



## Environmental protection is more important to European citizens of all political persuasions than economic growth: A 14-country study in the marine context

Jozsef Arato<sup>a,1</sup>, Mathew P. White<sup>a,b,\*,1</sup>, Sophie M.C. Davison<sup>b</sup>, Sabine Pahl<sup>c,d</sup>, Timothy Taylor<sup>b</sup>, Morris Krainz<sup>e</sup>, Sandra J. Geiger<sup>c</sup>, Paula Kellett<sup>f</sup>, Oonagh McMeel<sup>g</sup>, Lora E. Fleming<sup>b</sup>

<sup>a</sup> Cognitive Science Hub, University of Vienna, Vienna, Austria

<sup>b</sup> European Centre for Environment and Human Health, University of Exeter, Exeter, UK

<sup>c</sup> Urban and Environmental Psychology Group, University of Vienna, Vienna, Austria

<sup>d</sup> Environment and Climate Hub, University of Vienna, Vienna, Austria

<sup>e</sup> Consumer Decision & Sustainable Behaviour Lab, University of Geneva, Geneva, Switzerland

<sup>f</sup> European Marine Board, Ostend, Belgium

<sup>g</sup> Seascape Belgium, Brussels, Belgium

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### ABSTRACT

To focus on voters' priorities, Bill Clinton's campaign famously used the slogan, "It's the economy stupid." With growing environmental crises, is this still true? We explored this issue for the marine sector, using representatively-weighted survey data from 14 European countries ( $N = 11,130$ ). Citizens were asked about their own and policy makers' (perceived) preferences for marine-related economic, environmental, and human health policy goals. Results found the public consistently prioritised environmental protection and, to a lesser extent, health over economic growth. However, the public believed that policy makers cared less about the environment and health, but more about the economy than they did themselves. These patterns were consistent across all countries, all points of the political spectrum, and among coastal and inland residents. Marine policy makers who care about public opinion, may want to start considering that, at least for the European public, it is increasingly about "the environment, stupid!"

### 1. Introduction

During the 1992 US Presidential Campaign, Bill Clinton's political strategist James Carville is said to have urged campaigners not to forget the importance of the on-going recession in voter's minds by stressing that "[It's] the economy, stupid" (Cochrane, 2006). Thirty years on, economic challenges continue, but the growing environmental crisis, with implications for economic and social well-being (IPBES, 2019) is finally receiving unprecedented attention and calls for action (Gutteres, 2019). This global environmental crisis is particularly challenging for the marine environment which is not only highly vulnerable to the effects of climate change (including sea-level rise and ocean acidification), but also to widespread chemical (including plastic), biological, and

radioactive pollution, over-fishing, biodiversity loss, and invasive species (United Nations Environment Programme, 2021). Ultimately, marine health is intrinsically associated with human health and well-being (Fleming et al., 2019; Fleming et al., 2024a), so the environmental crisis affecting coasts, seas and global Ocean also poses significant threats for humans.

But does the general public care? Or more precisely, might they care about the threats to the marine environment which ultimately affect human health, but still believe, as the US population was thought to back in 1992, that the economy, including the livelihoods supported and tax revenues generated, still matters more? And what do they think policy maker's priorities are, and do they feel these are aligned with their own? The aim of the current paper was to explore these questions among

\* Corresponding author at: Cognitive Science Hub, Kolingasse 14-16, University of Vienna, Vienna A-1090, Austria.

E-mail address: [mathew.white@univie.ac.at](mailto:mathew.white@univie.ac.at) (M.P. White).

<sup>1</sup> Joint first authors.

a highly heterogeneous multi-country sample of citizens across Europe.

From an EU policy perspective, the messages appear mixed. For instance, although the EU's Blue Growth marine sector initiative stated sustainability ambitions, it still had economic development as its priority, and barely mentioned equity or the downstream implications for human health of such activities (Louey, 2022). Further, although the Marine Strategic Framework Directive (MSFD) aimed to bring good ecological status to Europe's marine regions by 2020 (Borja et al., 2010), it has arguably had little impact on reducing the negative environmental, and ultimately health-related, impacts of blue economic activities (Puharinen, 2023). This has led to calls for more research into how to shift the predominant policy focus on economic development and more successful implementation of the sustainability targets the EU has set itself (H2020 SOPHIE Consortium, 2020; <https://sophie2020.eu/strategic-research-agenda/>).

One potential mechanism is to better understand and leverage the opinion of the general public, which is known to be an important environmental policy driver. For instance, public support for climate change policies is one of the strongest predictors of city level pro-climate policy adoption in the US (Yeganeh et al., 2020) and there is a substantive relationship between policy and opinion across a range of topics in the European context (Rasmussen et al., 2019). Anderson et al. (Anderson et al., 2017), for instance, found that as public opinion shifted, the rate of renewable energy policy outputs in Europe increased significantly. These and other examples show that policy makers are sensitive to public opinion on environmental issues (Schaffer et al., 2022), closely monitoring it in order to develop policies that will appeal to the electorate (Schaffer et al., 2022; Farmer, 2018).

Thus, it is not just a question of what policies the policy makers actually create, promote and enact, rather it is important for policy makers to know both whether the public agrees with their policy priorities, and whether the public is accurately aware of them. For instance, in the absence of good data, policy makers and politicians might rely on other sources to infer public opinion. In a 2018 interview study in the UK, for instance, Members of Parliament reported little pressure from their electorate to act upon climate change. In response, they reported acting in a way they thought at that time appealed to their electorate. This arguably resulted in policies that downplayed the seriousness of climate change and the co-benefits of pro-climate policies, such as human health protection (Willis, 2018).

Of course, the public is far from homogeneous, with citizens supporting parties across the political spectrum. At the time of writing (2024), for instance, the ruling coalition in Germany includes both the expressly pro-economic Free Democratic Party (FDP) and the overtly environmental Greens, as well as the more centrist Social Democratic Party (SDP). Similar coalitions around Europe highlight the complexity of public opinion. Thus, it is also important to understand the public's (or publics' if we consider multiple publics (Hinchliffe et al., 2018)) political persuasions when trying to understand their policy priorities with respect to the marine environment.

The current study explored these issues using data from the Seas, Oceans and Public Health in Europe (SOPHIE) survey which collected samples across 14 European countries. Findings with respect to the public perceptions of marine-related plastic pollution (Davison et al., 2021), biodiversity loss (Davison et al., 2023) and broader health and well-being issues (Geiger et al., 2023; Roberts et al., 2021) have been published elsewhere. Here, we focus on three aspects of the survey not previously explored. First, we examined respondent's high-level policy preferences in terms of marine-related economic, environmental, and human health protection goals. Given the size and representativeness of the sample, results provide useful information about the public's general preferences across a large proportion of Europe including countries where the marine sector is particularly important to the economy (e.g. Greece, Norway and Spain (European Commission, 2023)).

