

Attitudes to public spending on environmental risk reduction: The role of temporal and spatial distance

Climate change is often perceived as a distant threat affecting people in distant places and the far future. Such perceptions could dampen public willingness to spend on climate mitigation. We contribute to the knowledge on attitudes to public spending on environmental risk reduction by designing a survey experiment that disentangles two dimensions of distance—spatial and temporal—and examines these dimensions for two different, but related, environmental risks: climate change and air pollution. Consistent with previous research on climate change, we find somewhat more favourable attitudes in scenarios that allow delaying the planned spending. This pattern is, to a degree, present for both types of environmental risks examined. With regards to spatial variation, however, we find that the type of environmental risk being addressed matters for how the public responds to the variations in distance. In the case of air pollution, attitudes to public spending are more favourable in the spatially proximate condition. In the case of climate change, the difference points in the opposite direction. These patterns are strongest in the immediate scenarios, but they also hold irrespective of temporal distance, and is not driven by any particular political ideological subset of respondents.

Keywords: climate change; air pollution; public spending; policy attitudes; perception

Introduction

Although environmental problems are generally considered important by the public in Western countries (Capstick et al. 2015), citizens sometimes assign only low policy priority to them compared to other issues (Leiserowitz 2006). For example, in the

context of climate change, Leiserowitz (2006) finds that two-thirds of Americans in a national survey were most concerned about impacts on people around the world and on non-human nature, against only 13% emphasizing effects on themselves or their local communities. This is one of many findings that climate change is often perceived as a threat, but a remote one, affecting people in distant places or the distant future (Liu, Xie, and She 2014; Lorenzoni and Pidgeon 2006; Lujala, Lein, and Rød 2015 for Norway; Scannell and Gifford 2013). As Vlek (2000) argues, people tend to prioritize the ‘us here and now’ and can better assess short-term costs and benefits. Environmental problems are also a good example of a social dilemma, as the short-term benefits of environmental exploitation tend to be perceived as more valuable than the long-term benefits of protection (Harring and Jagers 2013). It follows that individuals would not want to pay the costs which would be imposed by actions taken immediately, and would prefer to delay the payment and thus the action itself. This is even more the case if the benefits are perceived to be long-term and affecting future generations rather than people living at present. All in all, the sense of far-distant risks and dangers of climate change, as well as far-distant benefits of mitigating it, to all appearance contributes to the propensity to delay costs and hence the action.

At the same time, unanswered questions remain about the role of spatial and temporal distance as regards policies to reduce environmental risks of various types. First, while the literature has accumulated a considerable amount of evidence of the role of distance in risk perception and worry, less is known about the effects on willingness to spend money on risk reduction. Second, we do not know enough about whether temporal and spatial distance effects are generic for all environmental problems, or alternatively differ across various problem types such as climate change and air pollution.

In this paper, we address these questions using a 2*2*2 factorial survey experiment, varying temporal and spatial distance as well as the environmental problem presented. We find that the effect of geographical distance depends crucially on whether the scenario involves air pollution or climate change. Specifically, scenarios involving measures reducing climate change risk globally garner more support than national measures. By contrast, nationally focused air pollution risk mitigation policies receive greater endorsement than globally oriented policies. The results regarding temporal distance indicate a preference for delayed action, except if the risk is air pollution and the spatial distance is proximate.

The paper proceeds as follows: First, we review the literature on the role of distance in environmental risk perception and preferences and briefly present Norway as a case. We then present our methods and data. The subsequent results section presents the outcome of the survey experiment and displays the effects across three categories of individual ideological self-placement on a left-right scale. We then discuss the results and conclude with some implications for environmental risk communication and policy design.

The role of temporal and spatial distance in environmental opinion

Some authors (e.g. Lorenzoni, Nicholson-Cole, and Whitmarsh, 2007) argue in favour of framing climate change in local terms to enhance mitigation and adaptation responses. Devine-Wright and colleagues (2013; 2015) challenge this claim by pointing out the relevance of global, not only local, place attachment in climate change perceptions, and ask whether public engagement with climate change could ‘arise from global as well as local concerns’ (p. 68).

In fact, the role of psychological distance in climate change perception is far from thoroughly explored and understood (McDonald, Chai, and Newell 2015). Climate change may indeed be perceived as distant threat on multiple levels – spatially, temporally, socially, and as hypothetical or abstract (more on the concept of psychological distance e.g. Newell et al. 2014; Pahl et al. 2014; Scannell and Gifford 2013; Spence, Poortinga, and Pidgeon 2012). However, such perceived remoteness or abstraction does not necessarily mean that the issue elicits a weaker emotional or behavioural response. It may actually be quite the opposite – people are generally more optimistic regarding the risks climate change may pose to them personally (Pahl et al. 2014) but tend to perceive the geographically or temporally more distant threats as more serious (Spence and Pidgeon 2010). Consequently, some studies suggest that willingness to act on climate change is higher if the impacts are perceived as severe and distant (see McDonald, Chai, and Newell 2015 for a review).

On the other hand, there is some evidence that parts of the population tend to place less value on outcomes that are temporally distant, uncertain or occurring to others (Gattig and Hendrickx 2007, Nicolaij and Hendrickx 2003). In some studies, no effect of temporal distance is found (Böhm and Pfister 2005). In sum, the evidence on the issue is somewhat mixed.

Furthermore, some studies indicate that different social groups, based on their socio-economic and demographic characteristics, may differ in their assessment of different policy measures (e.g. financial incentives, information strategies, regulation etc.) and policy scenarios. These differences have been identified for gender (McCright 2008), education (Hammar and Jagers 2006), income (Coad, de Haan, and Woersdorfer 2009), and political orientation or party preference (Devine-Wright, Price, and Leviston 2015; Hart 2011; Konisky, Milyo, and Richardson 2008). With respect to the latter,

information about policy scenarios can be evaluated and interpreted within specific political discourses relevant to respondents' political orientations.

