Environmental disasters and public-opinion formation: A natural experiment

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Abstract

This study leverages the Fukushima Daiichi nuclear accident as natural experiment to determine the causal impact environmental disasters may have on the formation of environmental public opinion. Using Eurobarometer data on more than 60,000 individuals' attitudes toward environmental salience before and after the incident, I find that Fukushima had indeed a causal effect on whether people see the environment as a salient policy item. This impact is more strongly pronounced for what respondents think dominates the political agenda than for personal priorities. These results have important implications for the understanding of how public opinion about the environment is formed, and they have crucial consequences for the suspected link between policymaking and public opinion.

1. Introduction

How is public opinion about the environment formed? A large literature has emerged over the past few years examining the drivers behind individuals' views on the environment and environmental politics as understanding the factors shaping the public's environmental attitude is crucial for policy circles and scholars alike (for recent overviews, see, Bernauer and McGrath 2016, Bakaki and Bernauer 2017a, 2017b, 2018, Bakaki et al 2019, Howe et al 2019). For example, addressing climate change effectively requires that people fundamentally alter their behavior, which can only be done if individual support for environmental action is secured. As concluded in (Bakaki and Bernauer 2017b, p.1), this implies that public opinion sets important constraints on what policymakers can achieve. And, in fact, public opinion matters for policy by shaping legislation action and influencing which policies are implemented and which ones are not (Dunlap 1995, Anderson et al 2017, Bakaki et al 2019). On the other hand, Howe et al (2019) analyze more than 70 studies on the relationship between climate change and public opinion, but find that the evidence for this is rather inconsistent. As a result, it is pivotal to add to and improve our understanding of how public opinion on the environment looks like, how it is formed, and what drivers most crucially influence the emergence of people’s views.

That said, identifying causal factors that substantively affect environmental public-opinion formation has proven to be difficult (Howe et al 2019). Most quantitative works merely present correlations, which can suffer from reporting bias or cognitive dissonance (Bloom 1995, Dunlap and Mertig 2014). Very few studies have sought to identify a true causal factor behind environmental public opinion, but here the results are rather mixed and do not consistently point to a genuine treatment effect (see Barnes et al 2008, Carlisle et al 2010, Jorireman et al 2010, Bishop 2014, Bakaki and Bernauer 2017a, 2017b, 2018, Bernauer et al 2019, Huber et al 2019, Howe et al 2019). I build on and seek to contribute to this literature by focusing on one potential driver of environmental public opinion, environmental disasters, and leveraging a natural experiment to identify a genuine causal effect on people's environmental attitudes. Using a quasi-experimental research design based on
Eurobarometer data\(^1\), I investigate the impact of the Fukushima Daiichi nuclear accident from March 11, 2011 on Europeans’ views on environmental salience.

Not only did about 20,000 people die due to the earthquake and tsunami leading to the disaster, but also the nuclear incident itself had crucial negative implications for the environment by heavily contaminating the surrounding area as well as other parts of the globe with radioactivity\(^2\), by forcing more than 80,000 people out of their homes, and by lowering ecological diversity. Theoretically, a distinctive event such as Fukushima has the potential to evoke a collective change in attitude: the spillover from media coverage of the incident to media reception by individuals results in a change in their attitudes (see Bakaki et al. 2019). Consistent with this idea, Iyengar and Kinder (2010) contend that mass media have a political agenda setting effect, which also influences whether citizens pay attention to certain issues and form their views. Barnes et al. (2008) focus on Hurricane Katrina and arrive at a similar conclusion. The Fukushima Daiichi accident was widely covered in the news, also in Europe, and strongly linked to the environment (see Imtihani and Mariko 2013, Kepplinger and Lemke 2016). That said, we lack systematic research on whether Fukushima ultimately affected people’s views on the environment.