Second, we examined citizens beliefs about policy makers priorities (i.e. "second-order beliefs") with respect to the same three high-level

policy areas (economy, environment, health). Previous work often shows a mistaken discrepancy between what people value themselves and what they think others value. For example, Americans perceive that most other Americans care less about the environment than they do themselves (Bouman et al., 2020; Bouman et al., 2021) but in reality, public consensus surrounding environmental issues is often more consistent than they realise (Andre et al., 2024). Understanding how the public sees them, and whether or not citizens believe policy makers share their priorities is important information for policy makers keen to understand the social consensus.

Third, as well as looking at these patterns across the sample as a whole, we explored the extent to which political orientation might moderate these beliefs. Although we might expect voters on the right of the political spectrum to be more concerned with economic than environmental issues than those on the left (and vice versa), it is perhaps less obvious who would be more concerned about human health-related issues, or their second-order beliefs about policy makers' priorities. Given the importance to policy makers of understanding both the overall public's preferences as well as their more specific voter base, exploration of both issues is highly relevant.

Finally, these questions were explored both at the aggregate and individual county-level to explore the degree to which patterns were consistent or different across countries.

In short, this study explored the following Research Questions (RQ):

RQ1: *How important do European citizens perceive marine-related economic, environmental and human health goals to be (a) for themselves and (b) for policy makers?*

RQ2: *How consistent are these ratings across the 14 countries?*

RQ3: *To what extent might political orientation moderate these findings?*

RQ4: *How consistent are any moderation effects of political orientation across countries?*

## 2. Methods

### 2.1. Data collection

#### 2.1.1. Participants & country selection

Data were collected in 2019 as part of the Seas, Oceans, and Public Health in Europe (SOPHIE) project, funded under the EU's Horizon 2020 Framework Programme. A sample of approximately 1000 responses from adult participants, representative on age, gender and region (in keeping with previous studies in this field, e.g. Gelcich et al. (Gelcich et al., 2014)), were collected in each of the following 14 countries ( $N = 14,167$ ): Belgium, Bulgaria, Czech Republic, France, Germany, Greece, Republic of Ireland, Italy, the Netherlands, Norway, Poland, Portugal, Spain, and the United Kingdom (weighted mean age = 46.03 [SD = 15.72] years; 6898 [48.7 %] men, 7269 [51.3 %] women). Countries were selected based on several criteria, including: at least one country bordering each of Europe's six sea basins (i.e. Atlantic, Baltic, Black, Mediterranean, North, Arctic); a land-locked country for comparison (i.e. Czech Republic); and countries with key maritime sectors (e.g. Norway). Due to missing data for one or more outcome variables or the core moderator (i.e. political orientation) the final analytical sample was  $n = 11,130$  respondents (mean age 46.8 [+/- 15.70] with 5770 (51.84 %) males and 5360 (48.16 %) females). Table 1 suggests that the analytical sample did not differ substantively from the original sample.

#### 2.1.2. Study overview, ethics, and data availability

More details about the whole SOPHIE project and survey can be found here (H2020 SOPHIE Consortium (H2020 SOPHIE Consortium, n.d.); <https://sophie2020.eu/strategic-research-agenda/>). The survey took approximately 20 min to complete and was concerned with public attitudes towards the marine environment with a special focus on human health and well-being. It had six sections: 1) Contact with the marine environment, including residential proximity, occupational links, and recreational contact; 2) Attitudes towards marine-related

**Table 1**

Means (SDs) of marine-related goal type, target and Ns (%) of all predictors including covariates in the perceived importance of marine-related goal models (analytical sample smaller than overall sample due to missing data for some variables).

	Overall sample			Analytical sample		
	N	Mean	(SD)	N	Mean	(SD)
<b>Importance of goal by target</b>						
Economic for self	14,167	3.66	(1.69)	11,130	3.70	(1.68)
Economic for policy makers	14,167	4.14	(1.57)	11,130	4.16	(1.57)
Environmental for self	14,167	5.46	(1.00)	11,130	5.45	(1.01)
Environmental for policy makers	14,167	4.52	(1.77)	11,130	4.53	(1.77)
Health for self	14,167	5.13	(1.17)	11,130	5.14	(1.18)
Health for policy makers	14,167	4.37	(1.72)	11,130	4.38	(1.72)
<b>Age</b>	14,167	46.03	(15.72)	11,130	46.80	(15.70)
	N	(%)		N	(%)	
<b>Political orientation</b>						
Left	3082	(21.75)	/	2848	(25.59)	/
Centre	5499	(38.82)	/	5135	(46.14)	/
Right	3394	(23.96)	/	3147	(28.27)	/
Missing	2192	(15.47)	/	/	/	/
<b>Socio-demographics</b>						
<b>Gender</b>						
Males	6898	(48.69)	/	5770	(51.84)	/
Females	7269	(51.31)	/	5360	(48.16)	/
<b>Educational attainment</b>						
No university degree	7206	(50.86)	/	5390	(48.43)	/
University degree	6882	(48.58)	/	5719	(51.38)	/
Missing	79	(0.56)	/	21	(0.19)	/
<b>Employment situation</b>						
Full/part time	7871	(55.56)	/	6325	(56.83)	/
Other	6077	(42.90)	/	4688	(42.12)	/
Missing	219	(1.55)	/	117	(1.05)	/
<b>Income</b>						
Low income	3049	(21.52)	/	2305	(20.71)	/
Middle income	4791	(33.82)	/	3927	(35.28)	/
High income	4372	(30.86)	/	3719	(33.41)	/
Missing	1955	(13.80)	/	1179	(10.59)	/
<b>Home coastal proximity</b>						
≤5 km	2903	(20.49)	/	2319	(20.84)	/
>5 km	11,182	(78.93)	/	8752	(78.63)	/
Missing	82	(0.58)	/	59	(0.53)	/
<b>Country</b>						
Belgium	1001	(7.07)	/	763	(6.86)	/
Bulgaria	1004	(7.09)	/	795	(7.14)	/
Czechia	1006	(7.10)	/	743	(6.68)	/
France	1024	(7.23)	/	692	(6.22)	/
Germany	1017	(7.18)	/	847	(7.61)	/
Greece	1013	(7.15)	/	848	(7.62)	/
Italy	1020	(7.20)	/	791	(7.11)	/
Netherlands	1001	(7.07)	/	773	(6.95)	/
Norway	1019	(7.19)	/	760	(6.83)	/
Poland	1003	(7.08)	/	825	(7.41)	/
Portugal	1000	(7.06)	/	812	(7.30)	/
Rep. of Ireland	1000	(7.06)	/	791	(7.11)	/
Spain	1025	(7.24)	/	874	(7.85)	/
United Kingdom	1034	(7.30)	/	816	(7.33)	/

Note: Age, gender and country were collected by the polling company as part of the sampling profile so there was no missing data for these variables. Low income = lowest three deciles, middle income = middle four deciles, and high income = highest three deciles.

activities (including commercial fishing, aquaculture, offshore wind-farms and deep sea mineral extraction) in terms of implications for the economy, the environment and human health; 3) Concern about possible threats to health from the marine environment (including microbial, chemical and plastic pollution, collapsing fish stocks and sea level rise); 4) Marine-related policy and research funding priorities (including sustainable shipping, bathing water quality, and biotechnology); 5) Marine-related goals (the items of interest to the current paper, see below); and 6) Participant level information (including health, personality, age, gender, political orientation and income).

