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**Deliberating the Potential of
Ecosystem Science to Improve
Mainstreaming of Environmental
Priorities Across Marine and Coastal
Policy and Decision-making**

Rachel Holtby

PhD

2023

**Deliberating the Potential of
Ecosystem Science to Improve
Mainstreaming of Environmental
Priorities Across Marine and Coastal
Policy and Decision-making**

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the requirements of the University of
Northumbria at Newcastle for the degree
of Doctor of Philosophy

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Geography and Environmental Science

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Abstract

The marine and coastal environment is in serious decline due to overexploitation and fragmented governance and decision-making. This research examines the potential of ecosystem science (ESc) to improve environmental mainstreaming. Drawing from a review of wider mainstreaming literature, a conceptual framework and narrative characterising mainstreaming within different temporal and dynamic pathways is developed and tested using ESc. This framework reveals that individual ESc concepts alone have limited mainstreaming potential. However, if ESc concepts, such as natural capital, ecosystem services, nature-based solutions, net gain, and ecosystem-based management are considered holistically, involving interdisciplinary and transdisciplinary approaches, there is improved environmental mainstreaming potential. The primary research involved two rounds of one-to-one semi-structured interviews with local and policy participants, and a solution-based interdisciplinary focus group. These collectively illuminated the lived experiences of community, scientific, and political actors. The results show that the shared and connected nature of the environment is further illuminated through ESc helping to capture the value of nature. However, areas of concern emerged relating to language and values, including excessive commodification of nature if governed incorrectly. There was also concern that current governance is disconnected across sectors in siloes and not sufficient to make joined-up decisions about the marine and coastal, and adjoining terrestrial, environments. Therein, this research highlighted the need for improved connection and collaboration roles to address this within new ways of shared working. The results also highlight the need for greater inclusion and engagement in ESc knowledge development and diffusion; collaborative decision-making at smaller local scales, with nested plans supported by the government on larger challenges; and increasing social values to further include diverse perspectives outside of the traditional environmental economics primacy associated with ESc thus far. It is argued, from these results, this would lead to more resilient and more integrated outcomes for society, and the environment.

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Declaration

This thesis and the work to which it refers are the results of my own efforts. Any ideas, data, images or text resulting from the work of others (whether published or unpublished) are fully identified as such within the work and attributed to their originator in the text, reference list or in footnotes. This thesis has not been submitted in whole or in part for any other academic degree or professional qualification. I agree that the University has the right to submit my work to the plagiarism detection service TurnitinUK for originality checks. Whether or not drafts have been so assessed, the University reserves the right to require an electronic version of the final document (as submitted) for assessment as above.

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Acronyms

ALBs – Arm’s Length Bodies

CBD – Convention on Biological Diversity

Defra – The Department for the Environment, Food and Rural Affairs

EBM – Ecosystem-based Management

EcA – Ecosystem Approach

EIP – Environmental Improvement Plan

ES – Ecosystem Services

ESc – Ecosystem Science

ESF – Ecosystem Service Framework

GES – Good Environmental Status

IUCN – International Union for Conservation of Nature

LtG – Limits to Growth

MDGS - Millennium Development Goals

MA - Millennium Ecosystem Assessment

MMO – Marine Management Organisation

mNCEA – Marine Natural Capital Ecosystem Assessment

NbS – Nature-based Solutions

NPPF - National Planning Policy Framework

NC – Natural Capital

NCC – Natural Capital Committee

NCA – Natural Capital Approach

NCEA – Natural Capital Ecosystem Assessment

NERC – Natural Environment Research Council

NG – Net Gain

NGO – Non-governmental Organisation

PPPPs – Policies, plans, programmes, projects

SDG's – Sustainable Development Goals

SES's – Social-Ecological Systems

SMMR – Sustainable Management of Marine Resources (projects)

TEEB – The Economics of Ecosystems and Biodiversity

UKRI – United Kingdom Research Councils

25YEP – The 25 Year Environment Plan

1. Chapter One: Introduction

“The world is a complex, interconnected, finite, ecological-social-psychological-economic system. We treat it as if it were not. We treat it as if it were divisible, separable, simple, and infinite. Our persistent, intractable global problems arise directly from this mismatch” (Meadows, 1982)

This quote from Donella Meadows¹ is now over forty years old, though exposes the existent wicked problem of fragmented governance which makes it problematic for environmental priorities to be mainstream. The quote powerfully illuminates the issues pertinent to this thesis: the prevailing culture of siloed working and mentality, which does not account for the complexity and interconnectedness of ecosystems and the fragmentation of international and national governance that conceals damaging environmental activity amongst bureaucratic layers and power structures (Scott and Holtby et al., 2022).

Initially, this introductory chapter describes the current, degraded ecological conditions in the marine and coastal environment, highlighting why environmental priorities need to be better mainstreamed across all policy and decision-making that affects the marine and coastal space. The chapter then presents the research rationale, aim and research questions followed by an outline of the thesis structure.

The thesis structure describes the unfolding of the research: from the development of the mainstreaming conceptual framework built through in-depth exploration of contributing theories; to an examination of marine and coastal governance and decision-making; to the presentation of established literature on the developmental journey of environmental

¹ An environmental scientist and systems thinker, best known for her ground-breaking work ‘The Limits to Growth’ (1972).

mainstreaming, including protection, sustainable development, and ecosystem science (ESc) concepts². Thereafter, the interpretivist, inductive methodology involving semi-structured interviews with local stakeholders (Marine Pioneer³ study areas), and senior policy stakeholders (Defra and Arm's Length Bodies (ALB's)), and the interdisciplinary focus group, is described. The results of this research then logically follows in sequence, using contents-based narratives; then the discussion of the results in relation to the wider literature and the mainstreaming framework; concluding with the developmental journey to answering the research questions, and recommendations for policy and future research.

1.1. The complex, interconnected, and declining marine and coastal environment

The marine and coastal environment is complex and interconnected on ecological, social, and economic levels (Moore et al., 2001; Fulton et al., 2003; Armitage et al., 2009; Madden and McQuinn, 2015). Arguably it is best viewed as a social-ecological system (SES) (Berkes and Folke, 1998)⁴ championing the linked and holistic 'social' (human) and 'ecological' (biophysical) nature of ecosystems and linked economic and political systems (Ostrom, 2009); each component being equally important, interdependent, and co-evolutionary. Despite the complexity and interconnectedness of SESs on local, national, and international scales, historically, this connection has not been taken into consideration sufficiently within

² Included Natural Capital (NC), Ecosystem Services (ES), the Ecosystem Approach (EcA), Ecosystem-based Management (EbM), the Ecosystem Services Framework (ESF), the Natural Capital Approach (NCA), Nature-based Solutions (NbS), Net Gain (NG). Unpacked and discussed in the literature review chapter 3.7 with definitions presented in table 2.

³ A Defra and Marine Management Organisation, three-year project that tested delivery of the Government's 25 Year Environment Plan (Defra, 2018). Local study areas were Suffolk and North Devon.

⁴ Furthered by other key papers including but not exclusively, Ostrom and Janssen (2004) in relation to governance of SESs; Ostrom (2009) for analysing sustainability of SESs; Bruckmeier (2016) in relation to the ecosystem services within SESs; Folke et al. (2016) in relation to resilience, sustainability and the biosphere; and Berkes (2017) in relation to resilience and collaborative learning within SESs.

governance structures and related policy and decision-making frameworks (Duit et al., 2010; Patterson et al., 2017). Governance is defined here⁵ as:

“The structures and processes by which people in societies make decisions and share power” (Falke et al., 2005: p.444).

Traditionally, governance of marine and coastal areas in many countries and in international waters has been primarily sectoral, with fisheries agencies or departments regulating fisheries catches; environmental agencies dealing with pollution prevention; charities and non-governmental organisations (NGOs) fighting for more protection of marine life; and other specialised agencies regulating shipping, mining, energy, and oil and gas extraction (Soma et al., 2015). The environment and other activities that affect the environment, have been governed by separate legal frameworks (Boyes and Elliott, 2014), with different targets for achievement of different goals (van Tatenhove, 2013; Nobel et al., 2019; Grip and Blomqvist, 2020), which are often broken down into parts that can be manipulated for profit (Merchant, 1980, 2006; Smith, 2010). This is all fuelled by intellectual division through separate academic disciplines, each with their own vocabulary and theoretical champions as a practical way of gaining understanding (Cox, 2019). A systemic siloed mentality has left little room for quantification of cumulative stressors and effects on the environment (Hodgson et al., 2019), where impacts have not been effectively managed in isolation (Vierros, 2017), and where compounded costs to the environment are concealed (Bennett et al., 2021). This is particularly evident in the marine and coastal environment where it is difficult to see damage to ecosystems and food webs until it is almost too late (Murray et al., 2015).

⁵ Governance structures have different definitions, meanings and involvements in different literatures and domains (Van Kersbergen and Van Waarden, 2009). Different governance structures have different implications for mainstreaming and thus, governance is further unpacked in section 2.3.2., and section 3.2.

For centuries humankind has been using the marine and coastal environment as a source of food and natural resources; as a medium for transport and recreation, and as a hidden place to dispose of waste and other unwanted substances (Clarke, 2018). Over the coming years traditional marine and coastal uses will further increase and diversify with expanding industries such as offshore renewable energy (e.g., Draycott et al., 2019), intensive aquaculture (e.g., Tacon, 2020), marine biotechnology (e.g., Rotter et al., 2021), intensive seabed mining (e.g., Levin et al., 2020), desalination (e.g., Elsaid et al., 2020), and ultra-deep infrastructures and technologies (e.g., Singhal et al., 2019); collectively posing significant challenges for sustainable management.

Human activities have had and continue to have significant and widespread impact on habitats from coastal fringes to the deep sea. Only three per cent of the ocean has been described as free from human pressure (IPBES, 2019), and only thirteen per cent of the marine area is considered to be wilderness (Jones et al., 2018). Due to over-exploitation and uncoordinated activities, marine and coastal ecosystems are declining in biomass and biodiversity (MA, 2005; UKNEA, 2011; IPBES, 2019, Dasgupta, 2021), and are experiencing rapid and pervasive changes in species composition, which decreases overall ecosystem health, function, productivity, and growth (Gamfeldt et al., 2015). Commercial fishing is considered to have one of the greatest impacts on biodiversity (IPBES, 2019; Vázquez-Rowe, 2020). Currently, one in three fish stocks assessed are overfished (FAO, 2020), and many fishing practices lead to unintended bycatch of species such as seabirds, cetaceans, and turtles. Bycatch alters population structure and threatens the integrity and resilience of entire marine ecosystems. However, quantifying the global estimates of bycatch in the open ocean remains a challenge due to lack of data on catch mortality and post-release mortality (Ortuño Crespo and Dunn, 2017). Furthermore, illegal, unreported, or unregulated (IUU) fishing represents up to one third of the world's catch (IPBES, 2019), where practices such as shark finning, slaughter as many as 100 million Chondrichthyes per annum (SRI, 2022).

The prevailing narrative suggests that overfishing is driven by too many fishers chasing too few fish, requiring top-down regulatory interventions that reduce fisher access (Finkbeiner et al., 2017). Such interventions are deemed necessary to avoid Hardin's (1968) heavily cited theory of the 'tragedy of the commons' which posits that resource users will individually overharvest their local resource to maximize their own short-term benefit at the expense of the resource and other users. However, Hardin's work fails to adequately account for fundamental issues of power and politics that have inhibited the design and implementation of effective fisheries policy (Finkbeiner et al., 2017). Indeed, Ostrom (2009) finds that some government policies accelerate resource destruction, whereas some resource users have invested their time and energy to achieve sustainability. Typically, small-scale fisheries generate more employment per tonne of landed fish than industrial fleets, as well as less bycatch and discards (Fréon et al., 2014). However, large industrial fleets are allocated more quota as they have the initial capital, social connections, and are considered more productive for the economy due to economies of scale and profitability (Bernauer, 2022). Therefore, political relationships and key decision-makers play significant roles in who benefits and who loses, and at what cost to the marine ecosystems.

Other human impacts that are dramatically affecting the marine and coastal environment come from litter, waste, and toxic pollution, which largely enters the marine system from the terrestrial space. Marine plastic pollution has increased tenfold since 1980, affecting at least 86 per cent of marine turtles, 44 per cent of seabirds and 43 per cent of marine mammals (IPBES, 2022). Additionally, plastic microparticles and nanoparticles are affecting food webs as they are ingested by marine organisms and ultimately by humans (Sharma and Chatterjee, 2017), bioaccumulating through the food chain and causing localised toxicity within human, and non-human cells (Wright and Kelly, 2017). It has been found that coastal waters have high levels of metals and persistent organic pollutants from land-based industrial discharge and agricultural run-off which effects marine biota, including those species of commercial

interest (IPBES, 2019). Fertilizers from agricultural sources exacerbate primary production causing coastal eutrophication, which encourages microbial activity and the consumption of dissolved oxygen in bottom water, leading to dead zones that culminate in mass mortalities (Diaz and Rosenberg, 2008). It was reported in 2008 that seasonal dead zones now affect more than 400 coastal zones (Diaz and Rosenberg, 2008), and an additional 115 sites were added to the list in 2011 (Conley et al., 2011). Furthermore, infrastructure development and transformation of estuarine and coastal areas has accelerated dramatically in recent years, with over 40 per cent of the world's population living close to the coast (Hawkins et al., 2017). Developments relating to industry, urban design, ports and shipping, tourism, and recreation industries leads to multiple and diverse effects through land alteration, increased sedimentation, increased noise, and increased pollutant loads (Evans, 2009; Jefferson et al., 2009). Notwithstanding the toxic construction materials that leach into air and waterways. Increasingly natural materials are preferred by customers and suppliers due to their sustainable credentials, though there is the essential need to limit the production and extraction cost to the environment of the materials (Crocker, 2008).

Marine and coastal ecosystems – such as terrestrial ecosystems – are suffering the effects of anthropogenically induced climate change, which in turn experience feedback loops that further exacerbate each of these highlighted problems (Poloczanska et al., 2016; IPCC, 2022⁶). From the burning of fossil fuels, deforestation, and the conversion of land for agricultural use; elevated greenhouse gas emissions, in particular methane (CH₄) and carbon dioxide (CO₂), in the earth's atmosphere trap the sun's heat energy. The ocean absorbs the excess heat and CO₂, warming the marine and coastal environment and changing ocean chemistry. Data from the National Oceanic and Atmospheric Administration (NOAA) shows that the average global sea surface temperature has increased by approximately 0.13°C per decade over the

⁶ Since their First Assessment Report (1992), The Intergovernmental Panel on Climate Change (IPCC) have released multiple reports supporting this statement.

past 100 years. Since the 1950s, surface warming has shifted marine species, on average, 59 kilometres poleward (IPCC, 2022). Changes in the availability of fish under climate change and associated changes in distribution of interlinked food webs are projected to have substantial ramifications for food security, the economy, and livelihoods of dependent human communities (Sumaila et al., 2019).

