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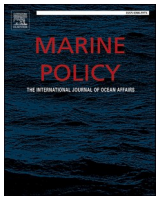

Full length article

Navigating tricky trade-offs in busy seas: Insights from England for blue justice

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ABSTRACT

The expanding blue economy intensifies competition for marine resources worldwide, necessitating trade-offs among sectors, stakeholders, and ecosystems. Our qualitative research examined how these marine trade-offs are managed in England and the implications for blue (social) justice. Through a desk review and interviews with marine managers and policy-makers we found that trade-offs are not addressed systematically, with decision-making biased by evidence gaps, limited stakeholder participation, and inconsistent reasoning. Social impacts are particularly underrepresented due to data limitations and consultation processes favouring well-resourced stakeholders. The sector-by-sector approach to trade-off decision-making generates cumulative impacts on vulnerable groups and species that often go unrecognised. While environmental compensation mechanisms exist, compensation for social losses is ad hoc. Equitable ocean governance requires moving from tacit to explicit consideration of trade-offs. This article argues this can be achieved through systematic and deliberative trade-off assessments with meaningful stakeholder participation (procedural justice) that is inclusive of diverse values and knowledges (recognition justice), establishing thresholds for determining unacceptable trade-offs (distributive justice), and mechanisms for addressing both unavoidable environmental and social losses (restorative justice).

1. Introduction

The growth of the global blue economy is accelerating rapidly, increasing competition for marine resources and marine space [17,44]. Complex decisions need to be made about which marine sectors, marine resource users, and environmental, social and economic policy objectives should be prioritised over others in different places. Decisions also need to balance the interests and wellbeing of current generations with those of future generations and marine environmental sustainability [35]. Despite the prevalence of win-win arguments in marine management, such trade-off decisions are the norm rather than the exception [52], and have implications for livelihoods, marine biodiversity, and the wellbeing of coastal communities [31].

Social scientists and activists are raising the alarm about certain blue growth benefits coming at the expense of the displacement or dispossession of existing livelihoods, environmental degradation, and the loss of community access to marine resources for food security [27,6]. In other words, there are social and environmental injustices stemming from growth of the ocean economy (including marine conservation). Blue justice encompasses recognition of different rights, values and knowledges, procedural fairness in how decisions are made, and distributional equity in who benefits and who bears costs [9]. We also integrate restorative justice in this analysis to address the capacity for policy processes to acknowledge and prevent structural harms that have

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historically resulted from marine development and conservation [53]. As the blue economy expands, there is growing recognition that trade-off decisions often prioritise powerful interests at the expense of marginalised coastal communities and small-scale resource users, raising concerns about justice [27].

The academic environmental management literature has identified many types of social, economic and environmental trade-offs [18,62]. However, while trade-offs in the marine context have been demonstrated, there remains a critical knowledge gap in how they are navigated on the ground in policy and practice. Moreover, trade-off analysis tends to focus on a specific type of intervention (such as protected areas; e.g. Chaigneau and Brown [13]) or policy domain (such as conservation planning; e.g. Gunton et al. [37]). However, interventions and policy domains frequently overlap, with the potential for synergies and trade-offs becoming more acute due to the growing imperatives of, and competition among, blue economic growth, conservation and nature recovery, and climate change mitigation and adaptation [35]. There is a need to better understand how the inevitable trade-offs made by interrelated marine decision-making processes address or exacerbate conflicts and inequities. Specifically, there is a lack of clarity on: (i) the extent to which different trade-offs across decision-making processes are visible to managers and policy-makers and therefore part of the calculus of decisions; (ii) how and by whom decisions are made that determine trade-offs; and (iii) how negative outcomes of those trade-off decisions are managed before and afterwards.

The article investigates how trade-offs are being made and the associated challenges for blue justice through a study of diverse, overlapping marine decision-making processes in England, one of four countries in the United Kingdom (UK). England provides an illuminating case study as the UK government faces difficult choices across a complex policy landscape in some of the most intensely used seas worldwide, with a booming blue economy. The English Channel is the busiest shipping lane in the world and the shipping industry continues to expand (e.g. gross value added by shipping grew by 38 %, 2010 2019, [12]). While the English fishing industry is in long-term decline, newer marine activities, such as marine energy, seabed mining, and carbon storage are making use of the English marine environment [64]. Offshore wind energy generation, in particular, has experienced unprecedented growth – UK offshore wind capacity grew 15-fold between 2009 and 2023 [24], with three-quarters of the UK capacity in English waters [23]. England is therefore on the front line of making tricky marine trade-off decisions among these and other sectors, as well as environmental, social and economic policy objectives.

Based on desk review, in-depth interviews and a workshop with marine managers and policy-makers, our results firstly examine the procedures by which trade-offs are identified, decided upon, and managed, and then secondly the perceived and inferred justice challenges associated with these procedures. We discuss the broader implications of these challenges and propose ways forward for achieving more just marine trade-off decision-making. We argue that operationalising blue justice principles in marine governance requires systematic assessment and deliberation of trade-offs, with meaningful stakeholder participation that is inclusive of diverse values and knowledges, fair mechanisms for defining thresholds for unacceptable trade-offs, and addressing both environmental and social losses from marine development and conservation.

2. Marine governance and trade-offs in England

Marine governance in England has experienced unprecedented change in the past 15 years. The Marine and Coastal Access Act (MCAA) (2009) and subsequent UK Marine Policy Statement established a new system for the regulation of marine activities in the UK and thus England [38]. The MCAA established a long-term vision for the integrated management and regulation of marine activities that balances economic, social and environmental concerns, representing a major change in policy away from decision-making based on single sectors, activities, issues, or species [61]. The MCAA also created the Marine Management Organisation (MMO), a public body responsible for marine management in England. More recently, the exiting of the UK from the European Union in 2020, i.e. Brexit, has led to further reforms to marine governance, including a new legal framework for fisheries under the Fisheries Act [29]. Both major changes have prompted a more explicit examination of competing priorities in marine policy, presenting an opportunity to better understand trade-off decision-making. Table 1 presents the decision-making areas and processes that this study analysed, which are further detailed in S1. These included decisions related to marine planning, marine conservation, fisheries management, maritime heritage, marine licensing, and coastal management.

Each of the marine decision-making processes in England entails decisions that generate trade-offs among sectors, stakeholders and the environment. A prominent type of trade-off tends to exist between environmental objectives and social ones. For example, issuing a marine license for offshore wind development or establishing a highly protected marine area can support Net Zero and biodiversity conservation goals, but at the potential expense of short-term fisheries' productivity by closing the area to fishing. This can have knock-on effects to the well-being of impacted fishers [15]. Decisions also have trade-offs across time (e.g. licensing offshore wind development restricts other marine activities today in return for future climate and energy security benefits) and across space (e.g. establishing a highly protected area displaces fishing pressure to other areas) [50].