Since the questions examined here with respect to policy importance followed earlier questions exploring a wide range of marine-related economic, environmental and health issues, participants had already been primed to consider a wide range of issues when answering the policy questions. Further, Section 4 began with a brief explanation of

what we meant by “policy making” in order to help support and contextualise policy-related responses: i.e. “Some people think we need strong policies (e.g. laws, regulations, subsidies) to protect public health, while others prefer little direct intervention...”. In other words, before respondents were asked about the three domains specifically, they had been introduced to various marine-related economic, environmental and health issues; and policy making had been defined as applying public policy tools such as laws and subsidies.

The study protocol was reviewed and approved by the University of Exeter Medical School research ethics committee (ref no: Nov18/B/171). The survey was distributed online in March and April 2019 by an international polling company, with the survey questions being translated into local languages. A detailed description of all variables, along with the full anonymised dataset, are available here: <https://beta.ukdataservice.ac.uk/datacatalogue/studies/study?id=8972>. Only the

methods and variables specific to the research questions of this paper are described below.

## 2.2. Materials

### 2.2.1. Key outcomes: importance of marine-related goals

The current research focused on the public's perceptions of three high-level goal priorities. Specifically, respondents were asked: 1) "How important do you think each of the following goals are for policy makers across Europe currently?" and 2) "How important do you (personally) consider each of the following goals to be?". The three high-level goals were: i) "increasing economic growth for marine businesses (e.g. fisheries)" – i.e. economic; ii) "protecting the marine environment" – i.e. environmental; and 3) "protecting and promoting public health/well-being from the marine environment" – i.e. health.<sup>2</sup> Respondents rated perceived importance on seven-point scales, from '0' (not at all important) to '6' (extremely important) for both 'targets', i.e. 'the self' and 'policy-makers'.

### 2.2.2. Moderator: political orientation

To measure political orientation, we used the European Social Survey "left-right" item: "In politics, people sometimes talk of 'left' and 'right'. Where would you place yourself on this scale, where 0 means the left and 10 means the right?". Although the raw data were used in the statistical analysis, for data visualization purposes below this 11-point scale was converted into four categories; 'Left' (responses 0–3), 'Centre' (responses 4–6), 'Right' (responses 7–10) and 'Missing' (responses "Don't know" and "Prefer not to answer"). 'Missing' answers were not included in the analytical sample.

### 2.2.3. Covariates

Covariates were included in the models predicting perceived importance of marine-related goals based on their relevance in earlier research into public perceptions of climate change (Hornsey et al., 2016) and previous analyses using the same dataset (Davison et al., 2021; Davison et al., 2023; Geiger et al., 2023; Roberts et al., 2021). Controlling for these factors allowed us to make more robust generalisations across populations, especially with respect to political orientation results. Covariates selected included age, gender (0 = male (reference); 1 = female), educational attainment (0 = no university degree (reference); 1 = degree or above), employment situation (1 = paid full/part time; 0 = other (reference)), household income (–1 = deciles 1–3; 0 = deciles 4–7 (reference); 1 = deciles 8–10), and residential proximity to the coast (0 ≥ 5 km (reference); 1 = ≤ 5 km). Full details of all covariates, including original items and collapsing rules are presented in Supplementary Materials Table S1.

## 2.3. Statistical analysis

Data were analysed using the Python programming language using the pinguin (Vallat, 2018) and statsmodels (Seabold and Perktold, 2010) libraries. Following best practice recommendations (Wagenmakers et al., 2021), we opted for a combination of different modelling approaches of increasingly complexity and sophistication to test the robustness of our main findings.

To address RQ1 (goal importance), we began with an 'unadjusted' fully repeated-measures 3 (Goals: economic, environmental, health) by 2 (Target: self, policy makers) within-participant Analysis of Variance (ANOVA) of importance ratings to understand the overall picture in the simplest fashion. Generalized eta-squared ( $\eta^2$ ) was used for effect sizes. Next, we ran a single linear mixed-model regression on importance

<sup>2</sup> Piloting suggested that the term "human health" is not widely used or understood among the public so for the survey we used the term "public health" to refer to the health of the public in general, and not in reference to the discipline of health promotion and disease prevention.

scores which assumed that the 0–6 scale could be treated as a linear outcome, with participant identifier and country as random intercept terms and the covariates outlined above included in the model. Participant identifier was included as a random intercept term to reflect the fact each participant was making six importance ratings and that these responses are not independent. Country of residence was included as a random intercept term to account for potential within-country non-independence effects (e.g. survey translation/linguistic effects). Covariates were added to account for potential confounds and support generalisability. Finally, to account for potential non-linearity of the importance ratings we extended this model using a mixed model ordered logistic regression (with the function *OrderedModel* in statsmodels), again including intercept terms for participant and country, and the same covariates. The results of the linear and ordinal models were essentially the same, and code, figures and results for both models can be found in supplementary code at: <https://osf.io/mhf76/>. Here we present the results of the final (more robust) ordinal logistic models where the coefficients reflect the change in the log odds of responding with a higher importance category per unit change in each predictor (everything else being equal). RQ3 (the potentially moderating effect of political orientation on these associations) was analysed with a similar approach but with political orientation also added as a between-participant factor alongside the interaction terms with Goal and Target (resulting in two additional two-way interactions and a three-way interaction). To be able to compare the magnitude of the effect between ordinal (0–10, political orientation) and categorical (goal/target) predictors, political orientation was standardised with 2 standard deviations, following the recommendation of Gelman et al. (Gelman et al., 2021)

To explore RQ2 and RQ4 (i.e. consistency of RQ1 & RQ3 results across country), separate models were run on each country to provide 14 country-specific results (including estimates of uncertainty). In order to facilitate cross-country comparisons, we swapped the frequentist approach adopted for RQs 1 and 3 for a Bayesian approach which allowed us to more robustly compare the credible intervals for the coefficients across countries. These 14 Bayesian ordered logistic regressions were run using the PyMC library (Patil et al., 2010).