Political orientation, for example, is apparently far more important in the formation of policy attitudes than provision of additional information or policy framing (Carrico, Truelove, Vandenberg, and Dana 2015). Hardisty, Johnson, and Weber (2009, p. 6), for example, report labelling effect conditional on party identification in the United States. Participants identifying as Democrats were not sensitive to whether a suggested policy was labelled 'tax' or 'offset', but Republicans responded negatively to the label 'tax'. This result led the authors to conclude that 'the power of a framing manipulation can depend on participants' pre-existing differences'. Furthermore, Rickard, Yang, and Schuldt (2016) conclude that varying the stipulated scenario year by which climate impacts would be felt - between 2020, 2047, and 2066 - barely affected policy support in the aggregate, but did produce effects when interacting with political orientation. Notably, US conservatives responded significantly more positively to scenarios that were spatially more proximate and temporally more distant. Lu and Schuldt (2015, 2016) also report that the link between emotions and policy attitudes is conditional on political orientation.

A positive association of attitudes toward climate change mitigation policies with left (US: liberal) political orientation, as well as backing green parties, is supported by robust evidence, although rare exceptions are present (Drews and van den Bergh 2015; Zvěřinová, Ščasný, and Kyselá 2014). Although Democrats seem more likely than Republicans to form positive attitudes toward climate actions in the US (Bannon, DeBell, Krosnick, Kopp, and Aldhous 2007 on samples representative of adult population; McCright, Dunlap, and Xiao 2013; O'Connor, Bord, Yarnal, and Wiefek 2002 on sample of residents of Pennsylvania; Wiest, Raymond, and Clawson 2015), the

effect is not universal. Stoutenborough, Bromley-Trujillo, and Vedlitz (2014), for example, find statistically significant positive effect of sympathising with Democrats on attitudes toward policies that would increase the prices of fossil fuels. The positive effect of identification with the Democratic Party was accompanied by a negative effect of identification with the Republicans. Such negative effect was present also for industrial taxes and the aggregated measure of all policy options, although it was not accompanied by the opposite positive effect of self-identification as a Democrat. For other analysed policies, namely market incentives, support for renewable energy, and increased fuel efficiency, no statistically significant effects of identification with either party were reported in the study. Effects of political orientation are therefore hardly straightforward.

At the same time, there are not many studies exploring the relationship of political orientation and policy attitudes outside the US. One exception is the recent work by Poortinga et al. (2019), who find that political orientation effects on levels of climate skepticism and concern about climate change are generally weaker in Central and Eastern Europe than in Western Europe.

The discussion so far has identified three gaps in the literature that need to be filled. First, it remains to be answered, whether it is the tendency to see climate change as a temporally distant threat due to the actual long-term character of climate change, which operates on decadal scales, or whether it is due to a latent general preference to postpone action for as long as possible. Here we assume that defining a problem as near in time also implies a need for near-term action, and thus that resistance to near-term action may lead to a redefinition of the problem to a long-term one. Postponement of action may thus constitute a type of ‘solution aversion’ (Campbell and Kay, 2014). At the same time, earlier literature has shown that people distinguish between air pollution

and climate change on the dimensions of their respective causes and impact (Tvinnereim et al., 2017) – our research will also examine whether similarly differential effects may be found for policy attitudes toward both issues.

Second, the evidence for perceived spatial and temporal distance in climate change risk perception and worry is strong. It is not clear, however, whether such effects also hold in the context of policy attitudes. Specifically, do temporal and spatial difference effects appear when evaluating policies that are to take place here and now versus globally and in the future?

Third, we ask how well the role of ideology in environmental risk perception travels outside the US. Since a disproportionate share of the literature combining study of political polarization and environmental public opinion builds on studies conducted in the US, data from other countries are needed to establish whether current generalizations are valid or simply an artefact of exceptional American circumstances.

The study we describe in this paper aims to answer these three research questions using a three-dimensional survey experiment. First, we examine the stability of responses in relation to temporal and spatial attributes of policy scenarios in the case of public funding of climate change or air pollution risk reduction. More specifically, we examine whether there is a more positive evaluation of scenarios distant in time and space, or whether there would be any tendency to evaluate home-based scenarios more favourably. Importantly, we also ask whether these effects will be conditional on the environmental issue at hand. If distance effects are mostly caused by general solution aversion, the findings for climate change and air pollution should be similar. Conversely, a finding of divergent effects of the two different issue treatments would suggest that people do consider the two problems as having different impacts and solutions.

Second, and relatedly, we seek to establish whether temporal and spatial distance effects, which have been shown for risk perception and worry, also apply to different policy scenarios in space and time.

Third, we investigate whether these effects for the two issues are conditional on political orientation in a non-US context – specifically, Norway. We furthermore ask whether there is any polarization conditional on the characteristics of the scenarios. In other words, we ask if some funding scenarios are more likely than others to polarize the public along the lines of political orientation.

Altogether, the goal of this study is to find out whether more positive stance on delayed action and distant or homeland risk reduction of two different environmental problems is different and if it is conditional on political orientation. In consequence, the tendency to evaluate delayed action more positively than immediate action may be relevant only for some environmental issues and some segments of the population. It may, as well, be polarizing only in specific conditions, rather than universally.

We compare two related environmental issues, which can be construed differently – climate change and local air pollution. Air pollution is, by the nature of both problems, closely interlinked with climate change. Among other things, nitrogen oxide (NO₂), sulphur oxide (SO₂) and other pollutants such as particulate matter often co-occur with carbon dioxide (CO₂) emissions. Consequently, mitigation of climate change through the reduction of fossil fuel combustion typically has positive effects on air pollution as an ancillary benefit. The perception of both issues by the public is related as well, since people often perceive air pollution as the cause of climate change or global warming (Whitmarsh 2009). Whitmarsh (2009) even suggests using the link to air pollution to gain more public interest and increase motivation to act. Moreover, citizens may also associate certain level of policy making as appropriate for certain

problems. Air pollution could be seen as best solved on local level, while climate change, as a global process, would be seen as best tackled on global policy level. Consequently, one may expect that public spending on air pollution will gain affirmative attitudes more often but still be subject to some of the distance effects found for climate change.