Climate models indicate that by the year 2100 mean global ocean temperature is expected to rise between 1 to 4° C (IPCC, 2022). This will cause sea water expansion; thus, sea level is expected to rise by 0.18 to 0.79 metres, and if freshwater ice glaciers and ice sheets also melt, global sea level would rise by more than sixty metres (NASA, 2022). Ocean circulation patterns are expected to be modified and weather patterns are likely to change, resulting in an increase in the severity and frequency of storm events and storm surges (IPCC, 2022). Furthermore, as a result of the absorption of CO₂, seawater pH is in decline, which causes ocean acidification (Solomon et al., 2007). Widespread biological impacts of human-driven ocean acidification have been suggested, ranging from changes in organism physiology and population dynamics to altered communities and ecosystems (Doney et al., 2020). Calcifying species such as corals and shellfish are affected the most; already, live coral cover on reefs has halved in the past 150 years, the decline dramatically accelerating over the past two or three decades (IPBES, 2019). These changes in physical and chemical characteristics are changing the timing of seasonal activities, and the distribution and abundance of fauna and flora, from micro to macro-organisms, with mass population declines and increased risks of species extinctions (IPCC, 2022).

Coastal ecosystems are not able to adapt to the rate of change resulting in further loss of coral reefs, seagrass, kelp, saltmarsh and mangrove habitats and any coastal and terrestrial land below the rising sea levels (IPCC, 2022). This loss of land will have devastating effects for

coastal communities and island nations (Dolan et al., 2006; Jevrejeva et al., 2016), leading to mass human migration (Hauer et al., 2020). There is an enormous body of evidence to suggest the natural environment is reaching tipping points and, in some places, has far surpassed these apices (Carson, 1962; Meadows et al., 1972; Georgescu-Roegen, 1971; Rockström et al., 2009; Lenton, 2013; Botero et al., 2015).

Scientists have been presenting data on human impact and environmental limits for over half a century now. The start of the modern day (>1960's) environmental movement, arguably, was Rachel Carson's book, *Silent Spring* (1962), which described how chemicals like pesticides and insecticides were contaminating the environment. Shortly followed by Meadows et al. (1972) who wrote their book 'Limits to Growth' (LtG), describing the limited rate at which humans can extract resources and emit wastes without exceeding the productive or absorptive capacities of the world. LtG analysed long-term patterns of population and material economic growth, finding that continued growth in the global economy would lead to planetary limits being exceeded most likely resulting in the collapse of the population and economic system. Scientifically, LtG introduced the new computational approach of 'system dynamics' modelling and quantitative scenario analysis into the environmental discipline. By linking the world economy with the environment, it was the first integrated global model (Costanza et al., 2007), showing how everything is connected: challenges cannot be considered in isolation of all other challenges, or opportunities for that matter.

The release of LtG had immediate and ongoing impacts; environmental issues were popularised and had a large impact on creating a worldwide environmental consciousness (Mesarovic and Pestel, 1974). However, the work was widely criticized on its validity and methodological flaws (Sandbach, 1978; Ekersley, 1992; Schoijet, 1999). With counter arguments of technological progress and increased substitutability between production inputs,

presented to oppose concerns of environmental limits or physical scarcity (Solow, 1974; Lomborg and Rubin, 2002). Opinions such as these go some way to explain why environmental action has not been taken up at speed - due to the denial, in some circles, that there is a problem with finite resources running out. Yet, more recent analysis of actual economic and environment trends compared against predictions from LtG, shows that 30 years of historical data confirm key features of LtG's worrying business-as-usual scenario, which results in collapse of the global system midway through the 21st century (Turner, 2008). In his book *The Good Ancestor* (2021), Krznaric identifies three pathways: breakdown, reform, and transformation. Krznaric agrees with Meadows that breakdown is the path of business-as-usual, where humanity continues striving for the old twentieth century goal of material economic progress, soon to reach a point of societal, ecological and institutional collapse. Based on this, Krznaric predicts a likely trajectory of reform, where humanity responds to global crisis in piecemeal and inadequate ways that merely extend the breakdown trajectory. Here, there is a belief that technological solutions will emerge just in the nick of time, and idealised reinventions of current status quo ideals such as reinventing capitalism⁷ dominate the narrative. The third trajectory of transformation sees a radical shift in values from sustainability to regeneration of civilisation, embracing new systems models such as Doughnut Economics (Raworth, 2017), Happy Planet Index (NEF, 2006), and ensuring rights of our ancestors through holistic forecasting and intergenerational justice principles, designing and living in connected systems with long-term mindsets (Krznaric, 2021). The essential need for a transformational long-term thinking path has been legalised in the Well-being of Future Generations Act (2015)⁸, which is currently unique to Wales.

⁷ Explored further in section 3.3. and 3.4

⁸ <https://www.futuregenerations.wales/about-us/future-generations-act/>

It can be seen there are serious issues with the continued decline of the environment, there are also major challenges in the way in which the decline is presented and (mis)managed on international and national scales. This research was carried out to examine these issues and contribute towards deliverable solutions set within the marine and coastal environment. There is urgent need to mainstream environmental priorities across all policy and decision-making that affect the environment to ensure our global system, including environmental and social aspects, does not completely collapse.

The research sets out an enhanced understanding of mainstreaming, as a change process and an improved outcome. This is done by critically reviewing progress in environmental mainstreaming to date, including the environmental protection and sustainable development movements and associated challenges and contradictions to understand how to address complex challenges going forward. As part of this review ecosystem science - a collective body of concepts, tools, and approaches rooted in SES thinking (Scott et al., 2018) that includes Natural Capital (NC), Ecosystem Services (ES), the Ecosystem Approach (EcA), Ecosystem-based Management (EbM), the Ecosystem Services Framework (ESF), the Natural Capital Approach (NCA), Nature-based Solutions (NbS), and Net Gain (NG)⁹ is unpacked. Ecosystem science (ESc) is advanced and their contribution to help environmental mainstreaming within marine and coastal governance and decision-making is deliberated.

⁹ ESc is discussed in the literature review section 3.7., with definitions presented in table 5.

1.2. Rationale, aim, research questions and objectives

Despite the complexity and interconnectedness of SESs on local, national, and international scales, the connections are not yet sufficiently embedded into policy and decision-making frameworks (Duit et al., 2010; Boyes and Elliott, 2014; Patterson et al., 2017). The marine and coastal environment is overexploited and declining in biodiversity and biomass (MA, 2005; UKNEA, 2011; IPBES, 2019, 2022; Dasgupta, 2021). However, there is intensification and diversification of activities within and outwith the blue economy (e.g., Draycott et al., 2019; Singhal et al., 2019; Elsaid et al., 2020; Levin et al., 2020; Tacon, 2020; Rotter et al., 2021). There needs to be a way to ensure environmental priorities achieve higher consideration at the forefront of all policy and decision-making that affects the marine and coastal environment, to ensure a stable and healthy place to live, and that diverse actors and organisations can collaborate around these complex issues.

As part of SES thinking, this thesis examines how ecosystem science (ESc) concepts might have the potential to improve mainstreaming of environmental priorities (Scott and Holtby et al., 2021). Hence, the aim of this research is to:

Investigate ESc concepts and their role in mainstreaming environmental priorities across the marine and coastal governance and decision-making system.

Two research questions and corresponding objectives will be answered in this thesis:

1. What is mainstreaming, and why should environmental priorities be mainstreamed into marine and coastal governance and decision-making?

- 1.1. Synthesise mainstreaming theory to develop a mainstreaming conceptual framework.
- 1.2. Establish marine and coastal environmental issues to identify advancements and challenges in mainstreaming environmental priorities.
- 1.3. Develop advanced understanding (through a literature review, interviews and focus group) of marine and coastal governance and decision-making, including marine [spatial]¹⁰ planning, to understand the enabling environment.

2. What is ESc, and how can ESc concepts mainstream environmental priorities into governance and decision-making?

- 2.1. Assess ESc literature, highlight individual concepts and establish evidence of any individual or collective advantage.
- 2.2. Gain intelligence (through interviews and focus group) from marine and coastal stakeholders on their views of ESc concepts, and their views on ESc concepts to mainstream environmental priorities.

¹⁰ Marine spatial planning is an emerging way of governing and managing marine activities. The spatial nature is not always applied. This is unpacked first in section 3.2.

- 2.3. Gain intelligence (through interviews and focus group) from marine and coastal stakeholders on their views of opportunities and/or challenges to mainstreaming ESc.
- 2.4. Based on the wider literature and supported by research outcomes, utilise the mainstreaming framework to assess ESc concepts.

1.3. Thesis structure

Presented below is the structure of the thesis, as it follows on from this current Chapter One Introduction:

Chapter Two - Mainstreaming theory and conceptual framework

In this chapter mainstreaming literature is reviewed and contributing theoretical insights from the wider literature are highlighted to build an inclusive mainstreaming narrative, highlighting the active process of mainstreaming agendas, and the antithesis of apathy necessary for systems change. Thereafter, a mainstreaming conceptual framework is developed and presented, which could be applied to any mainstreaming endeavour. This framework is applied in the discussion chapter (6) to evaluate and assess the role of ESc in elevating the importance and concern for environmental priorities within wider (non-environmental¹¹) sectors and organisations.

¹¹ A non-environmental sector is defined (by the researcher) as an industry or organisation that carries out daily activities largely irrespective of environmental impact – be that in a local area or through a global inter-regional connectedness.

Chapter Three - Marine and coastal governance, advancements and challenges for mainstreaming environmental priorities

In this chapter literature on governance is reviewed with a particular focus on how the environment is considered and treated. This provides the setting and inherent institutional propensities that proliferate the challenges for mainstreaming the environment. These challenges are critically assessed with attention on the role of capitalism and neoliberalism in the demise of natural resources and contribution to fragmented governance. Thereafter, the literature review addresses developments and contradictions in environmental policy, including the protection and conservation movement, sustainable development intentions and realities. Finally, ESc concepts are unpacked and critically reviewed.

Chapter Four – Methodology

This chapter presents the research philosophy, which follows an interpretivist paradigm that has a relativist ontology and subjectivist epistemology. The consequential methodology involved two rounds of one to one, semi-structured interviews, initially with local stakeholders and then policy stakeholders, and thereafter an interdisciplinary focus group. This qualitative research was inductive, where research outcomes emerged through dialogue with participants and researcher analysis. It was also deliberative, where each round of research built upon the themes and outcomes of the previous round. The pathway - from local to policy to interdisciplinary - was purposeful to the research design. Firstly, to gain understanding of lived experience and local knowledge; secondly to gain understanding of practicalities from a scientific and political perspective, and lastly, to ensure multiple perspectives and knowledge exchange between different groups of people in a solutions-based focus group.

Also detailed in this section is the researcher embedded industry experience within the Marine Management Organisation (MMO) to advance understanding of marine and coastal policy and

decision-making process and enable improved interpretations of the results¹². This invaluable experience shaped thoughts and ideas, while also providing links and contacts for the primary research.

Chapter Five – Results

This chapter presents the results from the two rounds of semi-structured interviews, which were combined to highlight similarities and differences between local stakeholder and policy stakeholder perspectives. Thereafter, the interdisciplinary focus group results are presented. The results used a simple thematic contents analysis structure involving a narrative drawing on quotes to help unpack the key themes.

Chapter Six – Discussion

This chapter discusses the priority results from the semi-structured interviews and focus group alongside the wider literature. The chapter addresses the disintegrated governance challenge and highlights the essential nature of inclusion and engagement. Planning and delivery at different scales is discussed. Lastly, the mainstreaming framework is applied to ESc.

Chapter Seven - Conclusions and recommendations.

This chapter concludes by answering the research questions and provides key policy and practice recommendations, as well as actions for future research. It was found that environmental priorities need to be mainstreamed and ESc has potential. Recommendations centre around framing ESc as an interdisciplinary/transdisciplinary discipline with the interlinking concepts of NC, ES, NbS, NG and EBM. An open access data repository for ESc

¹² Alongside this research, in the final year, the researcher also held a part-time role as a Marine Consultant, therefore, experience was gained in academia, policy and practice.

evidence and monitoring, and regulatory support to promote restoration and enhancement of nature, using inclusive and holistic ESc methods within nested plans. Lastly, connecting roles to join-up the governance and decision-making system within and outwith the nested plans are a key finding. Thus, it is concluded that connecting roles are trialled in nested ESc pilot projects.

2. Chapter Two: Mainstreaming Theory and Conceptual Framework

“Revolutions rise after two trends, said Mr Eno; “firstly, when everyone realises something is wrong, and secondly, when everyone realises that everyone else has realised” (Imperial College London, 2022: p.1)

2.1. Introduction

In this chapter mainstreaming literature is presented, and a conceptual theory is developed. Initially, key literatures that characterise mainstreaming as a process and an outcome are reviewed. Thereafter, contributing theoretical insights from the wider literature are highlighted to build an inclusive narrative. It was found that the way in which knowledge is developed and exchanged, what is prioritised and how actors are incentivised, as well as the governance and enabling environment to support the change process, are key factors. Lastly, building on prior components, a mainstreaming conceptual framework is developed and presented, which could be applied to any mainstreaming endeavour.

2.2. Mainstreaming as an opportunity

As described in the introductory chapter, the marine and coastal environment is in significant decline (MA, 2005; UKNEA, 2011; IPBES, 2019, 2022; Dasgupta, 2021). One response is to call for improved mainstreaming of the environment across the marine and coastal system. Developed alongside this doctoral research was a paper entitled ‘Mainstreaming the

Environment: Exploring pathways and narratives to improve the environment' (Scott and Holtby et al., 2022). Therefore, throughout the thesis, in particular this section, there is cross-over of narrative and ideas with this paper.

The need to mainstream the environment emanates from an increasing acceptance that to tackle the challenge of environmental deterioration, environment-sector approaches alone are not enough. As Bruckmeier (2016: p.1) states *“the complexity of global social and environmental change is insufficiently understood in specialised disciplinary research and environmental policies”*. Instead of single sector approaches, there is a need for multidisciplinary¹³, interdisciplinary¹⁴ and transdisciplinary¹⁵ approaches, where traditional policy and disciplinary silos are broken down to pursue interventions that are beneficial for the environment as well as multiple involved actors and organisations that are within and outside conventional environmental domains (Scott and Holtby et al., 2022). To normalise the concept (of environmental priorities), from one policy domain (the environment sector) into the decision-making and routine activities of other policy domains (e.g., the extractive, industrial, infrastructure, energy, transport, tourism and recreational sectors).