To improve generalisability, survey weights were created in R using the package 'parameters' (Lüdtke et al., 2020) which took into account the country-level clustering of the data. The package creates two survey weights for each respondent, with 'pweights\_b' used here given its applicability for mixed effects models (weights were only used in the linear mixed model, and resulted in only very minor changes in the results). Weighted averages and standard deviations were calculated using the NumPy package. The matplotlib package was used to visualize the weighted estimated marginal means and confidence intervals for: a) the sample as a whole (RQ1; Fig. 1); b) the effect for policy makers vs. self for each country separately (RQ2; Fig. S1 in Supplementary Materials); and c) for the interactions between goal, target and political orientation

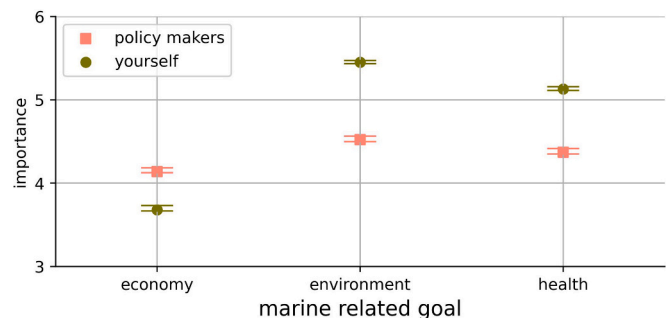


Fig. 1. Marginal estimated means and Confidence Intervals (2 SEM) for the perceived importance of marine-related economic, environmental and health goals for respondents personally and policy makers aggregated across the 14 European countries in the SOPHIE survey.

(RQ3; Fig. 2). Participants with missing data for the covariates (apart from political orientation) were included in the analysis as NaNs (i.e. Not a Number); the NaNs were imputed with means in the Bayesian analysis).

### 3. Results

#### 3.1. RQ1: perceived importance of marine-related goals for self and policy makers

The results of the simple two-way repeated measures ANOVA exploring policy importance as a function of goal and target are presented in Fig. 1. There were significant main effects of both goal

(economy/environment/health:  $F = 3955.35, p < 0.001, \eta^2 = 0.69$ ) and target (self/policy maker:  $F = 1485.43, p < 0.001, \eta^2 = 0.02$ ) and a significant interaction between them ( $F = 2531.34, p < 0.001, \eta^2 = 0.04$ ). The main effect of goal reflects the fact that, overall, environmental protection was seen as the most important goal for both the self ( $M = 5.45, SD = 1.00$ ) and policy makers ( $M = 4.53, SD = 1.76$ ), health the second most important for both targets (self:  $M = 5.14, SD = 1.17$ ; policy makers:  $M = 4.38, SD = 1.72$ ) and economic growth the least important for both targets (self:  $M = 3.70, SD = 1.69$ ; policy makers:  $M = 4.16, SD = 1.57$ ). Of note, given that 3 is the mid-point of the 0–6 scale a score of 3.70 for the self for economy still suggests that all goals were seen as relatively important in absolute terms, even if the economic goals were seen as the least important for the self.

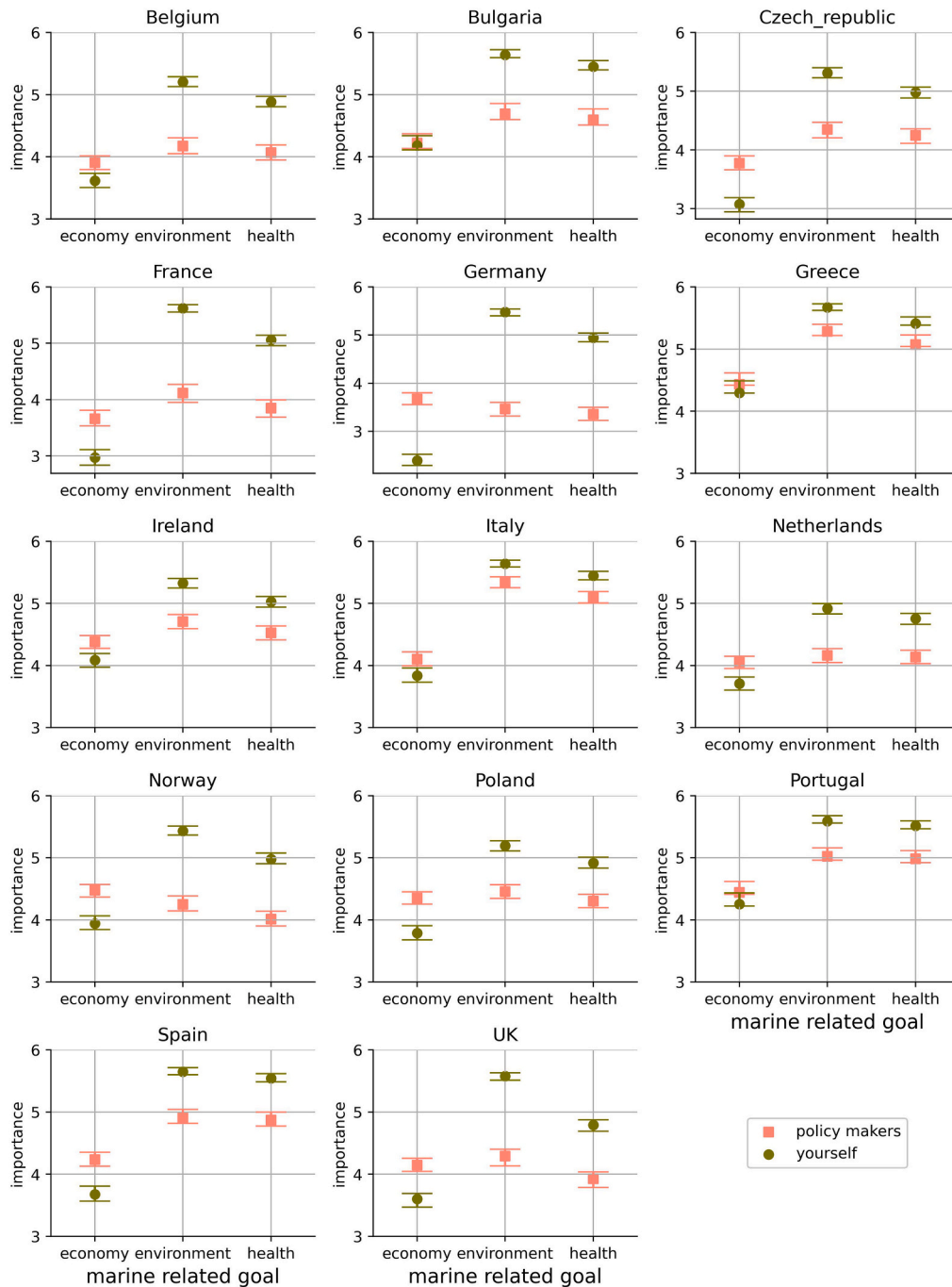


Fig. 2. Marginal estimated means and Confidence Intervals (2 SEM) for the perceived importance of marine-related economic, environmental and health goals for respondents themselves and policy makers for each of the 14 European countries separately.