In this context, policy-makers and marine managers are increasingly interested in recognising and interrogating trade-offs that exist or might arise from expanding the uses, management and conservation of England's marine areas, and how these trade-offs can be effectively addressed to avoid or reduce conflict among policy priorities and resistance from stakeholder groups. This case study provides a unique opportunity to examine how trade-off decision-making is carried out within high-level policy and management decision-making, insights from which can underpin improvements to decision-making in England, and for other busy seas worldwide.

3. Methods

The study involved a combination of interviews and a workshop with UK marine managers and policy-makers, and desk review of policy and procedural documents. The interviews (conducted between July 2022 and January 2023) were semi-structured and targeted 'elite' interviewees who possessed insider knowledge of marine management and policy decision-making processes to permit in-depth exploration and reflection [45,47] of formal and informal elements of trade-off decision-making. We recruited 29 participants with specialised knowledge of one or more of the England marine decision-making processes in Table 1 (also see S1). Project partners at the Department for Food and Rural Affairs (Defra), the government department responsible for UK marine policy, and the MMO suggested an initial set of potential interviewees and reviewed the completeness of our list of decision-making processes. Interviewees were not always the final decision-maker, but they were involved in facilitating all or some of the steps of the decision-making process or providing inputs. Table 1 outlines the number of interviewees and workshop participants for the decision-making processes, the topics covered in the interviews, and the inclusion and exclusion criteria applied when selecting interviewees. Interview numbers varied across policy domains, reflecting the diversity of decision-making processes within each (see Table 1) (we interviewed at least one manager per process). Fisheries had the most interviews due to their complex decision array and easier recruitment from the largest group of marine-related civil servants, who have greater discretionary space for trade-off decision-making (particularly given post-Brexit changes) and may therefore have more interest in the study. Despite this data imbalance, our analysis weighted all decision-making

Table 1
Number of interviewees for policy domains and interviewee inclusion/exclusion criteria.

Policy domain	Decision-making processes (DMPs)	No. interviews	No. workshop participants (no. of participants also interviewed)	Interview topics	Inclusion criteria	Exclusion criteria
General	Knowledge and experience across multiple marine DMPs	4	10 (1)	General information about the decision-making procedures; Tools and evidence used; Approaches to account for trade-offs and synergies; How decisions made on whether trade-offs acceptable; Trade-off management; Fairness and equity of DMPs; Overall strengths and weaknesses of trade-off approaches	Make or advise on decisions Deploy tools that support DMPs	Those affected by outcomes of DMPs (given breadth of DMPs studied this would result in unfeasible number of interviewees); Ministers (not feasible to recruit given their commitments); Politicians (not directly involved in DMPs once laws enacted)
Fisheries	Inshore byelaws; Fisheries Management Plans; Inshore quota management; Offshore quota management	11	9 (4)			
Conservation	Marine Conservation Zones and other marine protected areas and designations	5	1 (1)			
Licensing	Marine licensing; Nationally Significant Infrastructure Projects	4	0			
Marine planning	Marine plan development	2	2 (1)			
Heritage	Marine heritage designations and protection	2	0			
Coastal Resilience	Shoreline Management Plans	1	0			

processes equally.

One-on-one interviews were conducted remotely on MS Teams by either MF or OM, taking between 40 and 100 minutes. They were audio recorded with participant consent and transcribed by professional transcribers at GoTranscript. Interview transcripts were then analysed in the qualitative analysis software, NVivo, by LB and AP. We used a flexible coding approach [25], whereby data were first deductively coded according to the research themes of (i) how trade-offs are identified; (ii) how trade-off decisions are made, including factors determining trade-offs; (iii) how trade-offs are managed; and (iv) perceptions of fairness and equity. Within each of these themes, analytical codes were then identified inductively and then converted into broader informative sub-themes in consultation with MF and OM (see S2).

Relevant policy documents were identified by searching government websites and asking interviewees to recommend documents during or after the interview in relation to each of the decision-making processes. The review of the documents focused on topics highlighted during discussions and sought to verify factual information, policy details, and procedural aspects mentioned by interviewees.

A workshop (1.5-hour duration) was then held with 24 marine managers in May 2023 to validate and discuss the preliminary findings from the interview analysis. Invitations were given to those interviewed (of which seven attended), their relevant colleagues, and policy participants attending the Sustainable Management of Marine Resources (SMMR) 2023 conference, to which our workshop was appended (the SMMR conference was an annual meeting that brought together the UK marine science and policy community). The preliminary findings were presented to participants, who then discussed how the emerging findings resonated or differed to their experiences, how the decision-making tools and approaches could be improved, and the mechanisms and barriers for bringing about these improvements. Transcripts of the breakout group discussions were later coded using the same analytical approach as above within the existing NVivo project.

Ethical approval for the research was granted by the University of Exeter Geography Ethics committee (Reference Number 518872).

4. Results

We first provide an overview of how trade-offs are identified or made visible, decided upon, and managed in England's marine policy landscape. We then analyse these processes through a blue justice lens, examining challenges related to recognition and procedural, distributional and restorative justice. The results present the perspectives of marine managers and policy-makers with expertise in a respective decision-making process, triangulated with other interviews and policy documents where possible. Nevertheless, on some of these issues there may have been alternative perspectives that are not captured in the data.

4.1. Trade-off identification, decisions and management

Fig. 1 illustrates our analysis of how trade-offs are addressed in marine policy in England. The process involves identifying, assessing, and reviewing impacts (with trade-offs implicitly considered) before decisions are made by government, resulting in trade-off outcomes. Negative effects are sought to be managed both before and after decisions. Importantly, England lacks an explicit trade-off analysis and decision-making framework, with each process varying considerably. The following sub-sections explain the components of this figure in detail.

4.1.1. Impact identification

The visibility of marine trade-offs to decision-makers in England is determined by which social, economic and environmental impacts of management and policy decisions are identified. A range of tools were discussed by interviewees for identifying impacts, including impact assessments, each addressing various environmental and social impacts, and different types of consultation with statutory bodies, stakeholder representatives and the public (see S3 for a review of tools and approaches).

4.1.2. Analysis of trade-offs and communication to decision-makers

Identifying impacts alone does not constitute trade-off analysis, which requires trade-off analytical methods or, in its weakest form, presenting the negative and positive impacts for decision-makers to then weigh up the pros and cons of alternatives. The only explicit trade-off analysis used in England is cost-benefit analysis, which aggregates costs against benefits to determine if economic benefits outweigh costs. This economic analysis is applied when making the business case for programmes and projects related to marine planning, licensing, Marine Conservation Zone (MCZ) designation, offshore renewable energy, and coastal flood defence schemes.

