March 10th, 448 surveys were opened. We removed all respondents who did not complete any portion of the survey, click through the entire study, or did not complete the majority of the survey. The final sample size is 217, and completion rate is 10.85%.
9. We recode this measure and offer a clearer scale for the responses, see details in the results section.
10. Complete survey instrument is available from the authors upon request.
11. Studies in political behavior suggest that ‘Don’t know’ answers (similar to our ‘Not sure’) might represent guessing and may skew the distribution of knowledge (Laurison, 2015). Graham (2021) offers a more complex model to explore these issues. His approach is too demanding of our data and beyond the scope of this research.
12. In addition, the differences between the first group (larger than mean) and second (smaller than mean) are significant as the error-bars do not overlap.
13. Proportions are based on the original survey items (measured on a 1–5 scale). We collapse the responses to three categories (oppose, neutral, and support) by combining the proportion of strongly oppose and oppose into one, and combining strongly support and support into another one.
14. <https://www.chron.com/news/houston-texas/article/Limited-building-in-floodways-wins-council-1667371.php>
15. <https://gov.texas.gov/news/post/governor-abbott-announces-new-flood-prevention-efforts-in-kingwood-texas>
16. <https://www.congress.gov/bill/109th-congress/senate-bill/3721>
17. An example is the survey of elite decision-makers conducted by the Chicago council of Foreign affairs, latest survey is from 2018, see <https://www.thechicagocouncil.org/research/public-opinion-survey/coming-together-or-coming-apart>
18. UN report: <https://www.ipcc.ch/report/ar6/wg1/#SPM>

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