Although the main effect of target suggests that, overall, respondents rated the goals as higher for the self than policy makers, this is qualified by the interaction such that while this is true for both environmental and health goals, it is reversed for economic growth. In this latter case, policy makers were believed by respondents to think economic growth was more important than the self (*Ms* 4.16 vs. 3.70 respectively). The non-overlapping confidence intervals across all six judgments reflects the fact that they are all significantly different from each other (all post-hoc *ps* < 0.001). Nevertheless, policy makers are thought to have relatively balanced goal priorities with economic, environmental and health goals falling within a 0.39 range (4.15–4.54), compared to the self with a 1.80 range (3.67–5.47). These results were confirmed using the mixed model with ordered logistic outcomes, political orientation as a moderator, and covariates (Table 2).

Although not of direct interest here, because the coefficients do not differentiate between goal type and target, importance ratings overall were higher among older adults (per additional year  $\beta = 0.01$ ); females than males ( $\beta = 0.13$ ); people without (vs. with) a degree ( $\beta = -0.05$ ); and those who lived within 5 km (vs. further from) the coast ( $\beta = 0.22$ ). Employment status and income were not related to overall importance ratings.

**Table 2**

Results of a mixed-model ordinal logistic regression predicting public importance ratings as a function of different marine-related policy goals for the self and policy makers accounting for political orientation and covariates.

	$\beta$	SE	z	p
<b>Goal<sup>a</sup></b>				
Economy (ref)	–	–	–	–
Environment (Environ.)	2.33	0.03	81.27	<0.001
Health	1.68	0.03	63.67	<0.001
<b>Target<sup>a</sup></b>				
Self (ref)	–	–	–	–
Policy maker	0.47	0.02	18.94	<0.001
<b>Political orientation (Political)</b>				
Left to Right (0–10)	0.50	0.04	13.81	<0.001
<b>Interactions<sup>a</sup></b>				
Environ. * Target	–1.71	0.04	–44.38	<0.001
Health * Target	–1.32	0.03	–36.16	<0.001
Environ. * Political	–0.86	0.06	–15.19	<0.001
Health * Political	–0.71	0.05	–13.56	<0.001
Target * Political	–0.37	0.05	–7.39	<0.001
Environ. * Target * Political	0.88	0.08	11.36	<0.001
Health * Target * Political	0.75	0.07	10.13	<0.001
<b>Socio-demographics</b>				
Age	0.01	0.00	26.12	<0.001
Female (male = ref)	0.13	0.02	9.17	<0.001
Degree (no degree = ref)	–0.05	0.02	–3.29	0.001
Employed (other = ref)	0.00	0.02	–0.23	0.819
Income (Middle income = ref)	–0.01	0.01	–0.99	0.324
Live within 5 km coast (> 5 km = ref)	0.22	0.02	11.25	<0.001
<b>Marginal differences in responses</b>				
0.0/1.0	–1.60	0.04	–34.74	<0.001
1.0/2.0	–0.31	0.02	–12.93	<0.001
2.0/3.0	–0.24	0.02	–14.50	<0.001
3.0/4.0	–0.04	0.01	–3.87	0.004
4.0/5.0	–0.14	0.01	–15.22	<0.001
5.0/6.0	–0.22	0.01	–23.56	<0.001
<b>Random effects</b>				
1   Participant	<0.01	<0.01	23.26	<0.001
1   Country	0.02	0.00	10.45	<0.001
2-log likelihood:	–89,444			
AIC:	178,900			
N	11,130			

<sup>a</sup> Importance ratings ran from 0 (not at all important) to 6 (Extremely important); coefficients reflect the change in the log odds of responding with a higher importance category per unit change in each predictor (everything else being equal).

**3.2. RQ2: cross-country consistency in the effect of policy vs personal importance**

With respect to RQ2, we found that the overall pattern of results (controlling for covariates) was very similar across all 14 countries (Fig. 2). Full model results, expressed in terms of posterior distributions from the Bayesian ordinal mixed models for each policy goal for each of the 14 countries, are shown in Fig. S4 in Supplementary Materials. Respondents in all countries rated environmental protection as the most personally important goal and economic growth the least important. Further, economic goals were perceived to be more important for policy makers than the self and vice versa for environmental and health goals across all 14 countries (Fig. 3). The self-policy maker difference for economic goals was largest in Germany ( $\beta = 2.12$ ) and smallest in Bulgaria ( $\beta = 0.19$ ). The self-policy maker difference for environmental goals (in the opposite direction relative to economy) was also larger in some countries (e.g. France, Germany, UK:  $\beta$ s < –3.93) than others (e.g. Italy, Greece, Portugal and Spain:  $-2.71 < \beta$ s < –1.59). Finally, the patterns across countries for health were largely similar to environment, but with a smaller effect in each of the countries, with the largest decrease in the magnitude of the effect in the UK ( $\beta_{env} = -3.93$  vs.  $\beta_{health} = -2.09$ ).

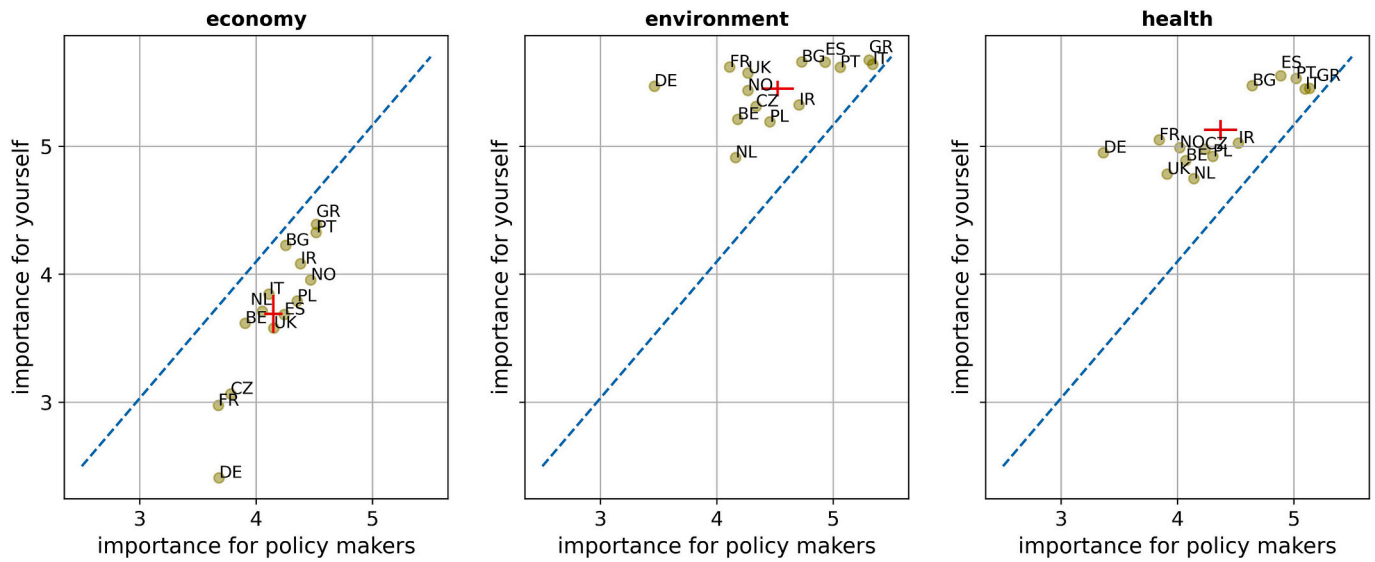
**3.3. RQ3: perceived importance of marine-related goals across political orientations**