While there are several studies that examine the impact of Fukushima on public opinion (e.g., Perko et al. 2012, Kim et al. 2013, Poortinga et al. 2013, Bird et al. 2014, Latré et al. 2017, Soni 2018), they either focus on single countries or a limited number of states, analyze people’s views on nuclear energy, or lack a clear identification strategy (see Jorant 2011, Poortinga et al. 2013, Kim et al. 2013, Bird et al. 2014, Arlt and Wolling 2016, Kristiansen et al. 2016, Meyer and Schoen 2017, Soni 2018, Hartwig and Tkach-Kawasaki 2019). The design of my research seeks to overcome these shortcomings: using the Eurobarometer, which fielded surveys before and after the accident about citizens’ attitudes toward environmental politics, I obtain data for 28 countries and more than 60,000 individuals before and after the disaster. This approximates an experimental design in which we can randomly assign exposure to Fukushima, thus allowing me to tease out a causal effect the incident may have had on environmental views. I also add to the literature by studying environmental salience, i.e., people’s views on whether the environment is a pressing issue that has to be addressed. Salience is the ‘intensity of a feeling’ and the degree of importance that individuals attach to the environment as a policy issue (see Hatton 2017). From a policy perspective, voters’ preferences do not become political priorities when salience is low.

The results suggest that the Fukushima Daiichi nuclear accident did indeed have a causal impact on public opinion. The analysis of the pooled sample highlights that people interviewed after the incident were about 1%-point more likely to report that they see the environment as a salient issue for themselves or something immediate national and EU politics have to deal with. This causal effect is more strongly pronounced in states like Germany, where the impact is higher than 3%-points. Moreover, when distinguishing between what respondents think dominates the political agenda and personal priorities, I find that Fukushima had the strongest effect on the former. This study makes several central contributions. First, this research is among the first to identify a genuine causal factor behind environmental public opinion by using a natural experimental design. What is more, similar approaches have been used in the study of terrorist attacks and public opinion (e.g., Legewie 2013, Nussio et al. 2019, Balcels and Torrats-Espinosa 2018) and by transferring such designs to environmental politics and public opinion, I connect diverse fields in the social sciences. Second, understanding how public opinion is formed is a key concern in democratic countries. I show in the case of people’s environmental views how and to what extent an environmental disaster can influence mass attitudes. Third, public opinion affects public policymaking (Kim et al. 2013, Anderson et al. 2017, Bakaki et al. 2019). By demonstrating that Fukushima had a causal impact on public opinion, I can establish a direct link between the accident and states’ policy responses.

**Design**

To examine whether the Fukushima disaster exerted a causal impact on environmental public opinion, I rely on Eurobarometer data and identified survey rounds that were conducted right before and after the accident. On one hand, there is Eurobarometer 74.2 that was fielded in November-December 2010 and, thus, immediately before Fukushima. On the other hand, I make use of Eurobarometer 75.3, which was fielded in May 2011 (about one and a half months after the incident). Employing these two data sets allows for a quasi-experimental design as I analyze individual views on the environment shortly before and after the accident. Respondents interviewed before Fukushima should not systematically differ from people interviewed after the accident except for the treatment. As discussed in Legewie (2013), among others, the identification strategy of this quasi-experimental design relies on two assumptions. First, the timing of the interviews must have occurred randomly. Second,

\(^1\) Available online at: https://www.gesis.org/eurobarometer-data-service/home/.

\(^2\) Radioactive material was detected even in North America or Europe.
there should be no other time-varying influences, which are causally before Fukushima and systematically related to environmental public opinion conditional on the accident. Fukushima constitutes a causally exogenous experimental stimulus that randomly separates the control and experimental groups, which lowers the risk of ‘alternative trends affecting potential changes’ (Nussio et al. 2019, p4). The treatment is assigned as-if random and since Eurobarometer 74.2 and 75.3 are the closest ones to the nuclear accident, I minimize the impact of other events influencing the outcome variable. Hence, the small difference in time and the absence of other notable events suggest that the two assumptions are met. The balance statistics further support this conclusion as the normalized differences of all items do not exceed 0.25 (Imbens and Wooldridge 2009). Specifically, the normalized difference for Left-Right Placement is 0.0105, for Age I obtain -0.0019, it is 0.0101 for Female, and for Unemployed I calculate the normalized difference at 0.0060. I have also conducted a falsification test.