According to Karlsson-Vinkhuyzen et al. (2017: p.145) mainstreaming is a developmental journey of an idea, innovation or knowledge from one disciplinary or policy domain through its subsequent embedding into other disciplinary or policy domains where it has not yet been normalised in practice or behaviours. Mainstreaming *“involves taking a specific objective of*

¹³ Multidisciplinary projects include partnerships from multiple sectors or backgrounds

¹⁴ Interdisciplinary research takes place in the overlapping areas between various disciplines, where the research questions are presented (Jahn, 2012), and aims to integrate knowledge and methods from the different disciplines to synthesise and harmonise connections into an intelligible whole (Stember, 1991; Max-Neef, 2005).

¹⁵ Transdisciplinary research transcends boundaries and involves numerous disciplinary perspectives, as well as epistemologies, and methodologies. This includes social and natural scientist, stakeholders and non-scientists (Hadorn, 2008). Transdisciplinary research aims to facilitate longer lasting and desired outcomes by asking the big questions from the offset, and drawing together a knowledge democracy that is influenced and accepted by related parties, so that both dominant and non-dominant actors have equal access and ability to put intelligence forward in the process of solving societal problems to then produce levels of working and insight that can be described in new and different ways (Max-Neef, 2004; Bruckmeier 2016).

one issue domain and declaring that this objective should be integrated into other issue domains where it is not sufficiently addressed". Environmental mainstreaming demands *"...the informed inclusion of relevant environmental and climate change concerns into the decisions of institutions that drive national, local and sectoral development policy, plans, rules, investment and action"* (Dalal-Clayton and Bass, 2009: p.11), so that environment priorities are at the forefront of policy and decision-making across all sectors. 'Main' implies dominance, whilst 'stream' has an aquatic derivation that evokes fluidity and flow (Picciotto, 2002). Consequently, mainstreaming indicates a dynamic, directional movement of an idea, knowledge, or concept into new domains where it may be required and/or beneficial (Petersen and Huntley, 2005).

Mainstreaming is both a process and outcome (Scott et al., 2018). As a process, mechanisms for mainstreaming include developing formal governance frameworks and informal collaborative networks around the policy priority; understanding power dynamics and key gatekeepers, where there is push and pull and how this can be managed to align with the policy priority; inclusion and engagement of affected actors and organisations early in the process; building shared values; managing change of individuals and organisations; and recognising possible need for incentives or compensations (Scott and Holtby et al., 2021). As an outcome, wider policy domains prioritise the environment with improved collective accountability and responsibility; where diverse groups are able to design and deliver more holistic responses to cross-cutting environmental policy priorities (Cowling et al., 2008). Thus, the additionality of mainstreaming is to improve the diagnostics and interventions in dealing with global challenges through improved holistic and participatory approaches (Leach et al., 2019; Sevinc et al., 2020; Scott and Holtby et al; 2022). This helps secure more effective solutions for a given priority that is currently misunderstood, underappreciated, challenged or resisted in other policy sectors (Cowling et al., 2008; Nunan et al., 2012). This additionality is secured through the realisation of mutual benefits; reduced duplication, reduced contradiction

and reduced disintegration in policy on the one hand and increased innovation, increased long-term resilience, and increased resource efficiency on the other (Adger et al., 2005; Scott et al., 2013; Runhaar et al., 2014). Furthermore, mainstreaming can bring people together to exploit opportunities for social learning within well managed participatory processes (Seyfang and Smith, 2007).

Mainstreaming is commonly encountered in diverse fields of human rights (e.g. Lee, 1993), feminism (e.g. Daly, 2005), gender (e.g. Walby, 2005), inclusion (e.g. Scruggs and Mastropieri, 1996), disability rights (e.g. Priestley and Roulstone, 2009), poverty eradication (e.g. de Coninck, 2009), education (e.g. Lindsay, 2007) and environment (e.g. Cowling et al., 2008; Nunan et al., 2012; Karlsson-Vinkhuyzen et al., 2017; Scott and Holtby et al., 2022). Mainstreaming aspirations have been adopted internationally and nationally as a key approach to addressing environmental concerns and promoting opportunities in national plans and strategies, as well as in sectoral policies and plans (Nunan et al., 2012). However, progress and actions towards environmental mainstreaming have been disappointing in both international and national contexts (Scott, 2019), as evidenced through the continued decline of the environment (as discussed in section 1.1.), suggesting that mainstreaming agendas have experienced, and continue to experience, significant barriers in practice.

The direction and progress of mainstreaming pathways will be affected by the potency of hooks, for example: information, incentives, and regulations; and barriers, for example: lack of information or guidance, gatekeepers, political actions, and disjointed / contradictory governance (Karlsson-Vinkhuyzen et al. 2017; Candel, 2018; Russel et al., 2018; Scott et al. 2018; Runhaar et al 2020). However, depending on planning, delivery and evaluation there is chance for hooks to become barriers and vice versa. For example, regulation can restrict positive impact projects for the environment, such as novel restoration projects (McLeod et

al., 2018; Shumway et al., 2021), where, for example, the current marine licence system can hinder progress (Zu Ermgassen et al., 2020). Any new concept, policy, plan, programme, or project (PPPP) needs to have sufficient credibility to persuade enough people to sign up to it or, indeed, deliver it as part of policy or decision-making. Thus, knowledge and evidence diffusion, how it is generated, and how it is used becomes key (Scott et al., 2018).

Brouwer et al. (2013) argue that the term mainstreaming has been used and defined uncritically and that empirical knowledge of how it works in practice remains scarce, lacking sufficient evidence of what success looks like (see also Cowling, 2005; Scott et al., 2018; Runhaar et al., 2020). Brouwer et al. (2013: p.137) state “*any attempt at measuring mainstreaming is compromised by the absence of a sound theoretical foundation on which to evaluate adaptation mainstreaming in terms of ultimate outcomes*” (see also Persson and Klein, 2009). Thus, this chapter further examines mainstreaming contributions to build a sound theoretical foundation.

2.3. Contributing theories to the mainstreaming discourse

Diffusion of Innovation can help us better understand mainstreaming as a journey or route map, proceeding in pathways through a wider policy ecosystem (Rogers et al., 2003; Scott et al., 2018). According to Rogers (2003), as new ideas are invented, they progress through five key stages: knowledge/evidence/information generation; persuasion; decision (adoption/rejection); implementation; and confirmation. Progress is never linear, however, and can be reversed leading to failure. Here, the effectiveness of the communication channels, receptiveness of key gatekeepers and stakeholders and the nature of change within the knowledge/innovation itself, all become interlinked features. Conceptual knowledge

broadens and deepens understanding, shapes thinking, and enables people to develop new beliefs and values; and strategic knowledge is used to promote a specific intervention or policy option or justify previously held beliefs and values. Scott et al. (2018), and Scott (2020) have adapted diffusion thinking featuring progressive stages from retrofit to incremental to whole system change based on capacity, capability, and pragmatism to the 'degree of mainstreaming' possible.

Similarly, Meadows (2009), advanced by Abson et al. (2017) and Chan et al. (2020) propose the concept of **Leverage Points** to distinguish between shallower and deeper sustainability interventions, which can be adapted to a degree of mainstreaming spectrum. Deeper interventions are more value-based and demand more upfront investment, given their emphasis on collaborative working, coproduction, and knowledge exchange (see also Cowling et al., 2008). But overall, they deliver greater resilience through promoting long-term behaviour change at a systemic level, and stronger mainstreaming. In contrast, shallow interventions, like taxes, are relatively easy and quick to employ, though they will only achieve minor changes without necessarily generating long term behaviour or system change. Indeed, they can build resentment and alienation (Scott and Holtby et al., 2022). Deeper interventions are in line with Krznaric's (2021) transformational trajectory, whilst shallower interventions are more in line with the reform trajectory, hence delaying but inevitably leading to breakdown (as presented in section 1.1).

According to Lewin's (1951) **Three Step Change Theory**, the first step in the process of changing behaviour is to unfreeze the existing situation or status quo, through increasing the driving forces that direct behaviour away from the existing situation and/or decreasing the restraining forces that negatively affect the movement from the existing equilibrium. Lewin's second step in the process of changing behaviour is movement through persuasion that the

status quo is not beneficial, working together towards something new, and connecting the views of the group to well-respected, powerful leaders that also support the change. Thirdly, Lewin states there is a need to refreeze to stabilise and sustain the new. Later, Lippitt and Watson (1958) add additional steps that focus on the role of the change agent. They point out that changes are more likely to be stable if they spread to neighbouring systems.

Kuhn's (1962) ***Structure of Scientific Revolutions*** essay on change helps us to better understand the dynamics of a contested change process. Where there is no consensus on a particular subject, competing schools of thought develop, each with their respective champions until there is sufficient traction for change. Any change is managed incrementally within the existing paradigm in keeping with Curry's (1993) ***fallacy of creeping incrementalism***. However, at some stage more tenacious problems or anomalies may be exposed which increasingly challenge the existing paradigm resulting in the potential for more significant change; a crisis and/or leading to a tipping point, essentially leading to a new paradigm; outcomes being dependent on the viability of any alternatives presented (Kuhn, 1962), and movement/lack of movement of hegemonic power structures.

Innovation and change, often require active disturbance; particularly if change is demanded from grassroots levels where diffusion through top-down policy is not an option. Challenging the status quo necessarily requires disruption (Christensen, 2013), revolution (Rebellion, 2019), activism (Gunningham, 2019), and "good" troublemaking (Jones, 2021) with a view to socially construct the properties of the world, rather than inheriting them (Kukla, 2013). These views highlight the active process of certain mainstreaming agendas, and the antithesis of apathy necessary for systems change.

Agenda setting relates to a theory about how the agendas of the mass media are transferred to public agendas with subsequent impacts on opinions and behaviours (McCombs and Shaw, 1972). According to the agenda-setting hypothesis, the media influence public priorities more than they mirror them (Ader, 1995). Particularly unobtrusive issues with which individuals rely on the media as the primary source of information, demonstrate a strong agenda-setting effect (Zucker, 1978). The environment is one such issue. When the mass-media(s) emphasise a topic, the audience receiving the message will consider this topic to be important (Cohen, 1963; McCombs and Shaw, 1972). Conversely, when mass medias downplay, oppose, or do not give space for a topic, general publics do not realise the magnitude of the issue, as has been seen in the environmental discourse (McCombs and Valenzuela, 2020). Political scientists draw on this to explain how political actors determine their priorities and do, or do not take decisions or a stance concerning these topics (Cobb and Elder, 1971; Kingdon and Stano, 1984). When setting agenda's, politicians will avoid taking decisions that could damage them politically. They tend to focus on societal issues for which they receive immediate credits (Biesbroek et al., 2009). If an issue is not part of the political agenda, limited or no resources are made available, however if politicians are committed to an issue, it leads to the provision of additional resources. In this this way 'political agenda setting' implies a dedicated approach with clear policy objectives and resource allocation (Uittenbroek et al., 2014). An issue can be framed as a problem or a solution; as a main objective or an added value (Rochefort and Cobb, 1993). For example, climate adaptation can be considered as a problem that requires investment or can be framed as an opportunity for sustaining safe and attractive places. In that sense environmental issues may be framed as solutions to other societal problems or as adding value to existing political objectives. As a result of indirect political commitment, implementation is erratic but deliberate, and under this theory, institutional entrepreneurs continuously need to reframe the mainstreaming concept to fit the objectives of a policy domain (Uittenbroek et al., 2014).

We live in a dynamic, evolutionary world of 'becoming' rather than a stable, predictable world of 'being' (Boulton, 2015). There are multiple factors at play with any mainstreaming agenda. A **Complex Systems Paradigm** highlights a framework (French and Lowe, 2018), through which to manage and govern for mainstreaming objectives, where a rationalist model engages with Complexity Theory. This change-framework aims to respond to the conditions of complexity and thus the mainstreaming process, by assisting in decision-making in non-linear, uncertain environments that experience periods of both gradual and rapid change (Folke, 2006). Outlined on a sense-and-respond basis (Kurtz and Snowden, 2003), as learning in complex systems is realised through reactions (Sterman, 1994). A cyclical process that analyses adaptive capacity, dynamic ability, and multi-level learning, with a feedback loop's between situation and outcomes (Pahl-Wostl, 2009; French and Lowe, 2018). Learning is presumed to be an exploratory, iterative process, where players trial with innovation until they meet constraints and new boundaries.

This type of **Participatory Learning and Action**¹⁶ (PLA) method emphasises a number of phases and steps that should be undertaken to achieve mainstreaming objectives (Veitayaki et al., 2003), and can guide initiation of a new concept and the practice of managing change in organisations. Through this lens what becomes 'mainstreamed' may well be unrecognisable from the original intentions of those seeking to mainstream, though may be more acceptable to a wider audience. The initial knowledge moves through the channels of a complex SES, interacting with the elements and actors of the system and in doing so, is continuously changing, so that the object that may become mainstream may be different to the original concept, objective, or item of knowledge. The knowledge, when it is applied to

¹⁶ The PLA method emphasises a number of phases and steps that should be undertaken. First, training of topic, thereafter fieldwork is emphasised because the work should be set in a context. Then, analysis of data is important to illustrate the significance of information and data gathered from the participants at is directly related to the discussion. Lastly, follow-up is critical because the participants need to be shown that the method is responsive to their needs (Veitayaki et al., 2003).

other domains, finds itself being portrayed in new and more relevant ways to that particular domain. In this sense, rather than attempting to understand the causes of behaviour, existing behaviours are taken as read and then barriers to change are identified with bespoke incentives then designed to tackle them.

More recent schools of thought have delved deeper into the causes for behaviour change, honouring the complex nature of psychology and sociological factors in decision-making to enable behaviour change based on core values (Pérez and Simon, 2017). For example, the ***Heartwired Guide*** (Pérez and Simon, 2017) details a strategy for change-makers based on human behaviour, as, it is within human societies and constructs that any mainstreaming objective is occurring. The Heartwired theory builds on the recent advances in neurological sciences that describes the set of 'hardwired' connections and circuits within the brain that processes primal reactions, emotions, and logic, which influences decision-making - to conceptualise further, the way that attitudes and behaviours are shaped (Pérez and Simon, 2017). Such as there is a complex network of circuits that wire individuals brains, there is also a complex psycho-social circuit that connects people's values, beliefs, identity and lived experiences – which significantly influences decision-making (March, 1994; Rangel et al., 2008). Cognitions of right and wrong are not enough to explain or predict decision-making behaviour, additional individual and situational variables interact with cognition to determine how an individual is likely to behave (Trevino, 1986).

The Heartwired approach asks what is the change to be seen? What is the current landscape on which the agenda is to be mainstreamed? What is the mind-set of the audience you need to persuade? How do you translate this understanding of your target audience to develop effective persuasion strategies? (Pérez and Simon, 2017). Decisions are moreover based on feelings than facts: what is valued will drive action (Imperial College London, 2022).