The mixed model with ordered logistic outcomes, political orientation as a moderator, and covariates (Table 2) showed a main effect of target such that the self was believed to have higher overall concern (on average across the three goals) than policy makers ( $\beta = 0.47$ ), and a main effect of goal such that respondents believed that (on average across both targets) environmental ( $\beta = 2.33$ ) and health ( $\beta = 1.68$ ) goals were more important than economic goals (the reference). Nevertheless, all two- and three-way interactions were also significant (*ps* < 0.001). To help interpret these complex patterns, we ran three separate models focusing on the interaction between target (self, policy maker) and political orientation for each policy goal (economic, environmental, health) separately using the same mixed model with ordinal outcomes approach. Full results are shown in Supplementary Tables 2–4.

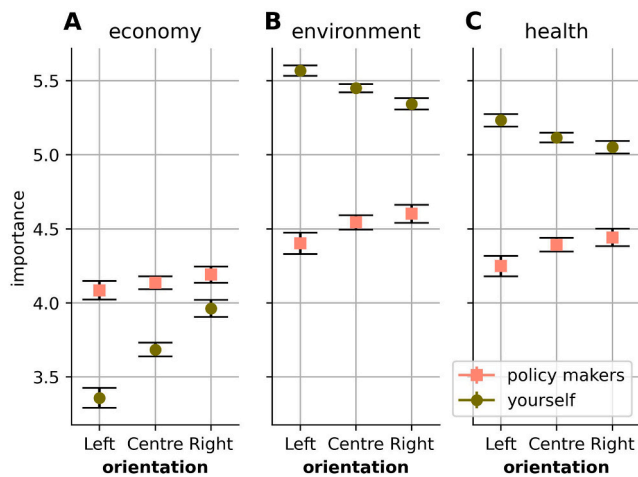
The results for economy found significantly positive main effects of both target ( $\beta = 0.51$ ,  $z = 20.18$ ,  $p < 0.001$ ) and political orientation ( $\beta = 0.54$ ,  $z = 14.70$ ,  $p < 0.001$ ). People rated the economy as more important for policy makers than themselves, and individuals on the political right believed economic goals were more important than those on the political left. These main effects were qualified by a negative interaction ( $\beta = -0.41$ ,  $z = -7.88$ ,  $p < 0.001$ ) such that the difference between self and policy makers decreases as one moves on the political spectrum from left to right (Fig. 4 left).

The results for environment showed a very different pattern (Fig. 4 centre). The main effects of target ( $\beta = -1.16$ ,  $z = -39.92$ ,  $p < 0.001$ ) and political orientation ( $\beta = -0.36$ ,  $z = -8.12$ ,  $p < 0.001$ ) were both significantly negative, with people rating the environment as significantly less important for policy makers than for themselves, and those on the political right rating environment importance lower than those on the left. Again, the interaction was significant ( $\beta = 0.49$ ,  $z = 8.34$ ,  $p < 0.001$ ), and again the difference between self and policy makers decreases as one moves on the political spectrum from left to right (Fig. 4 centre).

Finally, the results for health (Fig. 4 right) were very similar to those for the environment, with significant negative effects of target ( $\beta = -0.85$ ,  $z = -31.67$ ,  $p < 0.001$ ) and political orientation ( $\beta = -0.22$ ,  $z = -5.73$ ,  $p < 0.001$ ), and a significant interaction ( $\beta = 0.38$ ,  $z = 6.97$ ,  $p < 0.001$ ) which again suggested those on the right believed policy makers had more similar health-related importance ratings to their own compared to those on the left.



**Fig. 3.** Country specific mean importance for policy makers (x-axis) and yourself (y-axis), for marine-related economic, environmental and health goals. *Notes.* Above the diagonal line shows greater perceived importance for the self than policy makers, below the diagonal line shows greater perceived importance for policy makers than the self. The red crosses indicate the mean and standard error across countries. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)



**Fig. 4.** Marginal estimated means and confidence intervals (2 SEM) for the perceived importance of marine-related economic, environmental and health goals for the self and policy makers across 14 European countries, as a function of political orientation (left, centre, right).

As might be expected, economic goals were more important for those on the political right, while environmental and health goals were more important for those on the political left. Nevertheless, even those on the political right thought that environmental protection and health goals were overall more important than economic goals. Moreover, while those on the right believed that policy makers' preferences are considerably closer to their own than those on the political left, they still believed that policy makers' concerns with economic goals are significantly higher than their own (i.e. the 95 % CIs do not overlap), and significantly lower than their own importance ratings for environmental and health goals.

**3.4. RQ4: consistency of the relationships between political orientation and goal importance ratings across countries**

Using the same Bayesian ordinal mixed effects models as for RQ2 for each country separately, results found notable variability in the

relationships between goal importance ratings and political orientation across countries (Figs. S1-S3, S5 in Supplementary Materials). For instance, although having a more right-wing political orientation was associated with greater economic importance ratings in all countries (Figs. S1 & S5 left), the size of the association varied considerably, ranging from a relatively strong one in Spain ( $\beta = 1.64$ ), Ireland ( $\beta = 1.45$ ), and Norway ( $\beta = 1.29$ ) to lower associations in France ( $\beta = 0.57$ ), Germany ( $\beta = 0.58$ ), and the landlocked Czech Republic ( $\beta = 0.07$ ).

There was even more variation in the association between political orientation and the importance of the environment (Figs. S2 & S5 middle). In most countries we found a negative association (i.e. left-wing orientation was associated with more importance for the environment), with particularly strong associations in the UK ( $\beta = -1.70$ ), Spain ( $\beta = -1.26$ ) and Italy ( $\beta = -1.14$ ). However, in Bulgaria ( $\beta = 0.58$ ) and the Czech Republic ( $\beta = 0.68$ ), there was a positive association suggesting that respondents on the political right rated the environment as more important than those on the left.

Finally, concerning health, the three strongest negative associations (i.e. higher ratings among the political left) were found in the UK ( $\beta = -1.14$ ), Spain ( $\beta = -1.50$ ) and Italy ( $\beta = -0.92$ ), whereas positive associations were seen in the Czech Republic ( $\beta = 0.45$ ), Bulgaria ( $\beta = 0.15$ ), and now also Ireland ( $\beta = 0.54$ ) and Poland ( $\beta = 0.20$ ), meaning those on the political right rated health issues as more important on average.