Against this background, I have identified a series of relevant variables across Eurobarometer 74.2 and 75.3 that are operationalized in the same way, with the same question wordings. I have merged both data sets with the individual as the unit of analysis and eventually obtain 62,549 cases. The dependent variable, Environmental Salience, is constructed using various items of the two surveys. That is, first, there is the question ‘what do you think are the two most important issues facing (OUR COUNTRY) at the moment?’ and respondents could name the environment as one of the two issues. Second, this item is modified to address more personal views, i.e., ‘[a]nd personally, what are the two most important issues you are facing at the moment?’ Finally, there is ‘what do you think are the two most important issues facing the European Union at the moment?’ If individuals named the environment in any of these questions as one of the two most important issues their country, the EU, or themselves faced, Environmental Salience receives a value of 1 and 0 otherwise. Among the 62,549 respondents, 11.19 percent expressed that the environment is a salient policy issue according to this variable. In general, survey data generally comprise two dimensions of public opinion, i.e., preference and salience (see Hatton 2017). Whereas preferences relate to, e.g., the degree of environmental quality a respondent would like to see, salience captures the degree of importance linked to the environment as a policy issue (Hatton 2017). Highly salient issues can elicit strong policy responses and, thus, I use environmental salience as the dependent variable. Theoretically, I initially do not expect differences across the different types of salience, hence the aggregation into one variable.

Given the hierarchical nature of my data, i.e., individuals are nested in countries and years, I use multilevel mixed-effects (hierarchical) linear regression models and, as random components, incorporate a unit-level intercept to account for unobserved heterogeneity (see also Legewie 2013). The structural form of these models is:

$$ y = X\beta + Zu + \epsilon, \quad (1) $$

where $y$ is the dependent variable, Environmental Salience, $X$ is a matrix for the fixed effects that comprises the main independent variable in this study and the control covariates, and $Z$ is a matrix for the random effects $u$. Finally, $\epsilon$ pertains to the error term, which is assumed to be multivariate normal. The Eurobarometer provides information on regional subdivisions and units at the NUTS1, NUTS2, or NUTS3 level, which is a hierarchical geo-code standard that divides the territory of European states. NUTS regions are based on socioeconomic, cultural, and historical characteristics to represent relative homogenous areas (Legewie 2013). The unit-level intercept in my models is based on the lowest possible level of aggregation and is modeled according to a normal distribution. Finally, all estimations are weighted by a population and post-stratification weight to adjust for each (national) sample in proportion to its share in the total population aged 15 and over. I use the Eurobarometer’s W88 weight, which includes all 25 member countries after the 2004 enlargement, the new members as of 2007 (Romania and Bulgaria), and the remaining candidate countries Turkey and Croatia, the Turkish Cypriot Community, North Macedonia, and Iceland.

Treatment, the explanatory variable of main interest, receives a value of 1 if individuals were interviewed after the Fukushima disaster and a value of 0 when interviewed before as part of Eurobarometer 74.2. About 50.79 percent in my sample have received this treatment. Under the assumptions discussed above, any effect I may identify can be interpreted causally as the average causal effect of the treatment on Environmental Salience (Legewie 2013). Next to the main explanatory variable, I control for a series of individual-level characteristics, which are also related to environmental public opinion (see Bakaki and Bernauer 2017a, 2017b, 2018). First, there is the left-right self-placement. I employ a dichotomous variable to lower potential bias stemming from measurement error, which receives the value of 1 if respondents placed themselves as 8, 9, or 10 on the original 0–10 scale (0 otherwise). To this end, I practically construct a binary item on whether individuals have more conservative attitudes or not. About 14.39 percent consider themselves as more conservative or right-wing as operationalized this way. Second, I control for respondents’ age, which ranges between 15 and 98 in my sample.

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3 For this falsification analysis, I replaced the outcome variable by respondents’ trust in the European Central Bank (see also Muñoz et al. 2019). The treatment does not have a positive effect in this analysis.
(mean value of 47.69). Third, male respondents might differ from females in their views about the environment. I create a variable, Female, which is coded 1 if a survey participant was female (0 otherwise). Finally, when people indicated that they were not self-employed or employed, I code them as non-working (i.e., unemployed, retired, students, or people ‘responsible for ordinary shopping, etc’) and include the corresponding binary variable in the analysis as well.