Apart from cost-benefit analysis, two approaches were discussed by interviewees to communicate pros and cons or positive and negative impacts to decision-makers. First, spreadsheets are used to summarise different impacts for decision-makers, such as template matrices in Sustainability Appraisals for marine plans that display environmental,

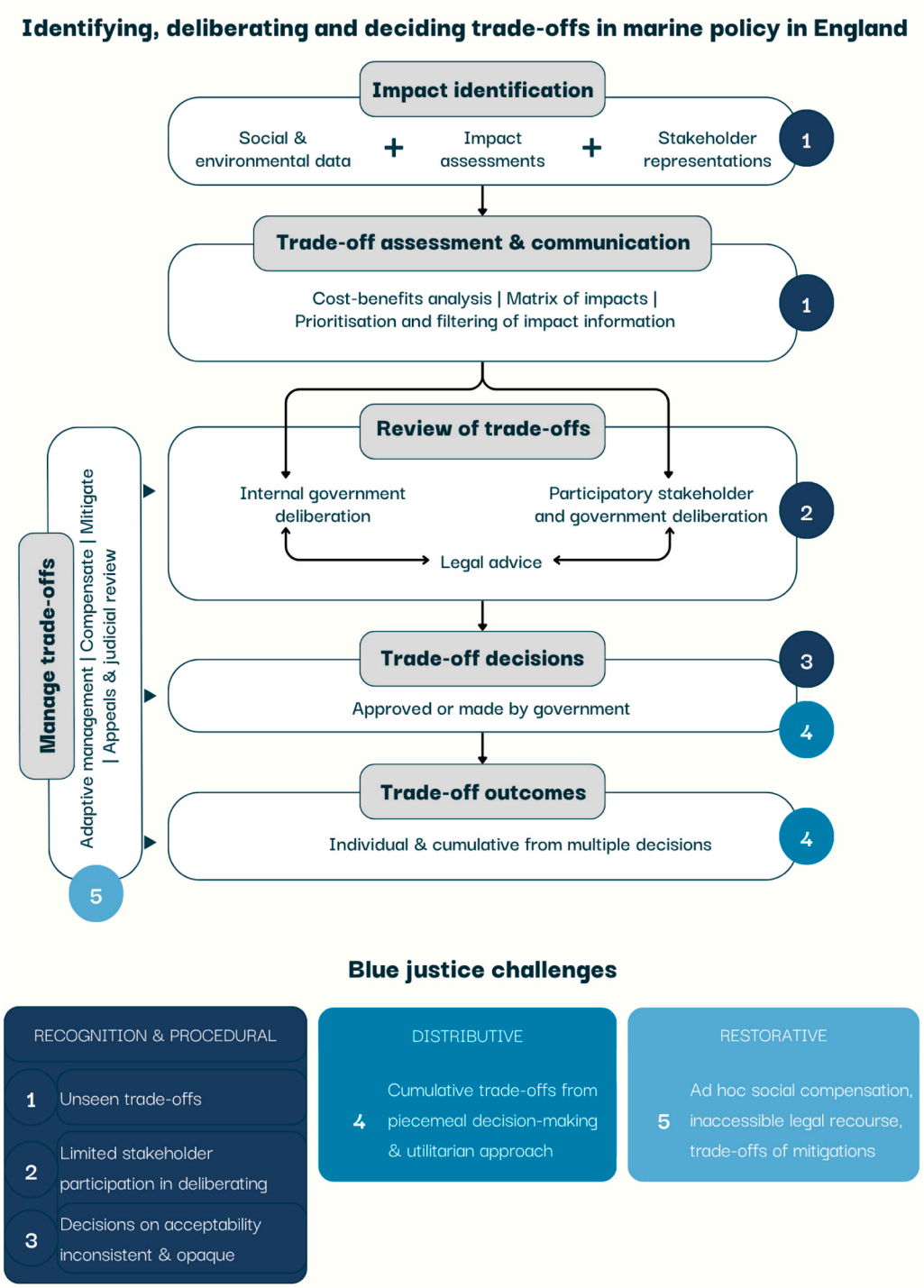

Fig. 1. Schematic of how marine trade-offs are made visible, considered, decided and managed, and related blue justice challenges, in England. Source: Authors' interpretation of data.

economic, and social impacts. Second, information can be filtered by civil servants who present key pros and cons in high-level summaries to decision-makers, exemplified in Nationally Significant Infrastructure licensing where Planning Committees receive pre-filtered guidance from the Planning Inspectorate on the most critical impacts.

4.1.3. Reviewing trade-offs

In England, while trade-off terminology is not explicitly used, decisions create new distributions of costs and benefits through licensing, rules, and designations that alter access to and use of marine space and resources. Two main approaches to reviewing overall impacts and implied trade-offs were discussed by interviewees:

(i) **Internal government processes:** Evidence on impacts and consultation results are evaluated by civil servants who make recommendations to senior officials or the Secretary of State for final decisions. This is the predominant approach across marine policy domains, including in marine licensing and marine planning. In marine planning, for example, in-depth stakeholder

consultation feeds into the Sustainability Appraisal, upon which preferred options for the plans are decided within government.

(ii) **Participatory stakeholder and government processes**. Some decisions involve stakeholders more actively in trade-off considerations through participatory engagement. Examples include: diverse stakeholder groups helping delineate MCZ boundaries through deliberation and compromise; Inshore Fisheries and Conservation Associations (IFCAs) have stakeholder representation on governing committees, which consider costs and benefits of proposed bylaws before recommending to central government for approval.

In both approaches, before any decision is made, legal advice is sought to ensure compliance with statutory requirements.

In many decision-making processes, both formal and informal dialogue and negotiations between government and stakeholders occur to find compromises. There is growing momentum in England for increased stakeholder involvement in management, as reflected in the Joint Fisheries Statement vision that "*industry should play a greater role in managing fisheries…[and be] actively engaged in fisheries management decisions*." Despite this trend towards greater stakeholder participation, ultimate decision-making power on trade-offs remains with high-level and centralised government officials.