Therefore, understanding shared values can bring together diverse groups to commune around shared environmental priority outcomes (McKinley et al., 2019; Kenter and O'Connor, 2022), to entice behaviour change towards shared priority outcomes (Benson et al., 2014; Cowling et al., 2008; Russel et al., 2018; Scott et al., 2018), supported by leadership and capacity building (Jordan and Lenschow, 2010), for effective knowledge development, transfer and uptake (Berkes and Folkes, 1992; Reed, 2008).

There are similarities with **Social Cognitive Theory**, which says that individuals learn by direct experiences, human dialogue and interaction, and observation. Social learning theory, later renamed social cognitive theory, proposes that behaviour change is affected by environmental influences, personal factors, and attributes of the behaviour itself (Robbins and Judge, 2009). The individual must possess self-efficacy, they must believe in their own capability to perform the behaviour and they must perceive that there is an incentive to do so (Robbins and Judge, 2009).

Combined, these theories speak to the multi-faceted process of mainstreaming. It can be seen throughout that there are the important factors of having/developing the information/knowledge to show why change is necessary; having/developing the incentive to want the change; and having/developing the capacity to make the change, instil the change and sustain the change across a complex and connected system, so that the new information and ways of working/existing is then mainstream. Though again, this is not linear as, for example, there must be both the capacity and incentive to generate information, and the information and capacity to create the incentive: whether the change process is instigated by governments, academics, or grass-roots organisations, or better still, a combination of all, as now further unpacked.

2.3.1. Developing and exchanging knowledge – modes of collaboration

Effective collaboration and stakeholder engagement is a necessary but often overlooked component in successful mainstreaming processes (Cowling et al. 2008; Fish and Saratsi, 2015). It helps build trust and confidence that interventions will be fair and transparent (De Vente et al., 2016); can assist knowledge generation and transfer, and social learning (Blackstock et al., 2007); and can enable new concepts to be better adopted, ultimately enhancing the rate of diffusion (e.g., Rogers, 2003 and Scott et al., 2018; Scott, 2020). For this reason, stakeholder participation in environmental decision-making has been increasingly sought and embedded into national and international policy. Although many benefits have been claimed for participation (e.g., Arnstein, 1969; Burden et al., 2019; Morf et al., 2019), disillusionment has grown amongst practitioners and stakeholders who have felt let down when these claims are not realised (Reed, 2008).

Consideration of environmental priorities is encumbered by a complex neoliberal¹⁷ silo mentality where different sectors develop their own paradigms and vocabularies, hindering cross-fertilisation of core ideas (Leach et al., 2019; Scott et al., 2013). This is not helped when environmental policy is often weakly worded as exposed by McWilliam et al. (2015) and Hislop et al. (2019) enabling conflicting interests to trump environmental interests more readily in practice. Therefore, collaboration aims to address institutional barriers with the creation of common language, agreed terms of reference, and shared understanding of issues and solutions (Scott et al., 2018).

¹⁷ Examined further in section 3.3 and 3.4.

For successful outcomes it is important to frame the environmental challenge inclusively, particularly dealing with issues of jargon (Fish and Saratsi 2015). As Cowling et al. (2008: p.9483) suggest this “*is achieved primarily through behaviour change*”, which focuses attention on how effectively science is generated, translated, and communicated to policy and publics (e.g., hooks), and how it is framed (e.g., agenda setting) and understood. However, Stoll-Kleeman (2019) highlight that generating awareness alone for protecting the marine environment rarely produces behaviour change due to social dissonance and moral disengagement. Therefore, ‘ocean literacy’, beyond basic knowledge of something, aims to also consider internal and external factors (Stoll-Kleeman, 2019), that are crucial for behaviour change. Drawing on existing research, and parallel and supporting concepts (e.g., marine citizenship, ocean connectedness, and public perceptions research), McKinley et al. (2023) proposes ten dimensions of ocean literacy, which develop from a knowledge-centric model to one which draws on and fosters active participation, connection, and engagement from a diversity of audiences across society (McKinley and Burdon, 2020). The key elements of ocean literacy are knowledge, awareness, communication, behaviour, attitudes, activism, emotional connection, access and experience, adaptive capacity, and trust and transparency. McKinley et al. (2023) recommends expanding previously recognised dimensions, in a bid to ensure that ocean literacy encompasses diverse knowledges, values and experiences in participatory processes. In that sense, the concept of ocean literacy reflects both public understanding, connection to, and behaviour towards the marine environment. Through highlighting connection to the marine and coastal environment ocean literacy has the potential to catalyse the behaviour changes needed for achieving a sustainable future (Kelly et al., 2021).

That said, typically, there are varying degrees to which engagement can, and is allowed to, occur (Arnstein, 1969). Often there is concern that engagement is a politically motivated and controlled process enabling only powerful and influential voices to be heard and acted upon

(Cooke and Kothari, 2001). Rather than seeing engagement as a panacea, understanding its limitations is key to understanding why certain change is resisted (Beierle and Koninsky, 2001). However, early inclusion of those stakeholders who the policy will affect, as well as the policymakers, in a people centred approach (Zuniga-Teran et al., 2020), increases the championing of social learning, knowledge exchange, and development of new relationships and ways of thinking and doing as core ingredients, and can increase the likelihood that decisions are holistic, fair and lasting (Nylen, 2002; Richards et al., 2004). Smoliner et al. (2001: p.263) writes *“the conventional rules of how science works, transmitted over many years, are now being questioned by society. The roof of the tower has been removed, and the solid stonework of the walls is coming apart. The rooms of scientific theory, organization, and research practice, previously accessible only to experts, are now exposed to the eyes of a curious public. As a result, new space for action is opening up: space for novel forms of communication, cooperation and conflict settlement”*.

In natural resource management, authors such as Sundblad et al. (2014) provide a typology of stakeholders based on individuals or organisations that: directly exploit or use the resource (direct stakeholders); influence by using products or services (indirect stakeholders); influence through supply chains (supporting stakeholders); or policymakers, individuals or organisations responsible for managing the regulatory framework (governance stakeholders); and individuals or organisations that influence how the resource is used and/or managed (influence stakeholders). Different types of stakeholders are found across different sectors and influence the resource in multiple ways. Therefore, participatory processes including different types of stakeholders should be used to support mainstreaming endeavours (Tress et al., 2005; Scott et al., 2013), where both dominant and non-dominant actors have equal access and ability to put intelligence forward in the process of solving societal problems (Bunders et al., 2010) to then produce additional levels of working and insight (Costanza, 1991). Reed et al. (2018) developed a typology of stakeholder and public engagement based on agency (who initiates

and leads engagement) and mode of engagement (from communication to coproduction). Reed et al. explain the variation in outcomes from different types of engagement, stating that: a number of socioeconomic, cultural, and institutional contextual factors influence the outcomes of engagement; there are a number of process design factors that can increase the likelihood that engagement leads to desired outcomes, across a wide range of sociocultural, political, economic, and biophysical contexts; the effectiveness of engagement is significantly influenced by power dynamics, the values of participants, and their epistemologies; and, engagement processes work differently and can lead to different outcomes when they operate over different spatial and temporal scales.

The different methods of disciplinary work, as shown diagrammatically in Figure 1, are all methods of co-production to achieve varying change outcomes, depending on varying levels of input. Current research and practice rarely move beyond multidisciplinary perspectives (Scott et al., 2013), where actors may draw on others information and expertise whilst continuing to reside within their own boundaries (Jahn, 2008). Cross disciplinary work views one discipline from the perspective of another (Stember, 1991). Interdisciplinary research takes place in the overlapping areas between various disciplines from the start, where the research questions are presented (Jahn, 2008), and aims to integrate knowledge and methods from the different disciplines to synthesise and harmonise connections into an intelligible whole (Stember, 1991; Max-Neef, 2005).

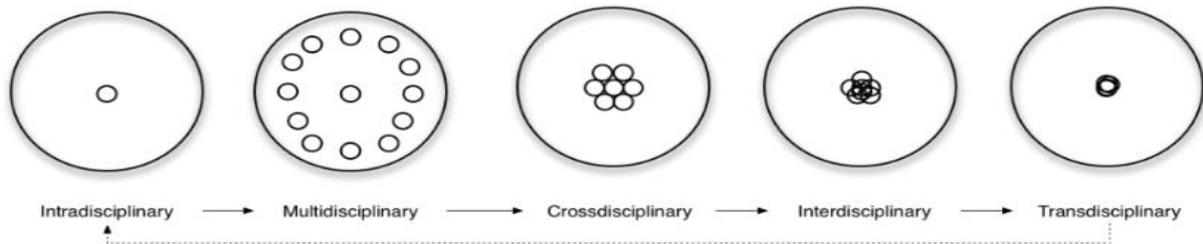


Figure 1. Disciplinary's: intra, cross, multi, inter, trans (Refsum Jensenius, 2012).

Further to this, transdisciplinary research transcends boundaries and involves numerous disciplinary perspectives, as well as epistemologies, and methodologies. This can include social and natural scientists, arts and humanities, policy professionals, citizens, stakeholders and non-scientists across different sectors (Gallopín et al., 2001; Hadorn, 2002). Transdisciplinary research aims to facilitate longer lasting and desired outcomes by asking the big questions from the offset, and drawing together a knowledge democracy that is influenced and accepted by related parties (Bundlers et al., 2010), to then produce levels of working and insight that can be described in new and different ways that are more widely acceptable (Costanza, 1991; Max-Neef, 2004; Bruckmeier 2016).

Transdisciplinary research is a process of complex, systemic problem solving and mutual social learning between and among organisations, stakeholders and researchers (Hadorn et al., 2002). Its legacy component thus becomes important in building lasting results for the wider system beyond the initial project work. Here, the new organisational cultures and structures, together with new partnerships and way of working, provide the core mainstreaming outcomes. However, as Hardin (1998: p.1) expressed *“it is easy to call for interdisciplinary syntheses, but will anyone respond? Scientists know how to train the young in narrowly focused work; but how do you teach people to stitch together established specialties that perhaps should not have been separated in the first place?”*. Indeed, Cowling et al. (2008) recognise this is a tricky and uncertain process that takes time to achieve, and

Jahn et al. (2012) comment that despite its increasing popularity, transdisciplinarity is far from academically established as funding practices do not effectively support it. Therefore, incentives to work in such ways become important (Smoliner et al., 2001); indeed, incentives form a major role in mainstreaming more broadly.

2.3.2. Incentives, motivations and values

Incentives are an important element of the enabling environment as they induce/nudge desired behaviour change (Cooke et al., 2011). They can be external and internal, which are different in their manner of motivation (Olubunmi et al., 2016). The main characteristic of external incentives are conditions or requirements that must be fulfilled by beneficiaries. This is also because external incentives are often provided by the government – who must ensure that due process is followed. Gagné and Deci (2005) label this ‘controlling motivation’, where people act with the intention of obtaining a desired consequence or avoiding an undesired one, so they are energised into action only when the action is instrumental to those ends.

Often these are financial incentives that include grants, tax incentives, or discounts (Olubunmi et al., 2016). Mechanisms may also be referred to as ‘market-based instruments’ because they often rely on price signals like those in private markets (Jack et al., 2008), such as user fees, subsidies, and payment for permits (Stavins, 2003), Environmental Impact Bonds, Habitat Banking (Santos et al., 2015), and Payments for Ecosystem Services¹⁸ (PES) models (e.g., Reed et al., 2013). Financial incentive-based mechanisms target local providers who have lower opportunity costs. Here, the purpose of the incentive is to ensure the economic

¹⁸ Ecosystem services are unpacked in section 3.7.

benefits of conserving the natural resource, are greater than using that resource in the first instance (Pearce and Moran, 2013). Non-financial, external incentives include, for example, additional rights, assistance in planning and development, or regulatory relief (Olubunmi et al., 2016).

Another form of incentive is provided through market-based organisations, which have created non–state-market–driven systems to develop and implement environmentally and socially responsible practices. These systems use the market’s supply chain to bring awareness to the end user through eco-labelling and societal expectations (Dangelico and Pujari, 2010), which forces companies to comply with industry standards. For example, sustainable forestry certification ‘FSC’ is arguably the most advanced case globally, while other examples can be seen in the Marine Stewardship Council ‘MSC’ certified fish to eat (e.g., Everard, 2009). Other important market incentives include codes of conduct (e.g., Somers, 2001), certification methods, corporate social responsibility (e.g., Schwartze, 2017), and praise and support for demonstration projects (e.g., Femenias, 2004). To this end, financial markets control, to an extent, the enabling circumstances for environmental mainstreaming as they engage business and investment communities (Castro, 2005).

These ‘societal levers’ have progressively institutionalised evolving societal values, influencing markets and other choices (Everard et al., 2016). The values that are incorporated into markets reflect a legacy of societal choices, however, the subset of values that are internalised tend to reflect those related to short-term wealth generation rather than the long-term integrity, equity, and resilience of supportive ecosystems. Economic and political decisions predominantly prioritise market-based values of nature, however, they do not adequately reflect how changes in nature affect people’s quality of life (IPBES, 2022). External mechanisms are therefore necessary to progressively internalise emergent environmental and

societal values into the market and other drivers of mainstream societal norms (Everard et al., 2016).

Values theories suggest that choices about pro-environmental behaviours are driven by personal norms (e.g., internalised ways of acting that the individual feels obliged to maintain to avoid negative consequences) and personal values (e.g., altruistic versus egoistic values) (Stern, 2000; Kenter et al., 2016). Therefore, while market values can create pro-environmental choices, the trend of what is available in the market is based on the current ethics of the time, which is based on how people intrinsically feel about a situation going forward.

Intrinsic incentives refer to situations where people are poised to act out of sense of volition or personal endorsement (Ryan and Deci, 2000). Unlike external incentives, which are forced choice, internal incentives arise from a person's feelings or connection about the activity (Amabile, 1993). The types of internal incentives are based around well-being, sense of gratification, altruistic, moral achievement, and values (Olubunmi et al., 2016). In philosophy, values are relatively stable principles that help us make decisions when our preferences are in conflict and thus convey some sense of what we consider good. In sociology, social psychology, and political science, two major lines of research have addressed environmental values. One has focused on four value clusters: self-interest, altruism, traditionalism, and openness to change and found relatively consistent theoretical and empirical support for the relationship of values to environmentalism. The second line of research suggests that environmentalism emerges when basic material needs are met and societies that are postmaterialist in their values are more likely to exhibit pro-environmental behaviours. Overall, the idea that values, especially altruism, are related to environmentalism, seems well established (for review see Dietz et al., 2005).