Results

The main findings are summarized in table 1: Model 1 only comprises the main explanatory variable next to the unit-level random effects, Model 2 includes all independent variables discussed so far. Both models are based on multilevel mixed-effects (M-E) linear regression. Model 3 mirrors the setup in Model 2, but I now employ multilevel mixed-effects logistic regression, which is more appropriate given the binary dependent variable. I present substantive quantities of interest in the form of average marginal effects for all main models in figure 1. The results strongly support the claim that Fukushima significantly and causally affected individuals’ views on the environment. Regardless of model specifications, the impact of Fukushima is remarkably similar across estimations as, in essence, the disaster increased the likelihood of the environment being perceived as salient by 1%-point. A rather large sample and a rather large amount of 0s on the outcome variable, as the environment may not feature as salient in most people’s views to begin with, make this is a sizeable impact. Hence, the analysis is among the first to identify a real, genuine causal effect stemming from the Fukushima Daiichi nuclear accident on environmental public opinion. The control variables display largely expected effects: more conservative and older individuals are less likely to see the environment as a pressing policy issue, non-working people are more likely to do so. In comparison, the substantive impact of Age and Non-Working is less strongly pronounced than for the treatment. The substantive effect of Left-Right Placement is stronger, though: about 2.4%-points versus a 1%-point increase due to the treatment.

While table 1 and figure 1 point to a general, cross-country effect, I have re-estimated Model 2 separately by country. The corresponding results are depicted in figure 2, which displays the marginal effects of the treatment by state. As demonstrated there, most countries are indeed linked to a positive treatment effect, which mirrors the results in table 1 and figure 1, but not all of them are significant at conventional levels. In fact, the overall treatment effect is driven to a large degree by France (increase in environmental salience by 3.25 percent), Germany (3.1 percent increase), Lithuania (1.4 percent increase), and Turkey (3.6 percent increase). Interestingly, Denmark even experienced a negative impact on environmental public opinion as the chances to see the environment as a salient policy issue have, in fact, decreased due to Fukushima. Ultimately, although there is a general effect across countries, heterogeneity of the effects persists. In the appendix, I shed some light on this variation across countries by examining the importance of nuclear power: the treatment effect persists in

| Table 1. Environmental Public Opinion: Main Models. |
|------------------------------------------------------|
| Model 1 Model 2 Model 3 |
| M-E Regression M-E Regression M-E Logistic Regression |
| Treatment | 0.010 a | 0.010 a | 0.010 a |
|           | (0.005) | (0.005) | (0.005) |
| Left-Right placement | −0.024 a | −0.027 a |
| Age | −0.001 a | −0.001 a |
| Female | 0.001 | 0.001 |
| Non-Working | 0.010 a | 0.008 |
| Constant | 0.110 a | 0.166 a | −1.729 a |
| Observations | 62,549 | 62,549 | 61,549 |

Note: table entries are coefficients from multilevel mixed-effects linear regression (Models 1-2) or average marginal effects from multilevel mixed-effects logistic regression (Model 3); robust standard errors in parentheses. a p < 0.05.
Figure 1. Average Marginal Effects.

Note: Vertical bars pertain to 90 percent confidence intervals.

Figure 2. Treatment Effect by Country.

Note: Vertical bars pertain to 90 percent confidence intervals.
those countries with a significantly large number of nuclear power plants— and France and Germany were among those states in 2010/2011.

In Table 2, although originally I do not expect differences across the different types of salience, I disaggregate the outcome variable into individuals’ personal views and priorities4 and what respondents think dominates the country’s and the Union’s political agenda. The results in Models 4-5 highlight that people’s personal views were largely unaffected by Fukushima. However, in terms of policy issues dominating the country or the EU, the disaster shaped public opinion in nearly the same substantive way as discussed above: the likelihood of seeing the environment as a national and EU policy priority increased by 0.8% due to the Fukushima accident. Hence, as Table 2 shows, the main results are largely driven by ‘political salience,’ i.e., issues deemed as important for a respondent’s home country and the EU. On one hand, Table 2 then emphasizes that disaggregation is important as even items with an underlying, similar latent concept can exert different effects. In my case, the Fukushima disaster may have been perceived as so intense that national and EU-wide responses were seen as necessary, thereby mainly producing a systematic impact for the political agenda instead of or in addition to personal views. On the other hand, Table 2 also explains the mixed evidence of many studies in the context of climate change and public opinion (e.g., Howe et al 2019) as disaggregation may uncover previously—in aggregated contexts—hidden patterns.