4.1.4. Deciding whether trade-offs are acceptable

Fig. 2 summarises the key factors interviewees reported as influential when making decisions. These factors create an implicit hierarchy that shapes the "wriggle room" available to decision-makers in determining what trade-offs are acceptable. These factors are not considered systematically and vary across decision-making processes. They range from non-negotiable elements (legal requirements and technical feasibility) to highly negotiable, politically determined decision spaces (such as which stakeholder values and interests receive priority); however, while negotiable, the wriggle room to make trade-offs has been constrained by the hierarchy. As one marine planner described: "*[Once] we've discounted the…hard [legal] boundaries – we can't [change] those – I would like to use a very technical term 'wriggle room' – this is where…it's in your gift to determine [trade-offs]*."

After all available evidence is assessed and a decision meets legal and policy requirements (guided by legal advice), recommendations and trade-off decisions are finalised.

4.1.5. Managing trade-offs

Trade-off thinking is not deliberately applied to mitigate potential and realised adverse effects of decisions, but various mechanisms implicitly manage trade-off outcomes both before and after decisions:

(i) **Mitigations**: Economic and cultural impacts are mitigated through iterative identification, negotiation, and resolution via consultations, partnerships, or participatory activities with key stakeholders. For example, when increased catch limits for sole incentivised increased fishing activity in Lyme Bay, fixed-gear fishers complained their nets were being destroyed by trawls. The MMO created a steering group where the fixed-gear fishers agreed to mark their gear with flags so that trawlers avoided those areas, which mitigated negative impacts of the management change, according to a fisheries manager.

(ii) **Compensation**: Environmental compensation mechanisms exist (e.g. under the Environment Act 2021 and Town and Country Act 1990) for habitat, species, and biodiversity losses from decisions where overriding public interest makes negative environmental impacts acceptable. For instance, creating seabird nesting sites to offset offshore wind farm impacts on bird populations. Compensation for social impacts tends to be ad hoc and not legislated (discussed below).

(iii) **Adaptive management**: When proceeding with interventions despite impact uncertainties, adaptive management allows flexibility to make adjustments as new information on impacts emerges. A marine licence officer reported that licences can be amended or even revoked when new data contradict initial impact assessments.

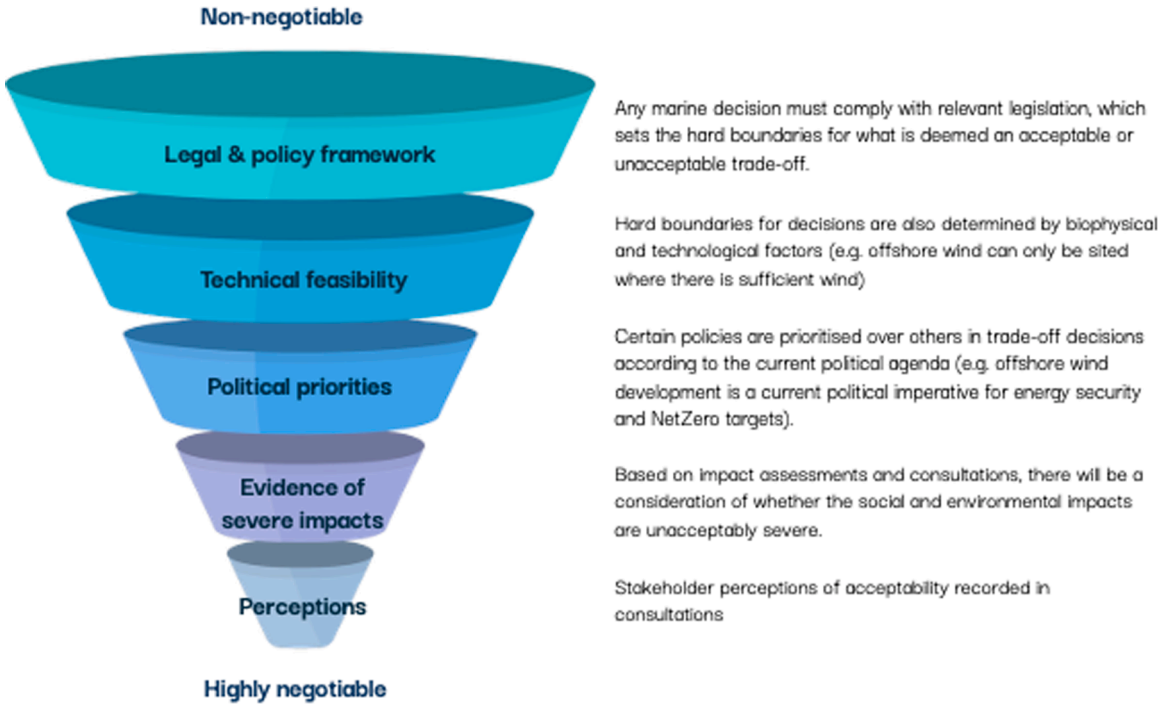

Fig. 2. Wriggle room: factors that influence decisions on whether potential trade-offs are deemed acceptable. The funnel depicts that there is a hierarchy of hard boundaries filtering down to issues of stakeholder perceptions where the wriggle room for making trade-offs is constrained by the hierarchy. Even if what is left is more negotiable, there remains limited inherent power to decide the acceptability of a trade-off.

(iv) **Appeals and judicial reviews**: These provide opportunities for legal challenges to decisions. Numerous judicial challenges have occurred regarding marine development projects and licensing of marine activities, serving as checks on government decisions and their environmental and social trade-offs, but, as we discuss below, this legal route is inaccessible for most stakeholders.

In sum, while there is not an explicit process to assess marine and coastal trade-offs in England, the data showed that a combination of impact assessment and consultations identified potential impacts of decisions and development, that these impacts are weighed up either by government alone or government with stakeholders, and that final trade-off decisions are mainly made by central government. They also show that negative impacts and therefore trade-offs can be managed through mitigations, compensation, adaptive management and judicial review.

4.2. Challenges to making just marine trade-off decisions in England

Analysis of interview and workshop data identified several perceived challenges with the current approach to marine trade-off decision-making in England, which have implications for progressing blue justice, discussed in the proceeding section.

4.2.1. Recognition and procedural justice challenges: who participates and how trade-off decisions are made

Procedural justice refers to fairness in the processes that allocate resources and resolve disputes. This includes the participation and influence of individuals and groups in both the design of decision-making processes that affect them and in the decision-making itself [53,9]. Because procedural justice is underpinned by, and inextricably linked to, recognition – understood as respect for rights, diverse worldviews, and values, and the institutionalisation of that respect [60] – we consider the coupled implications for these elements. Our data revealed challenges to both recognition and procedural justice in relation to data and assessment practices, stakeholder participation and representation, and the consistency and transparency of trade-off decision-making processes.