Shared values convey conceptions of the common good between people and are formed, expressed and assigned through social interactions (Kenter et al., 2016). The term shared values, and related terms such as social values, shared social values, (socio)cultural values and plural values, have been used to indicate a variety of concepts that relate to a sense of importance transcending individual utility, and that express the multidimensionality of values. It is argued that building shared values can enhance the legitimacy of valuation and lead to collective action (Kenter et al., 2016). However, the complex and dynamic nature of environmental problems requires flexible and transparent decision-making that embraces a diversity of knowledges and values (Reed, 2008). As Karlsson-Vinkhuyzen et al. (2017) states, unless there is a strong degree of inherent motivation among actors for the issue in question, top-down leadership, national laws, and regulatory tools are also essential elements of the enabling environment.

2.3.3. Governance and policy integration

At its core, mainstreaming is the introduction of something new into governance and decision-making framework(s) that have the adaptive capacity for change, challenging or developing the status quo. Parsons (1990: p.333) states that structural change is key as it is “*concerned with the process by which existing value systems change and new elements come in*” of which institutional flexibility and adaptive governance are central themes (Plummer and Armitage, 2010). Adaptive governance, through feedback and social learning, have been identified as essential for governing SES (Folke et al., 2005; Pahl-Wostl, 2009). Adaptive governance is in line with modes of governance where multiple actors are involved and interactions are across multiple levels (Karpouzoglou et al., 2016) in changing environments (Shultz et al., 2014), and for a future of extreme episodic change (Chaffin and Gunderson, 2015). Adaptive

governance provides capacity for decision-makers to confront varying degrees of planned and un-planned uncertainty through recognition of, and allowance for, adaptive cycles of disturbance and reorganisation (Holling and Meffe, 1996). Authors such as Gunderson and Holling (2002) help us to understand adaptive cycles in both natural and social systems, though when adaptability is low, advocacy for a change in governance through the formation of new institutional structures, management procedures, and partnerships between agencies, communities, and the public and private sector are often enabled by new legislation and regulation (Petersen and Huntley, 2005), which can strengthen mainstreaming agendas by introducing an element of compulsion (Petersen and Huntley, 2005; Cowling et al., 2008).

The development of legislation and regulations are a fundamental component of the enabling environment for mainstreaming agendas (Petersen and Huntley, 2005). However, regulation can often fail depending on how it is conceived and delivered, set within public acceptability and enforcement capabilities. Additionally, there can be conflict between one set of legislative or regulatory tools trying to do one thing and another set of legislative or regulatory tools doing another (Scott et al., 2014). This is often an issue of scale, where policy at the local authority level contradicts with national or international policy (Scott, 2018), or across sectors when high policy targets exist for competing sectors. Global agreements and target setting are an interesting mechanism with potential for mainstreaming which can include regulatory and incentive mechanisms but tend to be more rooted in non-statutory obligations. Hagerman and Pelai (2016) note that a key challenge to mainstreaming through global agreements is the aspirational nature of the agreements and targets themselves and their lack of fit within existing institutional commitments and governance, thus making them harder to deliver. Enforcement is cumbersome and costly if the users or public do not agree with the intended outcome, and the consequences of ignoring this can be disastrous for environmental quality or social welfare (Cohen, 1998). Equally, the effectiveness of regulation can be compromised if it is imposed from the top down without stakeholder involvement and buy in (Prager and

Freese, 2009), as well as through the risks of regulatory capture (Scott et al., 2014). Briassoulis (2017) found a major issue was the disconnect between desire and ambition and its delivery in practice; the policy implementation gap (Runhaar et al., 2020).

Where compliance is forced and delivery of basic standards is merely something that has to be done, rather than promoting, superseding or valuing the process, a tick box culture can prevail. Benson et al. (2014) expose a government-led fallacy that proposes ministries of environment as the best agency to tackle environmental issues. They found that environmental decision-making across national policies, sector plans, and budgeting processes gain more traction and success if led by, or collaborated with, more influential ministries of planning and/or finance. However, resistance is fuelled, in part, by the prevailing economic growth model that does not take the environment into account within cost-benefit assessments, and also by a lack of understanding of impacts of everyday policy decisions at household, agency and government levels (Benson et al., 2014). The role of individual gatekeepers and micropolitics can be really important drivers here (McAreavy, 2006).

Russel et al. (2018) identifies how change operates across different levels from individual agency to societal values, stressing the need to study the interactions between levels of governance, as much as the levels themselves. Lafferty and Hovden (2003) identify the importance of vertical and horizontal scales of governance, reflecting the need to understand both the extent to which a governing body has adopted environmental policy within its portfolio of objectives and priorities as well as the extent to which it is has integrated across other policy sectors at other scales (see also Brianssoulis, 2017). Here, leadership (Jordan and Lenschow, 2010), knowledge flows (McKenzie et al., 2014) and scale (Turnpenny et al., 2008 and 2014), become key mechanisms to enable desired policy and behaviour change (Kingston and Caballero, 2009).

Understanding governance structures brings into focus the dynamics of power relationships and conflict management (Jordan and Schout, 2006). The central tenants of neoliberalism associated with policies of liberalisation, privatisation and deregulation, has led to significant reductions in the size and role of government with administrations representing a significant shift from government to governance (Walsh, 2017). Governments have become more closely connected with funders, therefore, the mainstreaming process can experience governance challenges through competing policy agendas (Nunan et al., 2012); economic and financial barriers (e.g. the finance for different initiatives and perceived economies of scale) (Sorrell et al., 2004); instrumental barriers (e.g. geographical proximity or open networks); behavioural, cultural and personal barriers (e.g. good relations or a willingness to cooperate) (Morton et al., 2011); and political barriers (power structures, ideology, commitment, leadership, resistance to change etc.) (Amundsen et al., 2010).

Person and Runhaar (2018) help us understand mainstreaming through the lens of environmental policy integration (EPI) as a process that incorporates environmental concerns within sectoral governance arrangements outside the traditional environmental policy domain. However, the synergies between mainstreaming and policy integration literatures are still quite weak and relatively unexplored (Scott and Holtby et al., 2022) as, according to Runhaar et al. (2020), mainstreaming does not yet have the same definitional and conceptual maturity. Humphys (2015: p.434) argues that policy integration is a process *“by which some policies, and the objectives, principles and values on which the policies are based, are integrated into a whole, that is a broader and more holistic set of policies, where the former did not previously exist”*. Typically, policy interventions follow an ‘idealised rational model’ where the intervention is understood as a direct response to a problem, and therefore as having a direct impact on people or the environment (Bacchi and Eveline, 2003). However, French and Lowe (2018) argue these rationalist outcome-based approaches lead to a reductionist and deterministic worldview and do not always work in practice. Kørnøv and Thissen (2000) concur, arguing

that a rational procedure will not automatically lead to a rational outcome, emphasising the need for complexity consistent, inclusive approaches. Furthermore, Scoville-Simonds et al. (2020) argue mainstreaming into existing structures risks reproducing development-as-usual and reinforces technocratic patterns of control. Therefore, governance of complex SESs is not always about finding the best solution (indeed, there is not likely to be one best solution) but rather, it is about discovering ways of proceeding that are acceptable to multiple participants with varying perspectives and priorities, whilst aiming to put the health of the environment (and therefore the health of life on the planet) to the forefront of decision-making. Of course, by others this can be seen more negatively as a lowest common denominator approach (Scott et al., 2013). Important here, again, is the engagement of diverse members of a community, including citizens, stakeholders, specialists, associations and organisations to jointly learn and generate options (Scarlett and McKinney, 2016), to feel motivated and included in governance arrangements¹⁹ for delivery of the mainstreaming agenda.

2.4. Towards a mainstreaming conceptual framework

Having reviewed and discussed the theoretical and thematic contributions to mainstreaming, it has been shown that mainstreaming success is dependent on the capacity and capability of the entire governance and decision-making system to accept or resist change as well as the transformative nature of the change itself (Rogers, 2003; Scott, 2020; Scott and Holtby et al., 2022). Additionally, the success of mainstreaming is also shaped by the different participatory and disciplinary strategies pursued within the non-linear, innovation–persuasion–adoption stages. It is here that knowledge and information development, feedback loops through social

¹⁹ Table 1 develops governance modes

learning, and reflexivity become particularly significant. With this in mind, Scott and Holtby et al. (2022: p.213) advance a comprehensive goal-based definition of mainstreaming that is:

'An interdisciplinary and transdisciplinary process of transmorphing²⁰ and normalising a concept, objective, policy or plan within the decision-making and routine activities of multiple policy domains, necessary for effective delivery and impact; and in so doing building sufficient capacity and resilience to improve operational processes and outcomes enabling beneficial societal impacts for the long term'.

This definition has three key parts: 1) it reflects the importance of interdisciplinary and transdisciplinary working from the outset involving the contribution of necessary players who can design and deliver the desired change and integration; 2) it reflects the need to translate and adapt core concepts so that they can be understood in the context of other sectors priorities; and 3) it highlights the process component based on building resilience and societal benefit for the long term to prevent superficial changes. In this conceptualisation of mainstreaming as a process and outcome it offers opportunities for increasing the prioritisation of the environment within the wider marine and coastal governance system.

In combination with the wider literature as presented, this definition of mainstreaming supports the following mainstreaming framework which in itself builds from the previous contributions in this chapter. In the development of the framework, Cowell and Lennon (2014) champion using methodological approaches that better integrate competing theories and ideas rather than producing more complexity and competition through creeping theoretical incrementalism.

²⁰ Transmorphing is specifically used here due to the meaning of trans: 'to move across' or 'to go beyond', and morph: 'to change form or shape'. Thus, the meaning intended by transmorph(ing) is to move across and change. Ergo, the object found or generated in one domain can be moved across to other domains, in so doing will change shape and form to fit within the new domain.

However, as most assessment frameworks are linear and summative, attention is focussed on the temporal and dynamic aspects of mainstreaming, complexity consistent feedbacks and social learning. Figure 2 charts three hypothetical mainstreaming pathways across two different axes. On the x-axis, the degree of diffusion and change over time is captured through core stages of innovation, persuasion and adoption (Rogers, 2003; Scott, 2020). On the y-axis is the degree of system change desired, progressing from shallow (incremental change, reform trajectory) to deep (transformational change) (Meadows, 2009; Abson et al., 2017; Chan et al., 2020; Krznaric, 2021). The colour gradient in the mainstreaming pathways from red to blue represents the degree of collaboration, reflecting the importance of interdisciplinary and where possible transdisciplinary collaboration across multiple science and policy sectors (e.g., Cowling et al., 2008), and participatory learning and action (Veitayaki et al., 2003). Here it is important to recognise that high levels of collaboration can support both shallow and deep system change, but, in general, greater mainstreaming outcomes can be attributed to a higher degree of collaboration.

Theoretically, optimal mainstreaming is achieved in Path 1, but it is dangerous to view this without reference to the wider context within which mainstreaming proceeds. Here, the direction and progress of mainstreaming pathways will be affected by the potency of hooks (information, incentives, and regulations); and barriers (lack of information or guidance, gatekeepers, political actions, and disjointed governance and decision-making) (Karlsson-Vinkhuyzen et al. 2017; Candel, 2018; Russel et al., 2018; Scott et al. 2018; Runhaar et al 2020). Success is dependent on the capacity and capability of the entire governance and decision-making system to accept or resist change as well as the transformative nature of the change itself (Rogers, 2003; Scott, 2020; Scott and Holtby et al., 2022). Figure 2 also highlights that progress is messy and nonlinear in the different pathways (i.e., complexity consistent).

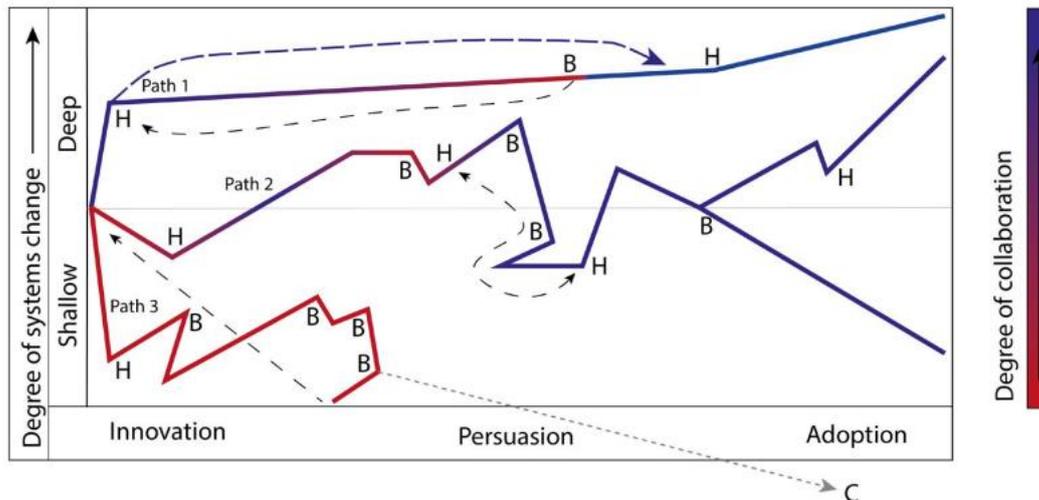


Figure 2. Mainstreaming framework: three different mainstreaming pathways.

Mainstreaming Path 1 shows strong collaboration from the start with a significant hook (H) involving multiple audiences with potential to design and deliver deeper system change. Because there has been early participation to develop shared values, progress through the persuasion phase is less problematic. In adoption, there may still be barriers (B) necessitating further innovation through feedback learning and evaluation loops (dashed arrow). Hence, because of the learning aspect barriers should not always be seen as negative in their overall impact. **Mainstreaming Path 2** starts with more shallow system change but tries to pursue deeper pathways and collaboration via different hooks and barriers, each with differing degrees of impact. Eventually, the mainstreaming pathways split in response to a barrier, highlighting that pursuing deep and shallow interventions simultaneously with high levels of collaboration can lead to successful outcomes. **Mainstreaming Path 3** follows a shallow mainstreaming pathway with limited collaboration, never really reaching sufficient traction or translating outside of the initial policy sector and, therefore, stalling in the persuasion phase. Consequently, it is subjected to multiple internal and external policy pushbacks with the cumulative impact of barriers being particularly problematic. Comment: The dotted line to C highlights the possibility of breaching tipping points which changes the entire policy ecosystem into crisis, from Kuhn's (1962) change model, which can insight collapse or revolution with unknown outcomes.

In the innovation phase, a new concept or idea is developed and introduced, normally in one policy domain by individuals or a group, but by no means should it be necessarily so. Indeed, there is strong evidence that by pursuing an explicitly collaborative approach, encompassing transdisciplinary activity from the start, greater traction can be built to overcome traditional barriers. In this stage, any new concept may stall or, indeed, fail. Key is the evidence provided and the perceived impact of the changes. Concepts can be enabled through legislative or policy hooks but also failure can occur due to key barriers. However, failure can lead to adapted ideas in successive innovation phases as long as there is sufficient social learning, evaluation and feedback involved.