**Conclusion**

What shapes public opinion? This fundamental question lies at the heart of modern democratic societies and shedding light on it has affected the social sciences for decades. In the context of environmental politics, however, a series of studies has dealt with the drivers of public opinion, but our understanding of it remains limited and few causal factors behind people’s attitudes could have been identified (e.g., Howe et al 2019). This study contributes to the literature by addressing whether environmental disasters can exert a causal impact on what individuals think about the environment. I focus on the Fukushima Daiichi nuclear accident and public opinion in Europe. By relying on a natural experimental design, I analyzed data on people’s views before and after the incident and find that Fukushima did indeed causally shape public opinion about the environment. According to the pooled analysis, the general effect is estimated at around 1%-point, i.e., Fukushima increased the chances of people seeing the environment as a salient policy issue by about 1%-point. Individual country effects are partly more strongly pronounced, e.g., in France or Germany. However, additional analyses in the appendix suggest that the effect I find, albeit causal, is rather short-lived and there is little evidence for a lasting effect of the disaster on public opinion. Specifically, the positive causal impact I have identified seems to have died out by November 2011 already. This is particularly important as previous works (see Barnes et al 2008, Carlisle et al 2010, Joireman et al 2010, Bishop 2014, Bakaki and Bernauer 2017a, 2017b, 2018, Bernauer et al 2019, Huber et al 2019, Howe et al 2019) also report that the effects

4 That is, ‘[a]nd personally, what are the two most important issues you are facing at the moment.’
of extreme weather on climate concern are small and fleeting. I report similar effects here, which suggests that there is a more general pattern present.

Still, Fukushima then not only had an impact on people’s views on nuclear energy (e.g., Perko et al 2012, Kim et al 2013, Poortinga et al 2013, Bird et al 2014, Latré et al 2017, Soni 2018), but also environmental salience. The implications of this finding are important for both policymakers and the academic literature. On one hand, this research identifies a genuine, causal effect that has shaped public opinion, even if only short-lived. The quasi-experimental design using Eurobarometer data overcomes limitations of previous work. To this end, our general understanding of how public opinion is formed is improved. The empirical evidence for a link of environmental influences and public opinion is mixed (see Barneset et al 2008, Carlisle et al 2010, Joireman et al 2010, Bishop 2014, Bakaki and Bernauer 2017a, 2017b, 2018, Bernauer et al 2019, Huber et al 2019, Howe et al 2019), which is often the result of research designs failing to establish a causal link. My work sought to precisely overcome this. On the other hand, recent research reports that policymaking reacts to public opinion (e.g., Anderson et al 2017, Bakaki et al 2019). The more the public sees the environment as a priority policy issue, the more likely it is that corresponding policies will be implemented. This research suggests then that policy action in light of Fukushima, such as the nuclear power phase-out initiated in Germany, was in part due to public opinion—which was, in light of my research, directly shaped by the environmental disaster. More generally, though, another key implication in this context is that disasters can open a ‘window of opportunity’ for policy action as public opinion influences the latter and its support is pivotal for successful policy implementation. Yet, as the effect of environmental disasters on public opinion seems to be short-lived, policymakers have to act fast.