4.2.1.1. ***Limited visibility of trade-offs.*** The visibility of trade-offs depends on anticipated, identified and measured impacts of decisions and interventions. Our findings reveal that identified impacts are not exhaustive and rely on tools that give variable attention to various environmental and socio-economic impacts (shown in S3).

Interviewees indicated that environmental data and data on impacts on natural assets are better represented and formalised than social data. While environmental evidence has recognised gaps and often high degrees of uncertainty (which can stymy conservation designations), many interviewees expressed concern that social evidence was less available than economic and environmental data for coastal marine contexts with implications for social justice: "*I feel like lack of good [social] data could add up to decisions made on incomplete information. You can't guarantee that they're fair, can you?" (isheries manager)*. Consequently, social impacts may be less thoroughly assessed through formal evidence gathering, making social trade-offs (e.g. a group losing access to a culturally important marine ecosystem) less visible than environmental (e.g. biodiversity loss) and economic ones (e.g. reduced income of a sector). A marine planner said ecological trade-offs were more likely to be considered unacceptable than social trade-offs because of the better availability, certainty and quantification of ecological impacts, while a marine protected area specialist said evidence of economic impacts plays an important role in designation decisions. Moreover, high civil service staff turnover was cited as reducing institutional memory of the outcomes of past decisions, and therefore recognition of the potential of similar decisions to have trade-offs.

Formal and informal consultation was frequently mentioned as a method to address social data gaps by gathering stakeholder and public perceptions about potential impacts from proposed interventions. However, consultation does not equate to systematic social evidence collection, and interviewees highlighted representation concerns related to stakeholder agency. Stakeholder analysis was said to not be standard procedure in all decision-making, only ad hoc, which means who is recognised as a stakeholder and whose voices are heard affects which trade-offs are visible. Most consultations are passive, requiring stakeholders to proactively complete online forms or attend meetings. Inshore fishers were said to "*rarely put their head above the pulpit [during consultations] for fear of recriminations*" (inshore fish representative), such as having gear sabotaged, when consultations involve larger operators. They also lack representation by an association, especially since the New Under Ten Fishermen's Association (NUFTA) ceased operations (fisheries manager). In marine licensing, conservation and marine planning decisions, citizens' values were said to be missing from consultations when "*they've not got a real interest in the marine environment and perhaps a history of working in that field*" (marine planner). These access barriers inadvertently favour the most resourced and organised stakeholder groups:

> *People who work for an environmental NGO and are paid to work five days a week can put together a really good consultation response. And also that they can get their members to sign thousands of postcards that say, 'We need this management measure'. If you're a fisherman, if the consultation is during the summer,… you're spending 90 % of your time at sea [so do not have the time to engage in consultations]. (senior evidence manager, statutory body)*

Differences in stakeholders' voice in consultations can lead to some trade-offs receiving more consideration than others in decisions. For example, the number of representations received about a particular issue was said to influence the level of attention it receives from the Examining Authority for nationally significant marine infrastructure projects.

Therefore, while impact assessments and consultations reveal positive and negative impacts, the range identified depends on which impacts are investigated, evidence availability and type, and stakeholder agency in voicing perceived impacts during consultations. This affects which trade-offs decision-makers see – trade-offs remain unidentified if the full range and distribution of impacts to people and environment are not revealed. Even when impacts are identified, decision-makers lack trade-off approaches or tools to systematically identify, analyse and deliberate the full range of trade-offs. An evidence specialist concluded there is lack of analysis of the data that are available or that could be collected using a standard procedure to identify trade-offs.

4.2.1.2. ***Opacity and inconsistency in deciding the acceptability of trade-offs.*** A key aspect of procedural justice is transparency and consistency in decision justification and making. Our findings revealed significant inconsistencies in principles used to determine trade-off acceptability, undermining perceived fairness and legitimacy of marine governance decisions. These inconsistencies manifest in three interconnected ways.

First, there are uncertain thresholds for unacceptable trade-offs. Environmental legislation provides clear boundaries for unacceptable environmental impacts, giving decision-makers limited flexibility. Compliance with these laws was frequently mentioned as primary: "*[Marine licences have] been refused on [seascape] grounds… this will be too much for the [seascape] to accommodate… impacts on designated populations of a species*" (principal advisor, statutory body). In contrast, social and economic impact acceptability remains vaguer in law and policy. As one IFCA officer explained: "*The objective of sustainable fish stocks is a* ***requirement*** *[in the Fisheries Act], while social and economic are just* ***considerations*** *(our emphasis added).*" That is not to say that environmental requirements are always non-negotiable – fisheries quota

negotiations, for example, with and within the European Union, routinely result in catch quotas being set so they exceed scientific advice on sustainable catch levels. However, even then, social considerations remain within decision-maker discretion rather than based on a predetermined threshold of what is required for a fishery to remain viable. For marine users whose livelihoods depend on marine resource access, this legal asymmetry can (but not always) mean their interests (and, arguably, rights) are often unprotected.

Second, there is a lack of transparency in trade-off decisions. While nearly all interviewees perceived processes to be ostensibly transparent (following statutory requirements with public hearings, evidence, and minutes), the actual weighing of trade-offs often occurs '*behind closed doors*' within government. Information was said to not always be communicated in accessible formats either (requiring requests or using complicated jargon) and stakeholders often do not understand procedures. A marine protected area specialist noted: "*The difficulty of articulating really complex technical information to your audiences, where the governance arrangements and the evidence you're using is really complicated, [means it…] isn't always very naturally transparent.*" According to cross-sectoral participants at the workshop, this opacity intensifies when decisions move up the governance hierarchy, with limited clarity on how ministers deliberate evidence, some citing political motives taking precedence over evidence. A government evidence advisor reflected in relation to MCZs and more broadly: "*you have a very transparent process to begin with, and then it becomes more top-down and behind closed doors, then the whole thing [transparency] is ruined*." Because there is a lack of transparency regarding how trade-offs are decided, stakeholders cannot fully understand the basis on which their interests might be prioritised or sacrificed.

Third, the ethical frameworks for deciding the acceptability of trade-offs are inconsistent. Some decision-makers explicitly endorse utilitarian principles: "*I think fairness ultimately, you have to look at it in terms of utilitarianism. So what's fair and best for the greatest number?*" (IFCA Chair). This utilitarian approach often underpins cost-benefit analyses, where aggregate economic benefits are weighed against aggregate costs. However, others expressed concerns about utilitarian approaches' limitations, particularly regarding distributional equity. Nationally significant infrastructure projects (such as offshore wind development) are a case in point:

> *what is quite a significant localised impact can become quite a small national impact when you think about UK PLC [public limited company] …That is where I think some coastal communities feel quite disenfranchised because they don't necessarily see the weight of their issue being given to the decision-making process. (marine licensing decision maker)*

Five interviewees emphasised considering stakeholders' capacity to adapt to impacts when determining acceptability. For example, whether an inshore fisher is critically dependent on an affected location or has the capacity to fish elsewhere. In practice, decision-makers sometimes depart from utilitarianism; for instance, interviewees cited Defra's decision against a Highly Protected Marine Area in Lindisfarne (Northumberland) due to potential severe impacts on local, culturally and economically important small-scale fishing.