The persuasion stage involves designing and developing processes that enable the concept or idea to become accepted within other key policy sectors that are deemed crucial for its successful delivery and impact (Scott and Hislop, 2020). It is here that increased collaboration should become evident in interdisciplinary or multidisciplinary methods. Gatekeepers, complexity of the knowledge itself, who is behind the idea/knowledge, the absence/presence of competing ideas, the effectiveness of language and communication, the presence of sector champions, perceived cost and resource implications and overall public desirability and inclusion, all became active considerations in shaping progress (Runhaar et al., 2020). Scott et al. (2018) notes the crucial importance of being able to 'translate' any new policy idea into the language and priorities of different key sectors using their hooks to gain initial traction and credibility to build enough support to advance through the persuasion stage towards adoption, the importance of framing and agenda setting are crucial. This is where some mainstreaming efforts stall or commonly break down when relying on the vocabulary from the initial policy domain for communication and collaboration.

The decision whether to pursue deep or shallow system change is important here depending on what is pragmatic and also politically acceptable. Often, there is an initial reluctance to pursue deep transformational change as incremental change is often preferred politically in the first instance. However, progress is never linear, and experiences gained from 'pioneer' attempts add more social learning, generating feedback loops into the mainstreaming process and knowledge itself as opportunities and barriers emerge. Thus, achieving successful shallow outcomes based on pragmatic assessment of what is politically acceptable might then provide the impetus for deeper efforts. Alternatively, as Path 2 (Figure 2) shows, two pathways can be pursued simultaneously. Consequently, progress through the persuasion phase is highly unpredictable and messy, but for the best chances of success it is likely that several mainstreaming pathways should be pursued to gain acceptance across the other policy

domains. This is important and reflects the need to depict mainstreaming as a series of interlinked pathways rather than just one.

In some instances, a hook or key agent or system shock might help, such as improved media coverage, political support, unexpected event and/or strong leadership (Candel, 2021; Jordan and Lenschow, 2010; Scott et al., 2018). Indeed, this can be transformational as in the case of Blue Planet or Black Lives Matter which sparked a range of government and agency responses globally (BBC, 2017; Isaar, 2020; New York Times, 2020). However, they should not be seen as isolated magic bullets as the context of past efforts and failures is important to understand too (Isaar, 2020). Furthermore, the ongoing challenge, for sure, is maintaining the change in actual behaviours and values for the long term. It is here that many mainstreaming efforts stay stuck in the persuasion phase and/or shallow mainstreaming unable to get the necessary traction towards adoption across other policy sectors.

The adoption phase is where the concept or idea has gained sufficient traction and acceptance in the persuasion phase to become normalised in policy and decision-making. This may be due to successful pilots and wider political support and also new legislation and policy instruments. It is not a final end point as it still can come under future challenge and, indeed, get trumped by a new policy paradigm or tipping point (Kuhn, 1962). Figure 2 highlights a range of mainstreaming outcomes within the shallow and deep system change, and the degree of collaboration. The ideal outcome would involve transformational long-term change with alignment across multiple policy domains and the environment at the forefront of decision-making, with consequent changes in values and behaviours (Path 1). Decisions to implement the policy become more widespread via regulatory and/or incentive packages with associated guidance maximising knowledge and communication flows. This is likely to have generated

significant behaviour change conforming to deep mainstreaming/policy prioritisation, as identified by Lafferty and Hovden (2003), Cowling et al. (2008) and Humphrys (2015).

There is also a shallower pathway in the adoption phase (e.g., Path 2) which revolves around the use of market-based incentives/disincentives. Here, the policy has largely been built into existing systems incrementally, but with little overall system change, reflecting the capacity and capability of the governance framework to change and the extent of competing ideas. This outcome is achieved through strong collaboration, highlighting that collaboration is a core component of mainstreaming but does not necessarily lead to deep system change. Here, more substantive change can take place only after a period of shallower change and collaboration. Thus, the framework can be seen as a series of 'Russian doll' cycles progressing through successive stages.

The framework highlights a potential problem with the environmental mainstreaming journey thus far, associated with its evolution and scientific advancement without sufficient upfront collaboration with those sectors (e.g., industry, business and built environment) necessary for policy delivery and impact outside the environment sector resulting in ongoing difficulties in getting it understood and accepted (see DalalClayton and Bass, 2009; Runhaar et al., 2018). Indeed, across the mainstreaming and policy integration literatures, there is a consistent message that transformative or deeper mainstreaming outcomes are rarely evidenced (Dalal-Clayton and Bass, 2009). This prompts an interesting discussion as to whether more mainstreaming success might occur with stronger collaboration from the outset when pursuing deep system change, incorporating interdisciplinary and transdisciplinary research and practice.

2.5. Conclusion

This chapter has highlighted the multiple contributing, interlinking theories, approaches and enabling factors for successful mainstreaming. The chapter developed a mainstreaming definition and conceptual mainstreaming framework which will be applied to ESc concepts in the discussion chapter (6), to establish whether ESc has the potential to mainstream environmental priorities into marine and coastal governance. The following chapter explores the literature regarding marine and coastal governance more specifically, and discusses the gradual progression of environmental mainstreaming highlighting advancements and challenges.

3. Chapter Three: Marine and Coastal Governance, Advancements and Challenges for Mainstreaming Environmental Priorities

“We are landless and listless, so estranged from our planet, so removed from the decision-making that governs it, so isolated from each other and the life we share this world with that we're seemingly unable even to come together and prevent global human and environmental catastrophe. We're still being divided and conquered by enclosure, only now the fences are invisible and internal too”
(Cowen, 2016: p.135)

3.1. Introduction

The quote by Cowen (2016) highlights the deep-rooted separation mindset of most humans from the environment and also the destructive separation of humans from one another on daily decision-making and governance levels. In this chapter, literature on current and past governance arrangements is presented and the developmental journey of the way in which the environment is governed and managed is unpacked. Initially, this chapter considers literature on governance and decision-making structures in the marine and coastal environment, including governance modes and the emerging concept of marine [spatial] planning, to provide the setting and inherent institutional propensities, which proliferate challenge for mainstreaming environmental priorities. Factors that negatively affect the natural environment are presented, in particular the role of capitalism and neoliberalism in the demise of natural resources and contribution to fragmented governance. Thereafter, the chapter addresses movements, developments, and contradictions in environmental policy, including the protection and conservation movement, followed by sustainable development intentions and realities and the contribution of ecosystem science (ESc). Literature relating to individual ESc concepts are initially presented and defined, specifically using search terms

relating to Natural Capital (NC), Ecosystem Services (ES), the Ecosystem Approach (EcA), Ecosystem-based Management (EbM), the Ecosystem Services Framework (ESF), the Natural Capital Approach (NCA), Nature-based Solutions (NbS), and Net Gain (NG) to build a picture of the developmental journey of individual ESc concepts and where there has been progression or crossover from one to the next. Thereafter, literature on their linkages and interrelations are showcased, assessing the potential for advancing mainstreaming of environmental priorities into non-environmental sectors.

3.2. Marine and coastal governance, planning and decision-making

As detailed in the introductory chapter, the impacts of human activities on marine and coastal environments have become so profound that they could alter the global system in ways that may prove irreversible (e.g., IPBES 2022). Uncoordinated activities, and siloed, non-inclusive governance has left little room for quantification of cumulative stressors and there is an accumulation of pervasive negative effects on the environment (MA, 2005; UKNEA, 2011; Vierros, 2017; Hodgson et al., 2019; Bennett et al., 2021; Dasgupta, 2021; IPBES, 2022). Governance was identified as a key factor in any mainstreaming endeavour, however, there are different modes of governance (Table 1) that enable different levels of knowledge development and exchange; including varying stakeholder involvement and diverse levels of power and accountability, based on the relationship between state intervention and societal autonomy (Treib et al., 2007). In general, environmental governance can be considered as the act or process of governing use and access to the environment (Chaffin and Gunderson, 2015). Marine and coastal governance requires an understanding of the interacting, interrelated and interdependent sub-systems comprising ecological, societal and management complexity (Elliot et al., 2020). This creates interlinked systems: SESs (Berks

et al., 2008; Ostrom, 2009) that are complex, adaptive, and defined by spatial or functional boundaries (Bruckmeier, 2016).

The immense scale and connectivity of marine SESs and their dynamic and transboundary nature, crosses geographic as well as administrative boundaries (Gilliland and Laffoley, 2008), requiring governance to be considered at multiple spatial scales, necessitating international agreements and national legislation and regulations. However, the conventional perception of governance, which was once thought to be synonymous with top-down control from the state, is no longer appropriate or easily applicable at local scales. A convergence is needed between government standards set to fulfil international and national objectives, alongside state-supported initiatives to achieve these standards at local levels, based on local priorities. This necessitates a 'governance structure' of formal and informal relationships between countries, government agencies, organisations, stakeholders, and local citizens (Crowder et al., 2006). Traditionally these modes of governance are based around a single resource or sector; hence there are major gaps, overlaps, and contradictions across governance frameworks, which contributes to deteriorating ocean health, impeding the achievement of marine management goals (Crowder et al., 2006; Ekstrom and Young, 2009).

More recently, environmental policy development has embraced cross-sectoral approaches that better integrate environmental concerns into other sectors (Nordbeck and Steurer, 2016). This change was mainly driven by the fact that both environmental problems and their socio-economic causes kept pace with the complexities of globalisation: while the environmental problems of the 1970s and 1980s such as water pollution were mainly local, regional, or national in scope, more recent problems such as climate change and loss of biodiversity are global concerns that require multi-level, multi-sectoral responses (Steurer, 2013). Though, despite widespread discussion of such approaches since the 1970s (Taljaard et al., 2012),

effective and sustainable implementation has experienced a number of challenges and the dominant perspective is that join-up across sectors that operate in the marine and coastal space are still insufficient (Boyes and Elliot, 2014 and 2016; Nunan et al., 2020).

Angst et al. (2018) state that fragmentation across water supply governance can impede action and decrease innovation capacity. To overcome this, Angst et al. suggest bridging actors who connect others within governance networks helps to overcome this challenge. Newman and Dale (2005), speaking of social networks, suggest there needs to be diversity in bridging organisations to enable community resilience against environmental change. Newman and Dale also argue for bonding roles that aim to build trust between people or groups. Bodin et al. (2006) further add a leadership role of a 'broker', who provide an exclusive link between disconnected groups and have a high degree of betweenness. They hold and transfer information and create new opportunities for innovation which others do not recognise. In a terrestrial rural-urban fringe setting Scott et al. (2013) describe a countryside manager as a role of mediator, negotiator and enabler positioned at the interface between the needs of visitor and residents, with the impacts and policies in a place. In the marine environment literature moreover details facilitator and knowledge exchange roles, more in relation to engagement rather than ongoing governance arrangements (e.g., Weiss et al., 2012; Ison et al., 2021).

Table 1. Different modes of governance found in marine natural resource management, with general descriptions and challenges from wider literature.

Governance mode	Description	Challenges
Top down / hierarchical / state-controlled	<p>Takes place at centralised locations. Found across most natural resource governance spheres. International and national frameworks, government direction through laws and regulations to initiate protection and safeguard and natural resources against over-use (Jones et al., 2011).</p> <p>Dominant command and control organisation set standards and rules for organisations positioned on at lower tiers. Instruments rely on rational choice decision-making by law and policymakers (Kooiman, 2003).</p> <p>Administrative rationality - 'leaving it to the experts' (Dryzek, 2005).</p> <p>Underpinned by the theory that resource depletion in open access regimes is inevitable due to individuals acting in self-interest (e.g., Hardin, 1968).</p> <p>Can extend beyond national boundaries to international regimes to manage transboundary resources, predicated upon the principle of coastal seas territories according to the Law of the Sea (UNCLOS).</p>	<p>Law and policy can provide solutions to address problems caused by societal complexity, but they can also obstruct change; a rigid regulatory framework may be too inflexible or too slow to cope with the dynamic, rapidly changing nature of SESs (Kooiman, 2003).</p> <p>Political failure due to the Principle-Agent problem²¹ and moral hazard, where information asymmetries, influence of special interest groups, corruption and other monitoring difficulties, and lack of opportunities for accountability and sanctions enable politicians and bureaucrats to serve interests that conflict with those of the public (Acheson, 2006). Can receive backlash, necessitates enforcements if not widely accepted. Can perpetrate us vs them mentalities.</p> <p>Regulatory uniformity does not account for variations in local ecology and local fisheries knowledge (e.g., Newfoundland cod) (Bavington, 2010), social organisation (e.g., Bengal), perverse outcomes of subsidies (e.g., WTO) (Sakai, Yagi and Sumaila, 2019), or the power of groups to benefit at the expense of other local stakeholders (e.g., Nambia; Odisha, India) (Nayak and Berkes, 2010)).</p> <p>Dysfunctional management leading to fisheries collapse, due to misunderstandings of scientific uncertainty in complex systems, and false assumptions about the extent to which natural processes can be predicted and controlled by legal systems (Bavington, 2010).</p>
Private property / market force	<p>Institutions organised around legislated rights to private property designed to provide e.g., fishers with secure entitlements and assurance that their investment benefits will accrue to them (e.g., North Pacific USA) (Mansfield, 2004).</p>	<p>Difficulties in implementing and monitoring regulation as a key reason for the failure of ITQ systems, (e.g., New England groundfish and Argentinian hake fisheries) (Hilborn et al., 2005).</p>

²¹ An agent is appointed by a principal to act on their behalf and in their best interests; a principal-agent problem occurs when there is a conflict in priorities between the agent and the principal, e.g., the agent begins to act in their own interests in a way that negatively impacts (costs) the principal.