Norway as a case

Norway is a suitable country for answering our research questions, as both air pollution and climate change have been high on the public agenda in recent years. Furthermore, the political system is relatively consensus-based (Lijphart, 1999), providing a useful contrast to the more polarized US.

Despite its image as a country of clean air and water, Norway has struggled with local air pollution in several cities and regions. Levels of air pollution from road traffic, residential wood burning, industrial activity and shipping have at times reached hazardous levels and surpassed EU limits on ambient air pollution. In 2015, the European Free Trade Agreement (EFTA) court found Norway in breach of EU Directive 2008/50/EC on ambient air quality and cleaner air for SO₂, NO₂ and particulate matter (PM₁₀).¹ The court also found that Norway had failed to produce adequate air quality plans as required by European law.

Furthermore, and in contrast to many other European countries, Norway's greenhouse gas emissions have increased from 1990, the base year for emission

¹ Case E-7/15, *ESA v Norway* [2015] EFTA Ct. Rep. 568

accounting under the Kyoto Protocol.² A major reason for this failure to cut emissions is the country's petroleum industry, which causes a dilemma between Norway's wish to appear as environmentally friendly while accumulating massive wealth from the export of fossil fuels (Norgaard, 2006). Relatedly, there is some evidence that certain types of climate scepticism among the Norwegian public are at the high end among industrialized countries (Tranter and Booth, 2015; Poortinga et al, 2019), although other studies show a more nuanced picture (Steentjes et al., 2017).

Methods

Data

Data from the second wave of the Norwegian Citizen Panel (2014) are analysed in this study. The Norwegian Citizen Panel is an infrastructure for Internet-based public opinion research, owned by the University of Bergen and exclusively used for academic purposes. The panellists were recruited prior to the first wave of the panel via random selection from the national population registry. A total of 4,905 respondents answered the first wave and 3,372 answered the second. Respondents were randomly assigned to two groups answering different sets of questions (see Supplementary Materials for the codebook, design and question wordings). A subset of Wave 2 respondents was selected for the current study, yielding 1,714 observations overall. These were further randomized into eight groups. Due to drop-out issues in the panel data, sampling biases

² The increase was approximately 3% from 1990 to 2017. Source: "Kvotepliktige og ikke-kvotepliktige utslipp av klimagasser," Norwegian Environment Agency, dated 12 Dec 2018, <https://www.miljodirektoratet.no/no/Tema/klima/Klimagasser/Kvotepliktige-og-ikke-kvotepliktige-utslipp-av-klimagasser/>, accessed 14 Feb 2019.

are present in the analysed sample. Namely, younger and less educated citizens are underrepresented (see Table 1 in Online Appendix A) and older and well-educated citizens are somewhat overrepresented. Models were run with both the weighted and unweighted data, producing substantively similar results. We therefore present unweighted data in the analyses below.

There were no statistically significant differences between the eight randomized groups with respect to the region of residence, education, age group, and gender (with a slight statistically significant overrepresentation of men in one of the groups; see Table 1), as well as perceived seriousness of climate change and other related attitudes (tested by Spearman's rho). There were some statistically significant differences with respect to the political orientation of the respondents (see Table 1) both between randomized groups and between one resulting experimental treatment (spatial attribute). Those oriented to the right side of the political spectrum are overrepresented by 6% in the condition *now*. As political orientation is an explanatory variable in one of our models, these differences are accounted for in that model.

TABLE 1

The survey was administered over the Internet and panellists were mailed a postal notice about their selection into the panel together with instructions to fill out the questionnaire. Panellists who have registered in the first wave were invited and eventually reminded to participate in the second wave by several e-mail reminders (see Høgestøl and Skjervheim 2014 for details). As an incentive, participants were entered into a lottery to win a travel gift card (25 000 NOK, ~2,500 EUR).

Experimental design

An experimental design was chosen to answer the hypotheses on influence of issue, temporal, and spatial scale. The experimental method was chosen in order to produce reliable estimates of the effects of the changes in the policy scenarios. The alternative, i.e. asking people to evaluate all of the scenarios, introduces risks of consistency bias, i.e. that responses to later scenarios will be influenced by preceding scenarios.

Therefore, the sample was randomized into eight subgroups. Each of the eight groups received a single question on degree of agreement with the use of public funds to finance environmental policy measures.

The scenarios had three attributes – spatial scale, timing, and targeted risks (air pollution or climate change). There were two distinct levels in each attribute, thus constituting a 2*2*2 full factorial design. The items asked about risk reduction of either climate change or local air pollution (issue attribute), and either in Norway or in the world (spatial attribute). They would also be implemented either immediately, or in 50 years (timing). All possible combinations of these attributes (8 in total) were worded identically (e.g. *To what extent do you agree or disagree with the following statement: Norwegian public funds should be spent on measures that reduce the risk of climate change in Norway immediately*). Each respondent was presented with only one combination. The responses were indicated on 7-point Likert-type scale, from ‘strongly disagree’ (1) via ‘neither agree nor disagree’ (4) to ‘strongly agree’ (7).³

With the exception of a negligible proportion of item non-response, no missing values were present in the dependent variable. The distribution of the dependent

³ Question codes: w02_km202a to h; original question wording in Online Appendix B.

variable for the specific combinations of attributes in each randomized group is presented in Figure 1. A binary variable was constructed by dividing the dependent variable in two categories – agrees (three points on the scale) and does not agree (four points including the mid-point). As can be seen in Figure 1, the distribution supports this division since few respondents chose the mid-point category.

The effect of the experimental treatments and their interactions was assessed by regression models. Since the dependent variable is ordinal, both ordinal regression (proportional odds) with the original variable and binary logistic regression with the dichotomized version were calculated. Because the results of both models are essentially uniform (with one exception commented on below), we present coefficients for the binary logistic model to simplify the interpretation.