Without clear principles for evaluating trade-offs, decisions can appear arbitrary, politically motivated, biased toward powerful interests, or "*decided on a case-by-case basis*". Current approaches provide little support to decision-makers navigating complex moral and justice dilemmas, and there are no clear tools for equity assessment: "*[justice] that's something that we don't really have tools to help with*" and "*lack of data, especially social data make it hard to assess the fairness of the decision*" (government advisor). According to an IFCA chair, trade-off deliberation "*is hugely influenced by the specific Minister […and] how different pieces of evidence are interpreted, understood and weighed [up]*." A government advisor explained: "*we put advice to them [but] it's a very political decision.*" A technical advisor noted that what is missing is a clear process for analysing and interpreting available social and economic data in a comprehensive and fair way so that decision-makers take account of it to recognise and make trade-offs. Consequently, decisions on who benefits and who loses tend to be made subjectively case-by-case rather than based on principles or agreed thresholds of when a social trade-off becomes unacceptable.

4.2.1.3. *Limited stakeholder participation in trade-off deliberation.*

Diverse stakeholder values and perspectives are incorporated into decision-making through representative committees, forums, and working groups. More participatory, deliberative approaches, such as IFCAs, provide forums for greater stakeholder inclusion in reviewing evidence and weighing up potential trade-offs. However, as noted above, stakeholder participation is mainly limited to being consulted on impacts and, even when stakeholders partially engage in deliberation, meaningful participation in weighing up of pros and cons faces significant challenges due to access barriers, power dynamics between participants (noted above), and centralised decision-making power that can overturn stakeholder recommendations. As one government evidence team member explained:

> *The final decision is the Secretary of State, which is a bit of the elephant in the room… how much do we guide in this process when it's meant to be a collaborative process, or how much freedom do we give to these groups to actually work it out?*

The MCZ designation process illustrates these tensions. A marine manager previously involved in this process highlighted that in-depth stakeholder collaboration and trade-off negotiation had occurred in working groups, only for most MCZ designations to be subsequently postponed, adapted by government, or not approved at all. The potential for future collaboration can be significantly undermined when final government trade-off decisions overturn or adjust compromises reached through participatory processes, especially when changes are not communicated to previously engaged stakeholders or there are a lack of opportunities to appeal those government decisions. This provides an example of a lack of transparency and accountability in how final trade-off decisions are made.

4.2.2. *Distributional justice challenges: cumulative costs and benefits across policy domains*

Distributional justice refers to the differential distribution of marine policy decisions' benefits and burdens on different people and groups across space and over time [53,9]. In England, marine environmental and social impacts and resulting trade-offs are normally only assessed for specific sectoral interventions, rather than at strategic, cross-sectoral scales. Marine plans were described as presenting policies to be considered during decision-making without making difficult a priori choices between policy objectives or sectoral uses of spatial areas. Both a planner and conservation specialist advisor cautioned that current approaches fail to capture trade-offs across policy domains and do not make the spatial prioritisation choices that "*inevitably need to be made*", with the latter describing the approach as "*piecemeal*" and the former as "first come, first served":

> *[Marine plans] are not as directing as other policies you might see in say, local plans on terrestrial environments. It's often the case that things like making decisions by balancing the rights of one industry over another, they're up for grabs. To be fair to the MMO, I would say that is because the politics involved in that are really quite sensitive and also bigger than them. (marine planner)*

Interviewees expressed concern that this approach could lead to cumulative impacts on certain species and social groups, even when individual decision trade-offs are deemed acceptable. For social cumulative effects, a fisheries manager said that fishers feel that the distribution of costs from multiple marine decisions to be unfair and their

views are not "*really listened to*", while an inshore fisher representative said this was resulting in "*fishermen losing all faith in management*". Regarding species impacts, the example given was offshore wind's massive scale-up potentially causing substantial cumulative impacts on seabird populations, even when individual windfarm impacts are considered acceptable.

Most decision-making processes also lack approaches to deal with temporal trade-offs, whereby a long-term benefit is traded off against a short-term cost, or vice versa (e.g. fisheries sustainability versus reduced short-term catches and income for fishers). According to interviewees, shoreline management planning was one of the only decision-making processes to include longer-term scenario planning in decision-making (e.g. the impact of climate change on coastal erosion): "*you're not just thinking about trade-offs currently of a [coastal protection] scheme, you're thinking about those long-term in different time horizons*" (flood risk and resilience planner). Many interviewees shared the sentiment that it was difficult to account for long-term trade-offs because of the uncertainty of scenarios.

When mitigations are implemented before a decision is approved to reduce an intervention's social or environmental burden, these mitigations create their own trade-offs. For example, stakeholder appeasement in MCZ designation demonstrates how mitigating potential socioeconomic impacts reduced potential ecological benefits: "*Because [of] the socioeconomic impacts taken [into] account…, we can't say that [the MCZ] meets the ecological network guidance*" (conservation specialist, statutory body). Knock-on trade-offs caused by mitigation actions do not appear to be considered or addressed in the decision-making processes.

As noted earlier, distributional justice is undermined by utilitarian approaches and economic aggregation of costs and benefits in cost-benefit analyses. Three interviewees from separate government bodies concluded they lack explicit approaches for assessing and making trade-off decisions that deliver more distributionally equitable outcomes – approaches that would not only assess costs and benefits but understand their implications for different stakeholders. Some interviewees suggested that fairness is too subjective and that striving for objectivity where all stakeholders are treated equally avoids preferential treatment. However, trade-offs that treat stakeholders and concerns equally do not necessarily produce equitable distributions that account for differential vulnerabilities and historic injustices.

4.2.3. Restorative justice challenges: compensation gaps and barriers to legal recourse

Restorative justice concerns the institutional acknowledgment of past harms, the provision of reparations to communities who have experienced injustice, and the transformation of practices to prevent the recurrence of those harms [53]. While restorative justice has not been a prominent or explicit component of blue justice frameworks to date [9], it offers a valuable lens for assessing the extent to which marine decision-making processes in England may either perpetuate or redress historical injustices associated with their impacts. The data revealed two key challenges to achieving restorative justice for trade-offs: lack of social compensation mechanisms and legal recourse. Dispute resolution through judicial review could be considered under procedural justice, but we consider it under restorative justice because it can rectify an anticipated or realised environmental or social harm.