	<p>Market incentives: the need for economic incentives to support alternative options and the need to attach economic value to the preservation of biodiversity, fish stocks and habitats in terms of ecosystem services (recreational fishing, diving, cultural and aesthetic values), and environmental property rights.</p> <p>Economic rationality – ‘leaving it to the markets’ (Dryzek, 2005).</p> <p>Property rights schemes are commonly expressed through Individual Transferable Quotas (ITQs)²², which have had varying success. Where ITQ systems are deemed successful (New Zealand rock lobster, Canadian sablefish, halibut fisheries in Canada and the US Pacific), important attributing factors include strong local cooperatives, effective government control and appropriate incentives that encourage behaviour consistent with conservation value, where institutional and social responsibility are interdependent (Chuenpagdee and Song, 2012). Zoning regulations and spatially designated property rights can ameliorate problems arising from ITQs and territorial user rights (TURFs) (Holland, 2004).</p>	<p>ITQ failure can occur due to unanticipated outcomes of institutional design (e.g., Kenya) (Evans, 2009), where there is uncertainty about resource availability and market inefficiencies due to spatial phenomena (e.g., New England, USA) (Holland, 2004), and may not necessarily result in economic benefits (e.g., West Coast groundfish USA) (Pinkerton and Edwards, 2009).</p> <p>Unfair or weighted allocation (e.g., Olson, 2011). Privatisation, appropriation or colonisation as a reason for ownership, excluding local or indigenous access rights (e.g., Olson, 2011; Pinkerton and Davis, 2015).</p>
<p>Community-based / self-governance / bottom-up</p>	<p>Inclusive community-based resource management (Armitage, 2005; Berkes, 2006).</p> <p>Self-organization, adaptive, based on local priorities (Ostrom, 1990).</p> <p>Promoting ownership and empowering local people through involvement (Jones et al., 2011).</p> <p>Deliberative pragmatism - ‘leaving it to the people’ (Dryzek, 2005).</p> <p>Social capital, a measure of the degree to which actors reach and implement decisions together through their professional and social networks, placing trust in each other, and having</p>	<p>Several studies identify the need for government involvement to support instances of community-based management, through local-level enforcement and monitoring, or funding (e.g., Gulf of Thailand) (Nasuchon and Charles, 2010). Necessitates surrender of top-down rule, which is hard to achieve where there are dominant power relations.</p> <p>To be part of wider connected system needs to broaden influences and integration, without losing community-based, grass-root integrity (Chuenpagdee and Song, 2012).</p> <p>Fragile nature of social capital, where removal of one component, for example trust, of funding can cause a cascading effect reducing or removing co-operation and associated</p>

²² ITQs refer to individual portions of a TAC – units of quota – which allow the holder to catch that portion of the TAC each season. The weight value of the ITQs change proportionately to changes in the TAC set for a species each season. ITQs are fully tradeable and can be sold or leased to other persons.

	<p>confidence that their cooperation will be reciprocated (Jones and Burgess, 2005).</p> <p>Trusted individuals do not need to be monitored which lowers transaction costs and enables reciprocal relations. Social capital is reinforcing, with reciprocity comes connectedness between people leading to greater trust, confidence and capacity for innovative thinking (Ostrom, 1998).</p> <p>Global policies such as subsidies (Sumaila et al., 2007), trades and certification schemes (Pérez-Ramírez et al., 2012) have increased connectivity between local level community-based institutions and external governance institutions.</p> <p>Levi-Faur (2014) suggests that self-managing, and empowered teams are more likely to be successful. Young et al. (2007), suggest there is an increasing emphasis on encouraging local institutions to initiate projects to govern their own marine resources using quasi-autonomous, place-based approaches to heterogeneous marine ecosystems.</p> <p>Citizens assemblies (e.g., Ireland) (Ireland, G. E. A., 2022). participatory budgeting whereby citizens engage in a process of deliberation and decision-making about public funds for local matters (Wilkinson et al., 2019).</p>	<p>benefits. If groups do not trust one another, co-operative arrangements are harder (Baland and Platteau, 1998).</p> <p>Immense scale and connectivity of marine ecosystems renders MPAs subject to continuous human and ecological interconnections that need national and international legislation as part of their project lifecycle, and thus, this requires the MPA governance to be considered at wider spatial scales, beyond local civic abilities (Jones, 2014).</p>
Multi-level / co-governance / communicative governance	<p>A hybrid institutional arrangement that usually involves shared responsibility by local-level organisations and government. Considers multiple points from above.</p> <p>Includes the concepts of collaboration, co-operation, co-ordination, and learning-by-doing (Kooiman 2003).</p> <p>Improving participation for multi-level governance requires the ability for those with different knowledge types to input into decision-making processes (Wills, 2020) aiming towards lasting outcomes.</p> <p>Includes sharing of power. A governance model which is not restricted to government actors, but aims to include a broad variety of business and civil society actors across all levels (Peters and Pierre, 1998).</p>	<p>The ability for people to shape governance decisions depends on the level of power associated with their type of knowledge. Governance decisions for natural resource management, local knowledge is often suppressed by scientific and political expertise (Wynne, 1992; Fischhoff, 2013).</p> <p>Free-riding problems may persists because interests and social relations may still be guided by self-interest and bettering individual utility (Jentoft et al., 1998).</p>

	<p>Co-evolutionary hierarchical governance concept (Jones, 2014), whereby the government assigns the standards needed to fulfil societal objectives, but decentralises the authority to achieve these standards to local levels. This concept is consistent with arguments that the state still has input in governance, nevertheless, local people are not subjects of state control, and rather, the state decentralises and devolves instead of relinquishing authority (Bell and Hindmoor, 2009).</p> <p>Communicative governance assumes social actors to be 'reasonable citizens' at different levels of societal organisation (Kooiman, 2003).</p> <p>Kooiman (2003) introduces co-management as a type of co-governance, adding that it has been mostly used in marine studies:</p> <p>Co-management provides vertical linkages between at least two levels of institution and involves formalised processes for sharing power and responsibility between the government and local resource users (Berkes, 2015). The definition of co-management has been expanded to consider power sharing and joint decision-making on a continuum (Armitage et al., 2009) and to include intricate multi-level linkages (Pinkerton, 1989).</p> <p>Emphasises on the value and importance of experiential and experimental learning and collaboration, both vertically across a community and horizontally through layers of governance stakeholders (Gustavsson and Riley, 2018). Central to this approach is building trust and social networks (Carlsson and Berkes, 2005; Armitage et al., 2012).</p>	
Multi-sectoral / multi-actor / multi-stakeholder	<p>Similar to multi-level governance, though with a particular emphasis on inclusion of different, sometimes competing sectors, in solution finding and decision-making. Horizontal as well as vertical links. Aims to mobilize a broad swathe of actors to pursue sustainability (Jänicke, 2015).</p> <p>Additional opportunities to address mutual / co-benefits (Jänicke, 2017).</p>	<p>As above</p> <p>Difference in language and working styles. Competition and conflicting interests (Nordbeck and Steurer, 2016; Jänicke, 2017).</p>

	<p>Interdisciplinary and transdisciplinary processes. These include strategies for sustainable development (Steurer, 2013) land management and natural resources Rayner and Howlett, 2009), climate change mitigation and adaptation (Casado-Asensio and Steurer, 2014).</p>	
Polycentric	<p>A structure of governance where there are multiple and overlapping centres of authority (Ostrom et al., 1961).</p> <p>Important roles of institutional links within multi-level, multi-type, multi-sectoral and multi-functional structures. Without a single central authority each unit (institution or organisational level) has considerable independence to make and enforce rules within their domain of authority or specified geographical area. These units include resource users with the authority to make at least some of the rules on resource utilisation (Ostrom et al., 1961).</p> <p>The multiple centres of authority are composed of multi-purpose governments and other highly specialised agencies including both public and private sector organisations (McGinnis and Ostrom, 2012). Within a polycentric system scientists and non-government organisations hold critical support and facilitation roles (Carlisle and Gruby, 2019).</p> <p>Communication between overlapping institutions aids connection between multiple levels (Wilson, 2006).</p> <p>Having multiple authorities across the system takes the risk away from one dominant organisation, as is typical within hierarchical governance. E.g., Maine Lobster Fishery (USA) exhibits long-term mutualistic relations between both local and state governance systems (Acheson, 2003). Fishery is zoned into territories, each with boundary rules and day-to-day fishing regulations organised by local fishers. These implement sanctions for people who do not abide by rules or on outsiders fishing the local stock. The state inputs through formalised laws to protect the breeding stock but do not limit catch, as this is done through the local rules. Supportive role of the state, willing to step-in when the issues exceed the scope of control of local groups (Wills, 2020).</p>	<p>Possible lack of knowledge of the mechanisms of polycentricity, the difficulty in identifying optimal rules to manage dynamic SESs and the chance of increased conflict due to interdependency between units. Decreased controllability, adding possibility for '<i>messiness</i>' rather than institutional fit to the governance of natural resources (Galaz et al., 2012).</p> <p>Dispersion of responsibilities could lead to greater uncertainty of policy outcomes (Kooiman, 2003) and decreased levels of legitimacy and accountability of decision-makers (Carlisle and Gruby, 2019).</p> <p>Possible inconsistencies, fragmentation, duplication, overlap (Galaz et al., 2012) and escalation of operational and transaction costs with more people participating in decision-making processes.</p>

<p>Partnership working</p>	<p>A dynamic relationship amongst diverse actors, based on mutual agreement, pursued through shared understanding of shared division of labour based on the respective benefits of each partner (Brinkerhoff, 2002).</p> <p>Promoted through global legislative drivers such as Agenda 21 (1987) and the Aarhus Convention (1998). In the UK, the 'third way' narrative details how public-private-third sector partnerships have become a dominant feature for governance (Giddens, 2013).</p> <p>Dietz (2013) argues that partnerships that include local communities, scientists and government agencies and which acknowledge different knowledge types are of paramount importance to effective natural resource management</p> <p>Within an institutional perspective, the focus of work is on partnerships as new forms of collective governance, with the emphasis on the roles that partnerships can and should play in multi-level and multi-scalar governance (Hague, 2004; Scott, 2012).</p>	<p>Partnership working often conducted for practical reasons (to improve understanding, resource efficiency, implementation and internal trust relations) rather than to promote discursive democracy between different groups (Sherlock et al., 2004).</p> <p>Partnership working rarely moves beyond multidisciplinary into transdisciplinary collaborations. Decisions often taken by a closed policy community made up of the 'usual suspects', technical experts who make decisions based on scientific rationality (Wills, 2020).</p> <p>Despite efforts for democratic representation through consultation with local stakeholders the policy community can remain exclusive, unable to expand participation due to bureaucratic process, and a lack of time and resources (Moore and Koontz 2003).</p>
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On international and national scales there is a complex patchwork of marine legislation and administrative frameworks (see Boyes and Elliot, 2014 and 2016 for detailed discussion). This includes a whole suite of international, national and regional laws, policies, and agreements controlling different sectors, by a plethora of organisations and administrative bodies; each with their own rules and cultures, often with a sectoral basis or bias (Boyes and Elliott, 2014 and 2016). This is often combined with the consideration and management of issues in isolation, which tends not to take full account of the complexity of natural systems; the interactions, opportunities and trade-offs across different sectors and scales; or the range of values and needs of local communities (Bradshaw et al., 2021).

Non-environmental sectors do not, as a routine, integrate environmental use, degradation, or destruction into their own governance and decision-making frameworks; they often seek high levels of economic development with unrestricted access to resources, unhindered by environmental concerns, which they view as development constraints (Panaiotov, 1994). Therefore, ad hoc, and specific institutions to protect the environment have been developed to tackle specific environmental impacts and market failure (Panaiotov, 1994), often with little systematic enquiry concerning how such instruments might interact with other forms of regulation (Gunningham and Sinclair, 2019). In recent years environmental policies increasingly advocate the need for a holistic approach to coastal and marine use that addresses the increasing degree of anthropogenic pressures as well as conflicts between multiple users competing for space and resources (Buhl-Mortensen et al. 2017; Le Tissier et al., 2020). In particular, the policies within Integrated Coastal Management²³ (ICM) (Sørensen, 1997; Olsen et al., 1997; Stojanovic et al., 2004; Shipman and Stojanovic, 2007),

²³ ICM is a widely accepted approach for sustainable management of the coastal environment. ICM emphasizes integration across sectors, levels of government, uses, stakeholders, and spatial and temporal scales (with the primary focus being on identifying coastal issues and then addressing these by implementing specific projects or programmes (Taljaard et al., 2012). Espousing the use of a whole or integrated system as the base layer for all planning and management (Vierros, 2017). Sometimes called integrated coastal zone management, or integrated coastal area management, or integrated water resources management. Marine Spatial Planning has largely taken over the discourse.

and more recently Marine Spatial Planning (MSP) (Ehler and Douvère, 2007 and 2009; Gilliland and Laffoley, 2008; Agardy et al., 2010; Rodriguez, 2017; Santos et al., 2019).

Both ICM and MSP are processes that seek to organise and manage human activities in coastal and marine areas to achieve economic and social objectives whilst safeguarding ecological integrity. They also seek to override traditional sectoral approaches in pursuit of sustainable development (Ehler and Douvère, 2009; Fletcher et al., 2013; Rodriguez, 2017; Smythe, 2017; Le Tissier et al., 2020), and are now considered a crucial step in effective marine area governance (Rodriguez, 2017; Ehler, 2018). Currently, over sixty countries have some type of MSP initiative; the majority are in Europe with Germany and the Netherlands as forerunners in approving management plans for their waters in 2005 (Zaucha and Gee, 2019). Also, there are initiatives in China (e.g., Fang et al., 2011), Central America, Canada, Africa, and Asia (Santos et al. 2019).

One of the best known and applied documents on MSP is the Intergovernmental Oceanographic Commission of UNESCO guide (Ehler and Douvère, 2009), and provides an MSP description as it is most frequently defined:

“Marine Spatial Planning is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process” (Ehler and Douvère, 2009: p.18).

However, there is still relatively little consensus over how to undertake an MSP process effectively, as first described by Fletcher et al. (2013), and it is still open to varying interpretation in different countries, as first described by Gilliland and Laffoley (2008). The MSP process usually results in a comprehensive plan or vision for a marine region (Ehler and

Douvere, 2007). Key common characteristics include integrated, iterative, adaptive, strategic, area-based, participatory processes (Ehler and Douvere, 2009) that are well led and clearly communicated (Fletcher et al., 2013). MSP aims to proactively reduce user-user and user-environment conflicts by balancing demand for development with the need to protect the declining environment (Ehler and Douvere, 2009).

MSP requires integration and collaboration between government agencies, non-governmental individuals and organisations, to address fragmentation of authority over different marine activities and resources (Smyth, 2017). In many cases, MSP also aims to include local and indigenous knowledge and sustainability concerns (Bennett et al., 2018). However, levels of inclusion in the decision-making process are variable: Flannery and McAteer (2020) point out that MSP is not innately rational as it problematises marine issues in specific ways that often reflect hegemonic agendas. They suggest that the illusion of impartial rationality in MSP appears progressive but in reality, it serves elite interests. Jones et al. (2016) make similar points through their case study analysis, indicating that MSP initiatives, as currently implemented, often cannot be considered to be striving towards cross-sectoral conflict resolution, as MSP processes are not designed in a way that allows conflicts to be 'planned away'. Rather MSP is often focused on achieving specific sectoral objectives related to nationally important strategic priorities. Clarke and Flannery (2020) summarise, while MSP has transformative capacity, evaluations of its implementation illustrate large gaps between how it is conceptualised and how it is practiced. This is similar to terrestrial spatial planning literature where issues of governmentality inhibit progression away from top-down defence of the status-quo (Scott et al., 2013).