The degree to which target (i.e. self vs. policy maker) moderated these relationships also varied by country. As for the overall effects (Fig. 4), more politically right orientated respondents tended to report their own importance ratings as more similar to policy makers across all three goals. However, there were some countries, such as Greece and Italy, where people of all political persuasions tended to see their own importance ratings as being similar to those of policy makers across economic, environmental and health goals. There were no countries where those on the political left consistently saw their ratings as being more aligned with policy makers than those on the right (Fig. S6, Supplementary Materials).

## 4. Discussion

### 4.1. The public's marine-related policy priorities

While the economy may have been at the forefront of voters' minds in the US presidential elections in the 1990s, our data suggest that when it came to marine-related issues among European citizens in 2019, protecting the marine environment was the top priority, followed by protecting human health. Although economic goals were perceived as the least important, it is still worth noting that the average response was above the mid-point of the scale indicating that the public recognises that all three goals are important in absolute terms. The overall basic pattern was present across all 14 countries examined, and among both coastal and inland residents. Findings echo, at least to some extent, growing public concerns about environmental issues more generally. For instance, US based research has found that the perceived environmental benefits of energy policies are more strongly related to policy support than either perceived economic or societal benefits (Swim and Geiger, 2021). Further, Andre et al. (2023) found that 69 % of 130,000 citizens across 125 countries were willing to contribute 1 % of their personal income to support pro-climate actions, particularly those in more immediately climate vulnerable locations (Andre et al., 2024). Although the more global trade-offs with economic growth were not examined in that work, it still shows that many individuals are willing to forgo their own short-term economic interests for greater environmental protection.

Our data further suggested that the basic pattern of greater concern for marine environmental protection over economic growth existed for those on both the right as well as the left of the political spectrum. Again, this echoes recent findings that even the majority of Republicans on the political right in the US also support climate action, even if many have underestimated this consensus (Dixon et al., 2024). Although environmental issues were formerly relatively partisan along political lines in the EU (McCright et al., 2016), the tide appears to be turning as more people of all political hues start to realise the full extent of the crisis we all face.

### 4.2. The public's beliefs about policy makers' priorities

In terms of rank order, the public's second-order beliefs about policy makers' perceived goal importance was similar to their own; the environment was rated highest, followed by health and then the economy. Despite the same rank, however, the mean perceived importance ratings of policy makers for environment and public health were lower, and the economy ratings higher, than for the public. This pattern was relatively stable across country and political orientation.

In short, people from all countries examined, and all shades of the political spectrum, thought that while policy makers were concerned about the environment, the relative level of importance they assigned to the three goals was out-of-step with their own preferences, over-weighting the importance of economic growth, and under-weighting issues of environmental protection and human health. Again, these findings are supported by environmental change research more generally. The Andre et al (Andre et al., 2024) paper, for instance, found that across the 125 countries they investigated, 86 % of respondents wanted policy makers to step up their pro-climate actions.

It was also apparent that there was notably less variance in the policy maker ratings of the economic, environmental and health goals than the public's own ratings. We see at least three possible explanations for this. First, respondents may genuinely believe that marine-related policy making is relatively balanced across the three domains. This may be due to a belief in carefully calibrated decision-making, or perhaps a belief that marine issues in general do not feature very high up the agenda for many policy makers, and thus all aspects are relatively low in importance ratings compared to more terrestrial matters. Second, "policy makers" is a very broad term and could include regional, national, and

international bodies and presumably different policy makers can have quite different preferences. Respondents may therefore have been making a relatively rational attempt to take an average of potentially quite different perspectives across different policy making communities. Third, whereas respondents have direct access to their own thoughts, they may simply not know what policy makers' importance ratings are, and thus went for a "safer" response in the middle. All of these, and other, possibilities may be playing a role. More in-depth qualitative research that asks respondents to discuss their thought processes on these issues is required.

Respondents in some countries, e.g. Spain, Portugal, Italy, and Greece also tended to believe policy makers had more similar importance ratings to their own, compared to other countries, e.g. France, Germany and the UK. This difference is to some extent consistent with findings by Buckley et al. (Buckley et al., 2017), who also conducted a large-scale survey of European citizens across a similar range of countries on a range of topics relating to the marine environment. In their study, countries such as Italy and Spain generally had higher trust in different organisations and types of government than countries such as Germany, and thus country-level attitudes towards governance generally may also be playing a role in our findings. It is however important to note that the level of "trust" different countries' citizens had in the Buckley et al. (Buckley et al., 2017) research varied between different types of government (e.g. European Union, Local Authorities, National Government) and therefore clarifying who the public are thinking about when asked to rate generic "policy maker" is important.

In general people on the political right also saw policy makers as having more similar preferences to themselves than those on the political left. This may reflect reality with policy makers in the marine field tending to be more "conservative", or it may reflect a misunderstanding on the part of those on the right. Further exploration of this would require more in-depth country-by-country level analysis (e.g. the political parties in power at the time) which was beyond the scope of the current paper. Such analysis would also need to account for the degree to which respondents are considering local, national and supra-national (e.g. European Commission/Parliament) policy makers when making these kinds of judgments.

Finally, although we have emphasised the importance of environmental goals to members of the public we also recognise that all three goals of economy, health and the environment were rated above the mid-point in all countries and at both ends of the political spectrum. The public thus clearly recognises the value of multiple goals in the marine sector and presumably, although we were unable to explore them here, the importance of potential synergies and trade-offs between them. Further research is needed to better explore the public's understanding of, and attitudes towards, these synergies and trade-offs. This recognition notwithstanding, we still think it is safe to conclude that European-based policy makers weighing up different marine-related policies options may want to remind themselves that as far as the public is concerned, it is increasingly about "the environment stupid!" (Friedman, 2019).

### 4.3. Limitations and future research

Several limitations of the current work are recognised. First, we fully acknowledge that the questions with respect to policy goals and the term policy makers were relatively generic and we are not sure which goals or policy makers different members of the public were thinking about. This limits our ability to explore the extent to which public perceptions might be relatively accurate or misguided. Future work could address this by asking more specific questions for which data can be accurately compared such as the Sustainable Development Goals (SDG). For example, public samples in multiple countries could be asked questions specifically related to key marine-related SDGs (e.g. 14.1, 14.2) such as: "What percentage (%) of [country's] key marine biodiversity waters do you think are protected?" and/or "On a score from 0 (worst) to 100



(best) how would you rate [country's] marine waters in terms of contamination levels from chemicals, excessive nutrients (eutrophication), human pathogens, and trash?". Policy makers and communicators can use this much more specific information to enact more specific communication messages (e.g. when the public underestimates current progress) or make greater progress towards enacting goals (e.g. when the public is more positive about the situation than is the case on the ground in order to maintain public trust).