The basic model included only dummy variables representing the policy attributes and their levels. The full model included dummy variables and their interactions. Inclusion of the interaction terms yielded higher values of variance inflation factor (VIF) and lower values of tolerance, posing some possible multicollinearity issues if stricter criteria were applied. For this reason, we omit the full-factorial model from interpretation.

To measure self-reported political orientation, we recoded answers on a 11-point left-right scale⁴ into three groups of respondents – those who answered one of the four points on either the left or right end of the scale were coded as having ‘left’ and ‘right’ political orientations, respectively. The rest of the respondents (three middle points) were coded as ‘centre oriented’.

⁴ Question code: w02_k207_1; original question wording in Online Appendix B.

Results

Agreement with funding

In general, wide majorities of the respondents were willing to spend public funds on reducing risks from either climate change or air pollution (between 70% and 87%, see Figure 1). Only minorities expressed downright disagreement. The shares of respondents choosing one of the three scale points of agreement are fairly consistent among most of the scenarios (see Figure 1 for confidence intervals). All four delayed action scenarios tend to elicit greater agreement in general than all immediate scenarios with the exception of reducing air pollution risks in Norway immediately.

FIGURE 1

Thus, at first sight, these general policy attitudes seem to be quite stable. There are, however, some interesting differences between experimental groups – delayed action elicited slightly greater agreement in all but one scenario. It is also notable that homeland air pollution risk reduction has greater endorsement than global action. We therefore further explore how exactly time and space attributes influence respondents' answers.

Out of the three experimental treatments, only the effect of change in timing is statistically significant in the basic logistic regression model without interactions (Table 2). The odds that one would agree rather than not are lower by 33% (significant at the 0.05 level) if the scenario is to reduce risks immediately compared to in 50 years. The coefficients for treatments of spatial level and issue are not statistically significant in

this model.⁵ Overall, there is a tendency to evaluate local reductions more positively, but this result is not robust. Without considering interactions then, it would appear that people generally prefer policies tackling environmental problems in the distant future and that type of risk and spatial distance does not matter.

TABLE 2

Interaction of scenario attributes

Once interaction terms are introduced in the regression model (Tables 2 and 3 in the Online Appendix), the interpretation of the main effects changes. These coefficients now measure an effect of change in the given attribute, while both other attributes are zero. If we recalculate the models with all possible codings of the binary independent variables, the intercepts of these recalculated models provide baseline odds, i.e. odds for different scenarios (with no change in the attributes). The values of baseline odds generally correspond with evaluations of the scenarios as seen in Figure 1. The scenario of reducing risks of air pollution in 50 years in Norway was most often positively evaluated and respondents receiving this combination of attribute levels have also almost eight times higher odds of agreeing with funding such a policy than not agreeing. Reducing the risk of air pollution immediately on the global level, on the other hand, was the least positively evaluated scenario.

⁵ In the ordinal regression model, however, the coefficient for change in the spatial level is statistically significant ($\text{Exp}(B)=0,780^{***}$). This discrepancy is caused by differences in distributions of answers under these two conditions. Specifically, whereas for global reduction more people have chosen the mid-point category, for reduction in Norway more people decided for slight disagreement, while both of these categories are merged in the binary model. These differences were evident in a series of binary logistic regressions with the dependent variable dichotomized at various cut points.

The coefficients for main effects indicate greater effect of temporal and spatial attributes in the air pollution scenarios, while main effects of changing time and space variables in the climate change scenarios are not statistically significant for the most part. In other words, agreement with funding air pollution risk reduction is more susceptible to the spatial and temporal characteristics of the scenario.

Greater agreement with delayed action is found for both environmental issues. First, the odds for the second most positively evaluated policy scenario, i.e. reducing risks of air pollution in Norway immediately, is 38% lower in comparison with in 50 years from now (scenario e → scenario g). Similarly, if the time horizon changes from 50 years to now in the case of reducing risks of local air pollution globally, the odds of agreeing is 37% lower. The effects in climate change scenarios are not statistically significant at the 0.05 level in the binary logistic model; they are, however, statistically significant at that level in ordinal regression model (see Tables 5 to 9 in Online Appendix) and generally confirm the overall effect of changing the time horizon. The effect of change in the time horizon is stable (see Figure 3). Neither of the two possible interactions of this factor has a statistically significant effect.

Second, policies for reducing the risks of local air pollution in either 50 years or immediately are less positively evaluated if the risks are to be reduced in the world rather than Norway alone. Odds of agreement in the world-wide air pollution scenario are 49% lower than for national scenarios. In the case of climate change, however, there is only a hint of an opposite effect of the change in the spatial attribute, and neither coefficient is statistically significant.

Similarly, for reducing risks in Norway, air pollution elicits higher shares of agreement than climate change. If the issue at hand is not air pollution but climate change in the national context, the odds are lower by 45% and 52% for acting now and

in 50 years respectively. Agreement with funding local air pollution risk reduction is much stronger when confined to Norway. Since air pollution was formulated as ‘local’, respondents may not have been very keen to fund its reduction throughout the world or, in other words, outside Norway. On the other hand, there are no strong, statistically significant effects for issue change at the global level.

The two effects present in the air pollution scenarios, i.e. greater agreement with delayed and local action, reinforce each other. This reinforcement results in the largest difference across all eight the scenarios, ‘air pollution in Norway in 50 years’ being the most often approved scenario while the ‘air pollution in the world immediately’ is the least frequently approved one. This suggests that air pollution is perceived as locally bounded.

Agreement with spending on reducing risks of climate change appears to be more consistent between the experimental conditions, although the idea of reducing these risks in Norway immediately elicits lower shares of agreement. Again, this is presumably a result of reinforcement between the two tendencies to delay action and assign climate change as an issue to the global rather than the national level, but the effects are too small to arrive at any robust conclusion.