First, many interviewees argued that social compensation mechanisms for marine resource users who experience losses are inadequate. Interviewees pointed out that environmental compensation faces unique difficulties – biodiversity losses are effectively irreplaceable, making "like-for-like" compensation challenging. Environmental compensation for losses to habitats, species, and biodiversity are awarded for flood and coastal erosion risk management and for offshore wind and other developments when overriding public interest deems environmental impacts acceptable. For example, seabird nesting sites are created to offset the impact of offshore wind farms on bird populations. For social and financial losses, however, unlike in terrestrial environments where property rights enable compensation for adverse land impacts, the UK government does not have policies or legislation for a standard social or economic compensation mechanism for marine interventions and policies. Recently, however, compensation has been provided on an ad hoc, discretionary basis. For example, fisheries negotiations with the EU decided that pollack could only be caught as bycatch, following scientific advice to set Total Allowable Catch for pollack at zero. The resultant impact on fishers reliant on pollack led to around 50 vessel owners being directly compensated for half their income lost [22]. With the exception of payments made during the Covid-19 pandemic to fishers, this compensation was unprecedented yet still relatively limited. Some interviewees noted that implicit compensation occasionally exists through developer payments (such as disruption settlements or community funds from offshore wind developers for marine businesses and coastal communities) or government grants (like the UK Seafood Fund and Fisheries and Seafood Scheme). However, these are entirely voluntary and ad hoc, occurring on a case-by-case basis.

Second, it is difficult for most complainants to access legal recourse. While appeals and judicial reviews theoretically provide opportunities for third parties to contest decisions with unjust trade-offs, launching such challenges requires substantial resources ("*the time, finance and ability*" according to a specialist from a statutory body), making them unfeasible for most stakeholders. Similar to participation in consultations, judicial reviews were reported to be realistically initiated only by well-resourced organisations such as international NGOs or charities.

In summary, restorative justice for marine trade-offs is hampered by ad hoc social compensation and the practical inaccessibility of legal remedies for most affected stakeholders.

5. Discussion

This study examined how marine trade-offs are navigated in England's increasingly busy seas through analysis of marine managers and policy-makers' perceptions across key decision-making processes. We explored these processes' implications for procedural-recognition, distributive, and restorative domains of blue justice. As a case study of well-resourced, fast-paced, and multi-domain decision-making, it illuminates implications for numerous marine and non-marine contexts.

Our findings reveal that while trade-off thinking is not explicitly employed, trade-offs are tacitly addressed through decision-making procedures. Trade-offs become visible through evidence gathering and consultation, are weighed primarily by government (sometimes with stakeholder participation), and final acceptability decisions are mainly made by central government. Trade-offs are managed through pre-decision mitigating adjustments, environmental compensations/offsets, and adaptive management. Importantly, trade-offs are not identified, analysed, or addressed systematically or comprehensively, with the following implications for advancing blue justice.

5.1. Recognition and procedural justice: the need for systematic, participatory marine trade-off assessment and deliberation

The lack of systematic trade-off analysis and communication of trade-offs in marine decision-making undermines coupled recognition and procedural justice in five key ways.

First, social data gaps mean many social trade-offs – and the diverse tangible and intangible values they impact – remain invisible to decision-makers. Environmental and economic data and impacts are better represented than social ones, reflecting how knowledge production privileges certain evidence types [32,33]. Knowledge is also privileged according to the background and expertise of decision-makers, with, for example, a legacy of ecologists and economists dominating fisheries management over social scientists [34,55]. The institutionalised privileging of quantitative environmental and economic data over qualitative social evidence mirrors broader critiques of marine governance globally, where technical-scientific knowledge often dominates

decision-making at the expense of other forms of knowledge [14], making it difficult to recognise diverse social values in trade-off calculi [48].

Second, stakeholder consultations inadvertently privilege well-resourced groups. While decision-making processes are ostensibly transparent, the actual weighing of trade-offs often remains opaque to stakeholders. Reliance on technical language and complex documentation can create barriers to meaningful engagement and influence, particularly for stakeholders without technical expertise or resources to navigate bureaucratic processes [57]. This echoes broader marine governance challenges where marginalised stakeholders struggle to engage effectively [7], creating systematic biases in whose impacts are considered, and thus how trade-offs are identified and decided upon. This finding suggests the recognition and procedural justice principles of full participation and transparency that account for diverse users, rights, values and knowledges [60] not being fully met in trade-off decision making.

Third, the passive consultation approaches reflect what Arnstein [3] termed "tokenism", where stakeholder perceptions are heard but lack real influence on deciding what balance of trade-offs is acceptable. Despite rhetoric emphasising participation, power over trade-off decisions remains centralised, with participation often occurring late in the process when stakeholders are invited to answer consultations. Our findings highlight the tensions between participatory and government-led approaches to trade-off decision making [43].

Fourth, there are limited evaluation tools for explicitly evaluating trade-offs beyond cost-benefit analysis, which is problematic from a justice perspective by reducing complex values to monetary terms and masking inequalities [19,20,21]. The aggregation of costs and benefits can hide important distributive effects and fail to account for existing vulnerabilities [20]. Such reductive tools are likely to overlook the multidimensional, tangible and intangible values that constitute diverse knowledges and worldviews and may contribute to groups being unrecognised and excluded from marine decision-making processes.

Fifth, inconsistent acceptability factors are applied to trade-offs. While legislation provides clear environmental boundaries of acceptability, those for social considerations remain vaguer, with political factors often mediating which groups benefit or experience costs [28]. This procedural inconsistency points to how the acceptability of trade-offs for different groups is not considered systematically or transparently, making decisions on acceptability ad hoc and value laden.

Improving recognition and procedural justice requires systematic trade-off assessment and meaningful participation of all stakeholders in deliberating trade-offs, even if final decisions are made by government. Decision-making processes need systematic approaches to identifying trade-offs between ecosystem services, environmental and social outcomes, and across temporal and spatial scales [54,59]. Stakeholder participation must move beyond consultation to meaningful involvement in trade-off deliberation. Tools like participatory multi-criteria decision analysis could help structure engagement while making power dynamics explicit [2,10]. Emerging approaches like the Marine Planning Trade-off Analysis toolkit [31] could engage stakeholders in deliberating trade-offs and in finding compromise trade-offs themselves. However, a prerequisite to successful participatory trade-off deliberation would be to address access barriers for marginalised groups and, as Flannery et al. [30] warn, such tools must be embedded within broader institutional reforms that address power imbalances among participants. The benefits of stakeholder participation need to be balanced with the risks of industry capture of decision-making processes and unequal representation favouring large-scale commercial interests [39,56]. More broadly, an institutional culture needs to be fostered that recognises and embraces trade-offs as normal and necessary to make, before it is possible for processes and tools to be taken up and applied consistently to decisions.