Second, the data were collected prior to the COVID-19 pandemic and other global events (e.g. the Ukraine and Palestinian conflicts), and it is possible that the public perceptions may have changed since 2019. Ideally such attitudes would be monitored on a rolling basis, e.g. in the Eurobarometer or European Social Survey, but marine issues are relatively neglected in these types of surveys compared to terrestrial concerns. Convincing those in charge of such ongoing data collection exercises of the importance of marine-related issues is an important challenge. We note, however, that many of the results included in the Life Below Water SDG14 indices have changed little since 2019 across the countries we examined here so while public perceptions may have changed, the objective circumstances have not undergone significant changes in this time period (<https://dashboards.sdgindex.org/profiles>).

Third, it is unclear whether participants were really reflecting on marine-related issues specifically, or whether through a lack of knowledge, they were drawing on more general beliefs about their own and policy maker preferences in general. We know of little research that has investigated the degree to which the general public are aware of or understand marine-related policies in Europe and can imagine those for whom these things seem quite remote, such as inland dwellers, having to make relatively heuristic judgments. We note, for instance, that the relationship between perceived economic importance and political orientation was much weaker in the landlocked Czech Republic than countries with significant maritime sectors such as Spain and Norway. This may reflect the reality regarding the degree to which marine issues feature on the political agenda in different countries. Thus, although there was relative consistency across countries, we also identified instances where patterns may differ in countries with a greater "stake" in maritime issues. Further research could investigate this, perhaps by exploring specific marine industries (e.g. fishing, energy, aggregates, tourism) or specific environmental issues (e.g. seabed disturbance, water pollution) in different country contexts (Potts et al., 2016; Jefferson et al., 2021).

Fourth, although we focused on potential moderation by country and political orientation, there are many other potential moderators that could be looked at in future work. As well as coastal proximity, it would also be interesting to see whether respondents were a member of the household works in a marine-related occupation (10 % of our sample), or those who engage in more marine-related recreational activities (e.g. watersports, 28 % of our sample) differ from others with less direct marine contact. Although these variables were controlled for statistically in our main results, greater understanding of the perspective of different publics with more or less marine familiarity is warranted. For instance, it may be that those whose livelihoods are directly affected have higher priorities for marine-related economic growth and those whose health may be affected (e.g. watersports enthusiasts) are more worried about health protection. While supporting such analyses, we stress that the current patterns are representative across all sectors of society, and the main result is powerful precisely because it is not partisan or reflects the priorities of any specific user group. If policy makers are keen to connect with wide sectors of society regardless of personal connections to, or interests in, the marine environment they should note how consistently strong the preferences for protecting the marine environment were.

Fifth, despite the large sample spanning 14 countries, many other countries in Europe and around the globe were not included. The marine environment and marine policies are just as, if not more, important in Asia, Africa, the Americas and Oceania. We note, for instance, that our

results are consistent with more in-depth regional research on the islands of Tasmania (Australia) (Fudge et al., 2023) and Palawan (Philippines) (Gajardo et al., 2023) which suggest that economically-related benefits from marine industries are not the only focus for local citizens who also value other aspects of human well-being and the cultural ecosystem services derived from healthy marine ecosystems. Similar work looking at citizen beliefs about the importance of a range of marine-related goals, as well as their second-order beliefs about policy makers' priorities, are urgently needed elsewhere. The Ocean is truly global and policies made in one part of the world will affect many other regions (Fleming et al., 2024a). Just as our understanding of the ocean needs to be joined up globally, so too does our understanding of human attitudes and beliefs about the global Ocean. This is one of the aims of the UN Decade of Ocean Science for Sustainable Development (<https://oceandecade.org/>), but it will require ongoing global engagement and collaboration to achieve (Jefferson et al., 2021).

Finally, although we asked citizens to assess the preferences of policy makers, we did not ask policy makers directly about either their own importance ratings or their second-order perceptions of the public's ratings. Future research could investigate these issues in order to better understand how accurate the public are in their beliefs about policy makers and also how accurate policy makers are in their beliefs about the public. Importantly, a better understanding of potential discrepancies on both sides may help improve democratically-based policy making. Despite continued discussion about a "democratic deficit" in Europe (Neuhold, 2020), levels of trust in policy makers pre COVID-19 tended to remain relatively stable (Glatz and Eder, 2020). However, the COVID-19 pandemic shook these relatively stable patterns, and trust fell across many European countries (Kukovic, 2022). Rebuilding this trust is crucial, and perhaps improving our understanding of citizen and policy makers' beliefs about each other's beliefs, including but not limited to the marine sector, might aid this process.

#### 4.4. Implications and conclusions

Our results feed into a wider debate about the use of the world's coasts, seas and global Ocean, and whether the exploitation of the marine environment for economic growth should be at the cost of marine environmental protection and protecting human health (Fleming et al., 2024b). Experts have suggested that increasing economic growth over recent decades has led to the global deterioration of the environment (MEA, 2005). The results of this study suggest that the public perceive protecting the marine environment to be of high importance, and while policy makers are also thought to be concerned about these issues. They are thought to be lagging behind the public in this respect.

How policy makers react to this information will be interesting. Specifically, they may wish to either: a) just note the difference; b) communicate to citizens and provide evidence that their preferences are more aligned than currently perceived (if true); c) acknowledge the perceived differences between themselves and citizens and try and make their own policies align better with the preferences of citizens; and/or, d) try and influence citizen preferences to be more like their own. It remains to be seen what happens next, but that the public also ranked health protection to be more important than economic growth supports recent calls "to link human health to ocean health policies", exploring "opportunities to reframe, adapt or reinterpret existing marine policies to incorporate Oceans and Human Health" (European Marine Board, 2020).

Given recent climatic events, including the hottest average temperatures recorded on both land and the Ocean (Meredith, 2023), the interconnections between our own health and the health of the environment are manifest. The results of this and other studies should encourage policy makers in Europe and beyond to prioritise immediate and long-term environmental and health benefits over a purely traditional economic focus when addressing the impacts on the Ocean of climate and other environmental change.

## CRedit authorship contribution statement

**Jozsef Arato:** Writing – review & editing, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation. **Mathew P. White:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Sophie M.C. Davison:** Writing – review & editing, Project administration, Investigation, Conceptualization. **Sabine Pahl:** Writing – review & editing, Supervision, Conceptualization. **Timothy Taylor:** Writing – review & editing, Supervision, Conceptualization. **Morris Krainz:** Writing – review & editing, Formal analysis, Data curation. **Sandra J. Geiger:** Writing – review & editing. **Paula Kellett:** Writing – review & editing, Funding acquisition. **Oonagh McMeel:** Writing – review & editing, Funding acquisition. **Lora E. Fleming:** Writing – review & editing, Project administration, Funding acquisition, Conceptualization.

## Declaration of competing interest

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

## Data availability

Data are publicly available at stated in the manuscript.

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## Appendix A. Supplementary data

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