FIGURE 2

Political orientation

Our results in general support the expected relationship of political orientation and policy attitudes. Almost all risk reduction spending scenarios appear less acceptable for those who claim to be oriented to the right compared to those who incline to the left (see Figure 3). The only exception is the proposition to reduce risks of air pollution in Norway in 50 years, to which around 90% of the respondents from all three groups

provided affirmative responses – this lack of differentiation may be due to a ceiling effect. Centre-oriented respondents usually do not statistically significantly differ from respondents either on the left or right, and their shares answering positively are in the mid-range between the other two groups.

FIGURE 3

In line with the results of the model without political orientation, air pollution scenarios elicit more agreement than climate change scenarios if the policy is said to be local. In all analysed population segments, climate change scenarios have odds lower at most by 56% (left; in 50 years) and at least by 40% (centre; acting now). Nonetheless, the same issue change in global policy schemes has no statistically significant effect.

The regression results reveal some interesting differences in how different segments evaluate proposed scenarios (see Tables 2 to 4 in Online Appendix). Both those on the right and on the left have lower odds of agreement if the air pollution scenario changes from the national to the global level (by 58% and 60%, respectively, for right and left orientation in the delayed action scenario, and by 57% and 60%, respectively, in the acting now scenario; all significant at the 5% level). Changing the spatial attribute from the national to the global level does not affect the attitudes in the climate change scenarios, with the exception of centre-oriented respondents. In both the ‘delayed action’ and ‘acting now’ scenarios, the odds of agreement almost double among centre-oriented respondents (statistically significant at the 1% level). Moreover, scenarios of funding air pollution risk reduction in Norway and in the world are more likely to be endorsed by those with centrist political orientation if delayed, rather than being implemented immediately. In both cases, the odds of agreement are higher by more than 40% if the scenario proposes a delay of 50 years.

Discussion

For air pollution, local focus increases agreement with public spending, while agreement with climate change scenarios is more strongly related to delay. Although air pollution and climate change are issues related through emissions from fossil fuel combustion, people perceive these issues differently in relation to the spatial attribute of their risk reductions - positive evaluations of funding measures reducing risks of climate change are higher in the global context, compared to air pollution scenarios. The more prevalent positive attitudes toward domestic air pollution risk reduction make sense if we consider that public funds used to finance risk-reducing measures are national. Moreover, using them to reduce global risks implies a burden-sharing rule based on wealth and capacity, rather than one based on the polluter-pays principle. There is some evidence that people tend to be prone to self-serving bias and prefer international distribution of costs that implies lower costs to their own country (Carlsson et al. 2013). Furthermore, national policy may be seen as more appropriate to tackle local air pollution rather than such a complex and global problem as climate change, where global solutions are needed. Indeed, it appears that Norwegian preferences are more in line with the idea of global cost-effectiveness in climate change mitigation, whereby funds are to be spent wherever they give the most effect (Kriegler et al., 2018).

Comparing the results obtained by the models presented here, it is clear that some of the effects we found in the first model with interactions are specific to certain segments of population. Namely, delayed action, compared to immediate risk reduction, is more often endorsed by those in the centre; this only holds for air pollution, however. Respondents politically oriented to the left or to the right do not seem to react differently on these scenarios. On the other hand, they seem to react to the spatial attribute of the air pollution scenarios – agreeing more often with funding of domestic

rather than global risk reduction. A complementary effect occurs in the scenarios of risk reduction in Norway. Here, funding air pollution risk reduction rather than climate change mitigation elicits greater agreement among those in the centre and on the right.

Consistently with previous evidence, those with left-leaning political orientation are more likely to agree with public funding of air pollution and climate change risk reduction, even in a country with pervasively positive attitudes. This difference is, however, not a straightforward polarization. Out of 1,714 respondents, 42% are politically oriented to the centre. Attitudes of this significant and large group spread between the other two and thus there is a continuum, rather than a clear bifurcation of public opinion. Interestingly, climate change seems not to be a divisive issue in any scenario. Although agreement with air pollution scenarios varies in response to some scenario attributes conditionally on political orientation, this variation is not polarized. Those on the left and on the right seem to react to the spatial attribute of the air pollution scenarios in a similar fashion.

The overall pervasive willingness to use public funds to reduce risks of air pollution and climate change in all scenarios, and to reduce climate change risks in the world specifically, allow for some positive expectations with respect to public attitudes toward environmental and climate policies. The results further support the previous conclusions on the relevance of global climate change framing despite the assumption that people see it as a distant threat that does not affect them (e.g. Spence and Pidgeon 2010). Although a lack of locally and personally relevant information can be a barrier to behavioural change or action (Lorenzoni, Nicholson-Cole, and Whitmarsh 2007), it does not mean that global framing and information on global impacts are irrelevant and not helpful. This implies that to be effective, the information should emphasise existing values people hold, their beliefs about their own responsibility to act or to contribute

(Krosnick et al. 2006) and their mental representations of climate change (Bostrom et al. 2012). These representations could be framed both locally and globally. In fact, the two levels are very likely to interact, especially with regard to sense of belonging and attachment, and it could be misleading to cast them as discrete (Devine-Wright, Price, and Leviston 2015). Not only can people see distant consequences as more serious (Spence and Pidgeon 2010), but are also more likely to act upon relevant pro-environmental attitudes if primed by a distant-future time perspective (see also Brügger, Morton, and Dessai 2016). These results, as well as ours presented in this study, generally support the notion that climate change can be narrated as both a global and a local issue without substantial losses of policy support, especially in populations that are inclined to agree with public spending in the domain in general.

The high shares of respondents agreeing with public spending in our experiment probably reduced the variance of responses in different experimental conditions. The skewed distributions are presumably a product of the general nature of the policy proposals, which did not include any information on the amount of public spending or on individual costs to the respondents. These are important determinants of policy attitudes (Bord et al., 2000) and would probably decrease the agreement with policy funding. Thus, the relevance of spatial, temporal, and issue contexts may in fact increase for more specific measures, suggesting that our findings are conservative estimates of the effects of the various experimental conditions.