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References

Anderson B, Böhmelt T and Ward H 2017 Public opinion and environmental policy output: a cross-national analysis of energy policies in Europe Environ. Res. Lett. 12 114011
Art D and Wolling J 2016 Fukushima effects in Germany? Changes in media coverage and public opinion on nuclear power Public Understand. Sci. 25 842–57
Bakaki Z and Bernauer T 2017a Citizens show strong support for climate policy, but are they also willing to pay? Clim. Change 145 15–26
Bakaki Z and Bernauer T 2017b Do global climate summits influence public awareness and policy preferences concerning climate change? Environmental Politics 26 1–26
Bakaki Z and Bernauer T 2018 Do economic conditions affect public support for environmental policy? J. Clean. Prod. 195 66–75
Bakaki Z, Böhmelt T and Ward H 2019 The triangular relationship between public concern for environmental issues, policy output, and media attention Environmental Politics 1–21
Balcells I and Torrats-Espinosa G 2018 Using a natural experiment to estimate the electoral consequences of terrorist attacks Proc. of the National Academy of Sciences 115 10624–9
Barnes M D, Hanson C L, Novilla L M B, Meacham A T, McIntyre E and Erickson B C 2008 Analysis of media agenda setting during and after Hurricane Katrina: Implications for emergency preparedness, disaster response, and disaster policy American Journal of Public Health 98 694–10
Bernauer T, Prakash A and Reiser-McGrath I 2019 Do exemptions undermine environmental policy support? An experimental stress test on the odd–even road space rationing policy in India Regulation & Governance 14 481–500
Bernauer T and McGrath I 2016 Simple reframing unlikely to boost public support for climate policy Nat. Clim. Change 6 680
Bird D, Haynes K, van den Honert R, McAneney J and Poortinga W 2014 Nuclear power in Australia: A comparative analysis of public opinion regarding climate change and the Fukushima disaster Energy Policy 65 644–53
Bishop B 2014 Focusing events and public opinion: evidence from the Deepwater Horizon disaster Political Behavior 36 1–22
Bloom D E 1995 International public opinion on the environment Science 269 354–8
Carlisle J E, Ferezz T J, Michaud K E H, Smith E R A N and Smith I L 2010 The public’s trust in scientific claims regarding offshore oil drilling Public Understand. Sci. 19 514–27
Dunlap R 1995 Public opinion and environmental policy Environmental Politics and Policy: Theories and Evidence 63–114
Dunlap R and Mertig A 2014 Trends in public opinion toward environmental issues: 1965–1990 American Environmentalism (Oxford: Taylor & Francis) 101–28
Hartwig M G and Tkach-Kawasaki L 2019 Identifying the ‘Fukushima Effect’ in Germany through policy actors’ responses: evidence from the G-GEFON 2 survey Quality & Quantity 53 2081–101
Hatton T 2017 Public opinion on immigration in Europe: preference versus salience CEPR Discussion Paper No. DP12084
Howe P D, Marlon J R, Mildenberger M and Shield B S 2019 How will climate change shape climate opinion? *Environ. Res. Lett.* **14** 113001
Huber R, Wicki M and Bernauer T 2019 Public support for environmental policy depends on beliefs concerning effectiveness, intrusiveness, and fairness *Environmental Politics* **29** 649–73
Imbens G and Wooldridge J 2009 Recent developments in the econometrics of program evaluation *J. Econ. Literature* **47** 5–86
Imtihani N and Mariko Y 2013 Media coverage of Fukushima nuclear power station accident 2011 (A case study of NHK and BBC World TV stations), *Procedia Environmental Sciences* **17** 938–86
Iyengar S and Kinder D R 2010 *News that matters: Television and American opinion* (Chicago, IL: University of Chicago Press)
Joiemani J, Truelove H B and Duell B 2010 Effect of outdoor temperature, heat primes and anchoring on belief in global warming *Journal of Environmental Psychology* **30** 358–67
Jorant C 2011 The implications of Fukushima *Bulletin of the Atomic Scientists* **67** 14–7
Keplinger H M and Lemke R 2016 Instrumentalizing Fukushima: Comparing media coverage of Fukushima in Germany, France, the United Kingdom, and Switzerland *Political Communication* **33** 351–73
Kim Y, Kim M and Kim W 2013 Effect of the Fukushima nuclear disaster on global public acceptance of nuclear energy *Energy Policy* **61** 822–8
Kristiansen S, Bonfadelli H and Kovic M 2016 Risk perception of nuclear energy after Fukushima: Stability and change in public opinion in *Switzerland International Journal of Public Opinion Research* **30** 24–50
Latré E, Perko T and Thijssen P 2017 Public opinion change after the Fukushima nuclear accident: The role of national context revisited *Energy Policy* **104** 124–33
Legewie J 2013 Terrorist events and attitudes toward immigrants: a natural experiment *American Journal of Sociology* **118** 1199–245
Meyer M and Schoen H 2017 Avoiding vote loss by changing policy positions: The Fukushima disaster, party responses, and the German electorate *Party Politics* **23** 424–36
Muñoz J, Falcó-Gimeno A and Hernández E 2019 Unexpected Event During Surveys Design: Promise and Pitfalls *Political Analysis* **28** 186–206
Nussio E, Bove V and Steele B 2019 The consequences of terrorism on migration attitudes across Europe *Political Geography* **75** 102047
Perko T, Turcana C and Geenen D 2012 Media reporting and changes in public opinion after Fukushima nuclear accident: Belgium as case study *International Journal of Nuclear Governance, Economy, and Ecology* **3** 291–307
Poortinga W, Aoyagi M and Pidgeon N F 2013 Public perceptions of climate change and energy futures before and after the Fukushima accident: a comparison between Britain and Japan *Energy Policy* **62** 1204–11
Soni A 2018 Out of sight, out of mind? Investigating the longitudinal impact of the Fukushima nuclear accident on public opinion in the United States *Energy Policy* **122** 169–75