5.2. *Distributive justice: moving beyond piecemeal approaches*

Procedural weaknesses in trade-off assessment and decision-making likely result in inequitable cost-benefit distributions. A key finding from the study was that trade-offs are assessed only for specific sectoral interventions rather than at strategic, cross-sectoral scales. Marine plans merely present policies for consideration rather than making difficult choices between objectives or spatial uses, creating piecemeal decision-making that evaluates trade-offs for individual developments without considering collective effects over space and time. While individual decisions may deem trade-offs acceptable, multiple interventions cumulatively erode certain sectors' resource access, illustrating how focusing on one sector generates trade-offs for others and unintended consequences [41].

This absence of strategic-level assessment is concerning given widening inequalities in English coastal communities [63] and threats to small-scale fishing viability [1,16,46], including displacement by more lucrative activities like offshore wind generation [11]. Research shows how cumulative impacts and appropriation of space and resources can marginalise smaller-scale users [5], reflecting blue economy patterns where benefits accrue to powerful actors while costs fall on marginalised groups [27,6]. Our findings suggest this dynamic occurs in England through accumulation of seemingly minor trade-offs that collectively threaten small-scale fishing communities despite policymakers' intentions. Interestingly, the data do not reveal other marine groups similarly suffering from distributive injustices – this may partly be because of the strong dependence of inshore fishers on the marine environment, that the concerns of some hard-to-reach groups (e.g. poor in coastal communities) are not heard by marine managers, and/or some issues are relatively new or neglected in policy processes (e.g. recreational users' concerns about sewage pollution).

Marine Spatial Prioritisation (MSP) could provide a framework for strategic trade-off consideration by generating spatial zoning plans rather than just setting policy objectives. Even with spatial planning, explicit consideration of synergies and trade-offs remains crucial for evaluating management alternatives and identifying co-benefit opportunities [15]. MSP should consider the social acceptability of the trade-offs of different configurations of spatial zones and historical/contemporary inequities, in order to address critiques that MSP fails to address power imbalances and equity concerns [30]. Basurto et al. [4] suggest that areas designated as preferential access areas for small-scale fisheries can provide important nutrition and economic opportunities for coastal fishing communities in the face of such power dynamics that otherwise 'squeeze' them out. MSP also fails to account for trade-offs from non-spatial policy decisions (e.g., overlapping fisheries regulations) that could be considered under Marine Planning as a broader integrative framework.

To advance distributive justice, marine governance needs mechanisms to assess critical trade-offs benefiting some system parts over others. Clear thresholds for acceptable change must be established. Frameworks like Doughnut Economics [58] could be downscaled to define environmental boundaries (critical ecological thresholds) and social foundations (above which all humans can meet their basic needs) that should not be breached in the marine context, thereby establishing redlines for the acceptability of both environmental and social trade-offs. These could be complemented by vulnerability assessments to consider different groups' capacity to adapt to adverse impacts and take advantage of benefits generated by an intervention [49]. However, when seeking to rebalance the distribution of costs and benefits it is important to recognise that mitigations often create their own trade-offs, as seen in MCZ designations where stakeholder appeasement reduced ecological gains, highlighting how managing trade-offs requires making further trade-offs that need their own assessment of acceptability.

5.3. Restorative justice: redress for harm and loss from trade-offs

Our findings reveal an imbalance in how existing losses from marine developments are addressed, revealing opportunities for decision-making processes to better accommodate redresses of past harms for restorative justice [53].

The contrast between environmental and social compensation mechanisms reveals an important restorative justice gap. While frameworks exist for biodiversity offsetting (although challenges remain) [40], there are no equivalent legal requirements to compensate marine resource users who lose access or livelihoods due to current or past decisions. Lack of social compensation mechanisms has also been found in marine conservation [31], despite international best practice that calls for people to be no worse off due to the implementation of a project [42]. Unlike terrestrial contexts with clear property rights and compensation obligations, marine users have limited legal recourse when displaced. This reflects how unclear rights often leave marine resource users vulnerable to displacement without compensation that might make harms acceptable [8].

Current voluntary compensation approaches, like disruption payments from offshore wind developers to fishers, lack consistency and often undervalue fishing interests [36]. This ad hoc approach contrasts with more systematic frameworks like Australia's Great Barrier Reef Marine Park structural adjustment package that provided comprehensive compensation for affected fishers, though its implementation revealed challenges in designing effective compensation mechanisms [51].

The emerging concept of Marine Net Gain offers potential for more integrated approaches to environmental compensation, whereby developments need to leave the marine environment in a measurably better state than before [26]. Our findings suggest social impacts need equivalent attention and innovative solutions.

6. Conclusion

Trade-offs are an inevitable feature of marine governance, but their assessment and management need not perpetuate existing inequities. By bringing blue justice principles to the fore in marine decision-making, our analysis suggests five priority areas for reform: (1) developing systematic approaches to trade-off assessment that capture the full range of impacts, particularly social dimensions; (2) strengthening mechanisms for meaningful stakeholder participation in trade-off deliberation (addressing representation and power dynamic issues) and transparent and accountable final trade-off decisions at higher levels; (3) identifying transparent thresholds, principles or guidelines for determining unacceptable environmental and social trade-offs; (4) establishing clearer frameworks for both environmental and social compensation when negative impacts cannot be avoided; and (5) moving beyond current piecemeal approaches to develop integrated frameworks that consider cumulative trade-offs.

With increasing competition for marine space and resources, the need to make difficult trade-off choices will only grow. Making blue justice central to how these choices are made offers a pathway to decisions that protect both environmental sustainability and human wellbeing. The experience of England demonstrates both the costs of failing to do so and potential opportunities for positive change.

CRediT authorship contribution statement

Matt Fortnam: Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Liliana Bastian:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **Angela Phan:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation. **Océane Marcone:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation. **Tomas Chaigneau:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Conceptualization. **Susan Kay:** Writing – review & editing. **Sarah Sutcliffe:** Writing – review & editing. **Rachel A Turner:** Writing – review & editing. **Ruby Grantham:** Writing – review & editing. **Aisling Lannin:** Writing – review & editing. **Louisa Evans:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Funding acquisition, Conceptualization.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.marpol.2025.106927.

Data availability

Data not publicly available as there is a risk participants could be identified from transcipts.

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