Conclusion

We started this paper by asking three research questions. First, we asked whether the previously demonstrated tendency to see climate change as a temporally and spatially distant threat also held for policy action, and notably for preferences over public

spending. Second, we asked whether these earlier findings of the perceived spatial and temporal remoteness of climate risks are due to a general preference to postpone action on any environmental issue. We introduced the contrast between air pollution and climate change to address this issue. Third, we asked to what extent political ideology would play a role in explaining variation in support for spending on risk reduction in various temporal and spatial scenario combinations. This last question was motivated by an interest in examining whether findings from the US would also apply in Europe.

To answer our research questions, we investigated public responses to general policy scenarios dealing with public funding of climate change and air pollution risk reductions. In an experimental design, we examined whether public responses to these scenarios would vary depending on spatial and temporal attributes of the scenarios and whether this variation would be issue specific to climate change or also hold in the context of air pollution. Moreover, we were interested in whether this variation is conditional on the political orientation of the respondents.

First, we found that preferences for responses to air pollution and climate change differ. The difference found in attitudes towards the two types of risks is particularly pronounced in the spatially and temporally proximate condition as seen in the second panel of Figure 2. In this scenario, endorsement of spending on air pollution is substantively and significantly higher than for spending on climate change. Respondents have in other words more positive attitude toward spending to reduce air pollution risks in Norway now than they have toward spending to reduce climate change risks in Norway now.

Second, we found that spatial proximity influences attitudes toward spending to reduce climate change and air pollution risks differently. In the case of air pollution risks, the spatially proximate, national, scenarios elicit most positive attitudes. For

climate change, the pattern is the opposite. Attitude is more positive in the spatially distant, global, scenarios. Thus, extending the earlier literature on differences in perceived causes and impacts of air pollution and climate change (Tvinnereim et al., 2017), we also find differences across these two environmental issues.

Third, some of these effects were conditional on political orientation, and effects of respondents' left-right self-placement on policy attitudes were particularly clear for scenarios that were more remote in time or space. Achieving public-wide support could therefore mean making trade-offs between different values held by different groups (Shwom, Bidwell, Dan, and Dietz 2010). However, the effects were somewhat different from those seen in existing research based mainly on US data. Specifically, we found little evidence of clear political polarization among the Norwegian public with respect to environmental policy attitudes. Funding climate change risk reduction seems not to be a divisive issue in any of our experimental conditions. On the other hand, agreement with air pollution scenarios varies conditionally on political orientation, but this variation is not polarized. Rather, consensus prevails among Norwegians with respect to public funding of environmental risk reduction.

Most importantly, our results indicate that even though the public shows a greater affinity for delaying spending in many cases, the type of environmental problem matters. In particular, attitudes were more positive toward spending on climate change risk reduction in the global context, whereas attitudes toward air pollution mitigation were more positive in the national context. As regards policy implications and communication, this suggests that emphasising local over global action on climate change may not necessarily enhance public acceptance, unless the action also encompasses related environmental problems such as air pollution.

References:

- Bannon, Brent, Matthew DeBell, John A. Krosnick, Ray Kopp, and Peter Aldhous. 2007. "Americans' Evaluations of Policies to Reduce Greenhouse Gas Emissions." Working Paper. <http://woodsinsitute.stanford.edu/sites/default/files/files/Global-Warming-New-Scientist-Poll-Technical-Report.pdf>.
- Böhm, Gisela and Hans-Rüdiger Pfister. 2005. "Consequences, Morality, and Time in Environmental Risk Evaluation." *Journal of Risk Research* 8(6):461–79.
- Bostrom, Ann, Robert E. O'Connor, Gisela Böhm, Daniel Hanss, Otto Bodi, Frida Ekström, Pradipta Halder, et al. 2012. "Causal thinking and support for climate change policies: International survey findings". *Global Environmental Change* 22 (1): 210–22. <https://doi.org/10.1016/j.gloenvcha.2011.09.012>.
- Bord, Richard J., Robert E. O'Connor, and Ann Fisher. 2000. "In What Sense Does the Public Need to Understand Global Climate Change?" *Public Understanding of Science* 3(9):205–18.
- Brügger, Adrian, Thomas A. Morton, and Suraje Dessai. 2016. "Proximising' climate change reconsidered: A construal level theory perspective." *Journal of Environmental Psychology*, 46: 125–42. <https://doi.org/10.1016/j.jenvp.2016.04.004>.
- Campbell, T. H. and A. C. Kay. 2014. "Solution aversion: On the relation between ideology and motivated disbelief." *Journal of personality and social psychology* 107(5): 809–824.
- Capstick, Stuart, Lorraine Whitmarsh, Wouter Poortinga, Nick Pidgeon, and Paul Upham. 2015. "International Trends in Public Perceptions of Climate Change over the Past Quarter Century." *Wiley Interdisciplinary Reviews: Climate Change* 6 (1): 35–61. <https://doi.org/10.1002/wcc.321>.
- Carlsson, Fredrik, Mitesh Kataria, Alan Krupnick, Elina Lampi, Åsa Löfgren, Ping Qin, and Thomas Sterner. 2013. "A fair share: Burden-sharing preferences in the United States and China." *Resource and Energy Economics* 35 (1): 1–17. <https://doi.org/10.1016/j.reseneeco.2012.11.001>.
- Carrico, Amanda R., Heather Barnes Truelove, Michael P. Vandenbergh, and David Dana. 2015. "Does Learning about Climate Change Adaptation Change Support

- for Mitigation?” *Journal of Environmental Psychology* 41 (March): 19–29.
<https://doi.org/10.1016/j.jenvp.2014.10.009>.
- Coad, Alex, Peter de Haan, and Julia Sophie Woersdorfer. 2009. “Consumer Support for Environmental Policies: An Application to Purchases of Green Cars.” *Ecological Economics* 68 (7): 2078–86.
<https://doi.org/10.1016/j.ecolecon.2009.01.015>.
- Devine-Wright, Patrick. 2013. “Think Global, Act Local? The Relevance of Place Attachments and Place Identities in a Climate Changed World.” *Global Environmental Change* 23 (1): 61–69.
<https://doi.org/10.1016/j.gloenvcha.2012.08.003>.
- Devine-Wright, Patrick, Jennifer Price, and Zoe Leviston. 2015. “My Country or My Planet? Exploring the Influence of Multiple Place Attachments and Ideological Beliefs upon Climate Change Attitudes and Opinions.” *Global Environmental Change* 30 (1): 68–79. <https://doi.org/10.1016/j.gloenvcha.2014.10.012>.
- Drews, Stefan, and Jeroen C.J.M. van den Bergh. 2015. “What Explains Public Support for Climate Policies? A Review of Empirical and Experimental Studies.” *Climate Policy* 16 (7): 1–22. <https://doi.org/10.1080/14693062.2015.1058240>.
- Gattig, Alexander, and Laurie Hendrickx. 2007. “Judgmental Discounting and Environmental Risk Perception: Dimensional Similarities, Domain Differences, and Implications for Sustainability.” *Journal of Social Issues* 63 (1): 21–39.
<https://doi.org/10.1111/j.1540-4560.2007.00494.x>.
- Hammar, Henrik, and Sverker C. Jagers. 2006. “Can Trust in Politicians Explain Individuals’ Support for Climate Policy? The Case of CO₂ Tax.” *Climate Policy* 5 (6): 613–25. <https://doi.org/10.1080/14693062.2006.9685582>.
- Hardisty, David J., Eric J. Johnson, and Elke U. Weber. 2009. “A Dirty Word or a Dirty World?: Attribute Framing, Political Affiliation, and Query Theory.” *Psychological Science* 21 (1): 86–92.
<https://doi.org/10.1177/0956797609355572>.
- Harring, Niklas, and Sverker Jagers. 2013. “Should We Trust in Values? Explaining Public Support for Pro-Environmental Taxes.” *Sustainability* 5 (1): 210–27.
<https://doi.org/10.3390/su5010210>.
- Hart, P. Sol. 2011. “One or Many? The Influence of Episodic and Thematic Climate Change Frames on Policy Preferences and Individual Behavior Change.”

- Science Communication* 33 (1): 28–51.
<https://doi.org/10.1177/1075547010366400>.
- Høgestøl, Asle, and Øivind Skjervheim. 2014. “Norwegian Citizen Panel 2014, second wave.” Methodology Report. Bergen: University in Bergen.
<http://tjinfo.uib.no/Vedlegg?id=a375b38f8e1fec2d9e7181d4f680dbb0>.
- Konisky, David M., Jeffrey Milyo, and Lilliard E. Richardson. 2008. “Environmental Policy Attitudes: Issues, Geographical Scale, and Political Trust.” *Social Science Quarterly* 89 (5): 1066–85. <https://doi.org/10.1111/j.1540-6237.2008.00574.x>.
- Kriegler, Elmar, Christoph Bertram, Takeshi Kuramochi, Michael Jakob, Michaja Pehl, Miodrag Stevanović, Niklas Höhne, Gunnar Luderer, Jan C. Minx, Hanna Fekete, Jérôme Hilaire, Lisa Luna, Alexander Popp, Jan Christoph Steckel, Sebastian Sterl, Amsalu Woldie Yalew, Jan Philipp Dietrich, and Ottmar Edenhofer. 2018. “Short Term Policies to Keep the Door Open for Paris Climate Goals.” *Environmental Research Letters* 13(7): 1–12.
- Krosnick, Jon A., Allyson L. Holbrook, Laura Lowe, and Penny S. Visser. 2006. “The Origins and Consequences of democratic citizens’ Policy Agendas: A Study of Popular Concern about Global Warming.” *Climatic Change* 77 (1–2): 7–43.
<https://doi.org/10.1007/s10584-006-9068-8>.
- Leiserowitz, Anthony. 2006. “Climate Change Risk Perception and Policy Preferences: The Role of Affect, Imagery, and Values.” *Climatic Change* 77 (1–2): 45–72.
<https://doi.org/10.1007/s10584-006-9059-9>.
- Lijphart, Arend. (1999). *Patterns of Democracy: Government Forms and Performance in Thirty-Six Countries*, Yale University Press.
- Liu, Yang, Charlene Xie, and Shengxiang She. 2014. “Perception of Delayed Environmental Risks: Beyond Time Discounting.” *Disaster Prevention and Management* 23 (2): 112–22. <http://dx.doi.org/10.1108/DPM-06-2013-0099>.
- Lorenzoni, Irene, Sophie Nicholson-Cole, and Lorraine Whitmarsh. 2007. “Barriers perceived to engaging with climate change among the UK public and their policy implications.” *Global Environmental Change* 17 (3–4): 445–59.
<https://doi.org/10.1016/j.gloenvcha.2007.01.004>.
- Lorenzoni, Irene, and Nick F. Pidgeon. 2006. “Public Views on Climate Change: European and USA Perspectives.” *Climatic Change* 77 (1–2): 73–95.
<https://doi.org/10.1007/s10584-006-9072-z>.

- Lu, Hang, and Jonathon P. Schuldt. 2015. "Exploring the Role of Incidental Emotions in Support for Climate Change Policy." *Climatic Change* 131 (4): 719–26. <https://doi.org/10.1007/s10584-015-1443-x>.
- . 2016. "Compassion for Climate Change Victims and Support for Mitigation Policy." *Journal of Environmental Psychology* 45 (March): 192–200. <https://doi.org/10.1016/j.jenvp.2016.01.007>.
- Lujala, Päivi, Haakon Lein, and Jan Ketil Rød. 2015. "Climate Change, Natural Hazards, and Risk Perception: The Role of Proximity and Personal Experience." *Local Environment* 20 (4): 489–509. <https://doi.org/10.1080/13549839.2014.887666>.
- McCright, Aaron M. 2008. "Social Bases of Climate Change Knowledge, Concern, and Policy Support in the U.S. General Public, The." *Hofstra Law Review* 37: 1017–1047.
- McDonald, Rachel I., Hui Yi Chai, and Ben R. Newell. 2015. "Personal experience and the 'psychological distance' of climate change: An integrative review." *Journal of Environmental Psychology* 44: 109–18. <https://doi.org/10.1016/j.jenvp.2015.10.003>.
- Nicolaij, Sietske, and Laurie Hendrickx. 2003. "The influence of temporal distance of negative consequences on the evaluation of environmental risks." In Laurie Hendrickx, Wander Jager, and Linda Steg (Eds.), *Human decision making and environmental perception. Understanding and assisting human decision making in real-life situations*. Groningen: University of Groningen.
- Newell, Ben R., Rachel I. McDonald, Marilyn Brewer, and Brett K. Hayes. 2014. "The Psychology of Environmental Decisions." *Annual Review of Environment and Resources* 39 (1): 443–67. <https://doi.org/10.1146/annurev-environ-010713-094623>.
- Norgaard, Kari Marie. 2006. "'We Don't Really Want to Know': Environmental Justice and Socially Organized Denial of Global Warming in Norway." *Organization & Environment* 19 (3): 347-370.
- O'Connor, Robert E., Richard J. Bord, Brent Yarnal, and Nancy Wiefek. 2002. "Who Wants to Reduce Greenhouse Gas Emissions?" *Social Science Quarterly* 83 (1): 1–17. <https://doi.org/10.1111/1540-6237.00067>.

- Pahl, Sabine, Stephen Sheppard, Christine Boomsma, and Christopher Groves. 2014. "Perceptions of Time in Relation to Climate Change: Perceptions of Time in Relation to Climate Change." *Wiley Interdisciplinary Reviews: Climate Change* 5 (3): 375–88. <https://doi.org/10.1002/wcc.272>.
- Poortinga, Wouter, Lorraine Whitmarsh, Linda Steg, Gisela Böhm, and Stephen Fisher. 2019. "Climate Change Perceptions and Their Individual-Level Determinants: A Cross-European Analysis." *Global Environmental Change* 55: 25–35.
- Rickard, L. N., Z. J. Yang and J. P. Schuldt. 2016. "Here and now, there and then: How 'departure dates' influence climate change engagement." *Global Environmental Change* 38: 97–107.
- Scannell, Leila, and Robert Gifford. 2013. "Personally relevant climate change the role of place attachment and local versus global message framing in engagement." *Environment and Behavior* 45 (1): 60–85.
- Shwom, Rachael, David Bidwell, Amy Dan, and Thomas Dietz. 2010. "Understanding U.S. Public Support for Domestic Climate Change Policies." *Global Environmental Change* 20 (3): 472–82. <https://doi.org/10.1016/j.gloenvcha.2010.02.003>.
- Spence, Alexa, and Nick Pidgeon. 2010. "Framing and communicating climate change: The effects of distance and outcome frame manipulations." *Global Environmental Change*, 20th Anniversary Special Issue, 20 (4): 656–67. <https://doi.org/10.1016/j.gloenvcha.2010.07.002>.
- Spence, Alexa, Wouter Poortinga, and Nick F. Pidgeon. 2012. "The Psychological Distance of Climate Change: Psychological Distance of Climate Change." *Risk Analysis* 32 (6): 957–72. <https://doi.org/10.1111/j.1539-6924.2011.01695.x>.
- Steenjtes, Katharine, Nick F. Pidgeon, Wouter Poortinga, Adam J. Corner, Annika Arnold, Gisela Böhm, Claire Mays, Marc Poumadère, Michael Ruddat, Dirk Scheer, Marco Sonnberger and Endre Tvinnereim. (2017). *European Perceptions of Climate Change (EPCC): Topline findings of a survey conducted in four European countries in 2016*.
- Stoutenborough, James W., Rebecca Bromley-Trujillo, and Arnold Vedlitz. 2014. "Public Support for Climate Change Policy: Consistency in the Influence of Values and Attitudes Over Time and Across Specific Policy Alternatives: Public

- Support for Climate Change Policies.” *Review of Policy Research* 31 (6): 555–83. <https://doi.org/10.1111/ropr.12104>.
- Tranter, Bruce and Kate Booth. 2015. “Scepticism in a changing climate: A cross-national study.” *Global Environmental Change* 33: 154–164.
- Tvinnereim, Endre, Xiaozhi Liu, and Eric M. Jamelske. 2017. “Public Perceptions of Air Pollution and Climate Change: Different Manifestations, Similar Causes, and Concerns.” *Climatic Change* 140(3):399–412.
- Vlek, Charles. 2000. “Essential Psychology for Environmental Policy Making.” *International Journal of Psychology* 35 (2): 153–67. <https://doi.org/10.1080/002075900399457>.
- Whitmarsh, Lorraine. 2009. “What’s in a Name? Commonalities and Differences in Public Understanding of 'Climate Change' and 'Global Warming'.” *Public Understanding of Science* 18 (4): 401–20. <https://doi.org/10.1177/0963662506073088>.
- Wiest, Sara L., Leigh Raymond, and Rosalee A. Clawson. 2015. “Framing, Partisan Predispositions, and Public Opinion on Climate Change.” *Global Environmental Change* 31: 187–98. <https://doi.org/10.1016/j.gloenvcha.2014.12.006>.
- Zvěřinová, Iva, Milan Ščasný, and Eva Kyselá. 2014. “What Influences Public Acceptance of the Current Policies to Reduce GHG Emissions?” WP2 Deliverable 2.5. Prague: Charles University Environment Center. <http://cecilia2050.eu/publications/239>.