In the UK, the Marine and Coastal Access Act (MaCAA) (2009)²⁴ sets out the statutory basis for regulating marine activities. It established the Marine Management Organisation (MMO)²⁵ and a marine planning system that requires the production of marine plans and associated policies in the context of the Marine Policy Statement²⁶. The MMO has prepared the first suite of marine plans for eleven regional marine areas in England. Notably, the ‘spatial’ nature of marine planning in England is currently lacking, in comparison to Scotland’s approach to create ‘marine regions’ specifically for spatially planning (Shucksmith et al., 2020). Indeed, most MSP initiatives around the world have a spatial nature to decision-making, whereas in England the term is ‘marine planning’ rather than MSP. It could be said that zoning does not well account for maritime sectors, such as recreation, pelagic fishing or shipping, which have locations that are relative to the water column rather than the seabed (Smith et al., 2011), and that spatial compartmentalisation of activities are not sustainable given potential for co-location, multi-use and the nature of environmental gradients in the sea (Stojanovic and Gee, 2020).

Instead, marine planning in England is intended to *“encourage sustainable development while considering the environment, economy and society”* (Gov.UK, online). Using a policy hierarchy, marine planning provides guidance on aspects to promote or avoid for some locations. Marine plan policies aim to reflect local opportunities and challenges. However, they also aim to deliver the aspirations of cross-governmental policy that aligns with high-level marine objectives, which some argue is geared towards enabling development and promotion of the ‘blue economy’ rather than environmental protection (Young, 2015; Jones et al., 2016).

²⁴ Marine and Coastal Access Act 2009 (legislation.gov.uk) as well as the MMO and marine planning, MaCCA reformed the marine licensing system; created a new mechanism for marine nature conservation; modernised inshore fisheries management and enforcement; authorised a scheme for migratory and freshwater fisheries; improvements in coastal access; and a more ‘joined-up’ approach to coastal and estuarine management

²⁵ An executive non-departmental public body in the UK with responsibility for English waters. The MMO exists to promote the UK government's vision for clean, healthy, safe, productive and biologically diverse oceans and seas.

²⁶ Marine Statement (publishing.service.gov.uk) the framework for preparing Marine Plans and taking decisions affecting the marine environment.

Potts (2016) furthered by McKinley et al. (2019: p.2297) describe the blue economy as a “platform for strategic, integrated and participatory coastal and ocean development and protection that incorporates a low carbon economy, the ecosystem approach and human well-being through advancing regional industries, services and activities” recognising that if ocean-based economic activities are to be sustainable, they need to move beyond resource exploitation and integrate with marine conservation and effective marine planning (McKinley et al., 2019). However, as McKinley et al. (2019) and Silver et al. (2015) point out, the term has been used in multiple and competing ways. While one perspective of the blue economy is that of environmentally friendly advances and technologies, a competing perspective stresses a strong industry role advancing the blue economy through further open access to ocean space and lucrative resources, raising questions of equity and sustainability (Silver et al., 2015). The latter perception supports some authors’ concerns (e.g., Jones et al., 2016; Flannery and McAteer, 2020; as detailed above) regarding the (ab)use of the term ‘sustainable development’ in marine planning, as well as supporting Flannery and McAteer’s (2020) point about elite, hegemonic agendas.

Marine planning is in its infancy compared to terrestrial planning; the evolution of marine planning and the priorities it adopts over the coming years is critical to the outcomes for the marine environment. Linked to both ICM and MSP through legal²⁷ and theoretical underpinnings, but not often delivered as such, is Ecosystem-Based Management (EBM)²⁸. Although ecosystem-based MSP has been presented as the best way to ensure both ecosystem conservation and development of human activities (Gilliland and Laffoley, 2008; Crowder and Norse, 2008), most European and UK MSP initiatives seem to follow an MSP

²⁷ For example the Marine Strategy Regulations 2010: Part 2, which transpose the Marine Strategy Framework Directive, and the UK Marine Policy Statement “*Manage competing demands on the marine area, taking an ecosystem-based approach*”. (2011: p:4).

²⁸ An environmental management approach that recognizes the full array of interactions within an ecosystem, including humans, rather than considering single issues, species, or ecosystem services in isolation (Slocumbe, 1993; Arkema et al., 2008). A further considered concept within ESc, unpacked in section 3.7.

approach focused in delivering for key sectors (Santos et al., 2019). Trouillet (2020) finds that initiatives view MSP as a strategic planning tool brought in to complement existing initiatives, rather than for any fundamental change in governance. Spijkerboer et al. (2020) agrees, stating that MSP is used as a sectoral tool rather than an approach for systematic marine governance.

ICM and MSP have evolved with a greater emphasis towards designing rules and procedures for how to govern an area whilst enabling activities to happen in their designated space (Rodriguez, 2017). While EBM has evolved to include many of the same spatial principles as ICM and MSP (Haines-Young and Potschin 2011), it has a greater emphasis on conserving ecosystems and considering the whole SES in decision-making, which brings in additional management challenges over and above simply merging sectoral approaches (Le Tissier, 2020). Although ICM and MSP are more straightforward in the planning process without integrating the extra level of EMB; implementation and follow-up of such plans have proven to be less effective in their own goals of integration (Cormier and Kannen, 2019).

Shipman and Stojanovic, (2007) found that after approximately forty years of application of the ICM framework four major challenges to implementation were pervasive: 1) the complexity of responsibilities at the coast continues to prevent agencies from taking a joined-up approach; 2) a policy vacuum is constraining implementation from national to local scales; 3) informational obstacles are significant in preventing co-ordination between science and policymakers, and between different sectors; and 4) a democratic deficit is preventing implementation in the working practices of coastal stakeholders, with little opportunity in decision-making for public comment or local accountability, especially offshore. Taljaard et al. (2012: p.40) agree observing that "*the governance systems within which ICM is applied have remained sector-based*" and Sale et al. (2014: p.12) suggest that this sector-led

approach has resulted in “*piecemeal*” management. Whilst coastal areas have a strong case for seeking a more integrated, joined-up approach between sectors, implementation still faces the challenge that governance systems remain largely sector based (Taljaard et al., 2012; Nunan et al., 2020; O'Hagan et al., 2020).

There seems to be a deep-rooted culture of fragmented policy and decision-making embedded in social processes at international, regional, and national scales (Fairbanks et al., 2019). Despite abundant evidence on the decline of the marine and coastal environment, experience shows that decisions that truly aim to balance environmental and social considerations with economic ones remain exiguous (Jordan and Lenschow, 2010; Juntti et al., 2009). Chuenpagdee and Song (2012) further highlight a growing consensus around institutional failure as an important contributing factor to the wicked problem of contemporary governance (see also Jentoft and Chuenpagdee, 2009). The mechanisms by which humans have historically governed their relationship with the natural environment is insufficient going forward (Biermann et al., 2010; Kanie and Biermann 2017; Carter, 2018). Therefore, to really understand why initiatives with good intentions to join-up planning and delivery, such as ICM and more recently MSP, are still at present unable to create lasting structures for collaborative governance and/or put environmental priorities to the forefront of all sectors, it is important to establish the roots of this disintegration if there is to be real progress.

3.3. Fragmentation as a culture: historical perspectives

It is argued that Western civilisation's view of the environment transformed from the sixteenth century onwards; from an organic, living organism with intrinsic, interlinked, and spiritual features to inert, mechanistic, and predictable matter that provides resources for human use (Leiss, 1974; Merchant, 1980; Manfredo et al., 2020). Leiss, (1974), Merchant (1980), and Manfredo et al. (2020) argue this is when the human-nature relationship had a major shift towards detachment, domination and control over the environment. However, Van Dyke (2008) argues religious commands and sacred traditions have never really been sufficient to keep humans from self-serving behaviour that often ruins their surrounding environment.

The use of the Scientific Method emerged and gained in purchase, developed largely by Francis Bacon [1561 – 1626] to interrogate the Earth (Russell, 2010): *"He managed to win wide acceptance for a novel conception of mastery over nature, and at the same time he unwittingly charted a course for later generations"* (Leiss, 1974: p.53). Natural science became an autonomous discipline distinct from philosophy and religion and came to be regarded as having utilitarian goals (Cohen, 2018). Building on this, René Descartes' [1596 – 1650] through the deterministic segregation of mind and matter, and the method of reductionism furthered the developing approach to scientific inquiry (Pattberg, 2007), which *"inevitably led to a fragmented view of the world – to a focus on the individual parts of a system rather than on the organic whole, on studying the way in which the constituent elements operated separately rather than the ways in which they interacted"* (Ponting, 1991: p.147).

Further developing the mechanistic and reductionistic view of the environment, Sir Isaac Newton [1642 – 1726/7] formulated an abstract and geometrised universe which, ultimately, resulted in the perception of the environment as governed only by the laws of physics (Braudel,

1993). This enabled scientists to use 'Cartesian' and 'Newtonian' science to systemise the environment into a set of basic principles and rules, resulting in a shift away from the notion of the environment as a complex, interconnected and mystical entity (Capra, 1975 and 1996) towards a belief that studying the separate parts is key to understanding the whole.

While there is no doubt that 'enlightenment culture' based on objectivity, progressed the development of science and technology with advances in many areas of society; in more recent times it is showing its limits (Ciancio and Nocentini, 2000). Capra (1975) questions the traditional world view, suggesting advances in modern science such as Quantum Theory reveals a basic oneness of the universe, showing that the world cannot be decomposed into independently existing smallest units. Rather, nature presents as a complicated web of relationships between the various parts of the whole. Meadows (1982: p.23), agrees and quotes an ancient Sufi teaching that captures the problem with the reductive world view: *"You think because you understand one you must understand two, because one and one makes two. But you must also understand and"*. Highlighting that when isolated contributions are viewed, the relationship between these inputs can be missed. Therefore, the complexity of the connections across the system, the emergent properties, and cumulative effects are not factored into thinking, management, and governance.

Despite early systems thinkers such as Capra and Meadows, and despite developments in modern science - social, corporate, and political structures have remained within the domain of classical Cartesian/Newtonian foundation (Salleh and Ahmad, 2010; Ross and Mitchell, 2018). Epistemologically this has hindered collaboration (Ross and Mitchell, 2018). While the amount of people on the planet is a dominating consideration, damage to the environment can also be attributed to mismanagement (Weiss, 1990), government failure (Andersson, 1991) and the development, especially in Western societies, of a separation mindset from humans

as part of nature, to humans as separate from nature (Brennan, 2018) in a dualist view of human culture (Passmore, 1976; Brechin et al., 2002; Peterson et al., 2010). Goudie (2000) argues, it is this separation mindset that seeks to legitimise human domination over the environment, leading to the dramatic and destructive impacts that can now be observed in global ecosystems. Additionally, the mechanistic view of the environment and the systemic segregation of species, habitats, sectors and corresponding decision-making and governance structures, has enabled exploitation of the environment because it camouflages interlinking features of action and effect, in order to utilise and optimise environmental resources in the interests of capitalism (Merchant, 1980, 1990; Magdoff and Foster, 2011; Larssen and Harrington, 2021).

3.4. Growth versus nature

The development of capitalism through the eighteenth century resulted in the enrichment of the bourgeoisie society who thereafter funded the Industrial Revolution (Muller, 1971). Mumford (1956: p.154) argues the *“new man of the Revolution is the true agent of the ideology of domination over nature in taking the decisive step towards industrialisation”*, and *“the engine of this advancement is economic growth”* (Hamilton, 2003: p.98). Smith (1776), proclaimed that advancement would be best served by self-interested decisions in a capital-based, free-market economy with minimal state interference, emphasising the self-creating power of individualism (Dicey, 1905). Wealth and a good life became associated with accumulation of money, for which, resources from the environment were needed (Wallerstein, 1986; Porritt, 2012). However, at the turn of the nineteenth century, the social inequality created by the rapid move towards industrialisation, which only benefitted a few actors financially, meant that

society increasingly turned towards the state for new direction (Frieden, 1978), which required a substantial increase in state activity and new governance regimes.

The 'new liberalism' of modern (post-industrial) society moved to a middle ground that reconciled with the common good (Turner, 2008). However, traditional liberal notions of individual interest, entrepreneurship, private property, and the classical conception of the market economy as an efficient engine for the creation of wealth, strengthened (Frieden, 1986). Each new and advanced capital investor - often with a specialised vision on perfecting their own extraction and production processes into a competitive market-based system was incentivised by the State and the economy to utilise natural resources for profit. Some view capitalism's adaptability to different social contexts and its capacity for technological innovation as more important than the natural world (Schumpeter, 1943), because the capitalist system has contributed to high economic growth and substantially rising levels of production and consumption (early key thinkers include: Hayek, 1976; Rand et al., 1986; Carlsson and Stankiewicz, 1991 - with modern day movements captured in: Amin, 2014; Frieden and Rogowski, 2014). Here environmental problems and scarcity of natural resources represent a challenge, but not any insurmountable barrier (Næss, 2006).

In the mid-1970s 'neoliberalism' gained hegemony, within the rhetoric of progress affiliated with members of society able to embrace capitalist growth (Palley 2005; Wissenburg, 2006). The process of neoliberalism involves fast evolving, multi-faceted and spatially variable practices and policies that support a market-enabling approach (Lovering, 2007; Peck et al., 2009; Allmendinger and Haughton 2013), where production often requires evermore finite resources and creates continued rounds of capital accumulation for elites (Brand, 2007; Moore, 2014). "*Under private ownership every bit of wealth, as it arises, is immediately and automatically privately appropriated*" (Schumacher, 1973: p.230).

This is well evidenced in the marine environment through individual transferable quotas (ITQs); permits to catch or transfer a fixed share of a total allowable catch (TAC). A growing body of scholarship has focused on the socio-economic impacts of ITQs, highlighting the role ITQs have played in capitalising fish quotas, transferring quota ownership to investors, increasing processor control, concentrating ownership, blocking entry of younger fishers, and increasing class divisions within coastal communities (e.g., Wiber, 2000; Brandt and Ding, 2008; Carothers and Chambers, 2012; Emery et al., 2014). Additionally, neoliberal-capitalist thinking has often been present in justifying the introduction of ocean grabbing, for example in some areas of aquaculture (Wilkinson, 2006), that lends itself to privatisation and marketisation of marine space (Pinkerton and Davis, 2015).

During the latest half century, the environmental costs of the predilection for economic growth, wrought by neoliberal-capitalist hegemony have become more and more evident (McCarthy and Prudham, 2004; Næss, 2006; Moore, 2016; Carter, 2018). The IPBES Global Assessment (2019) identified the role of economic growth as a driver of nature loss. Many of these developments threaten coastal communities with continued movement towards yet another sector under corporate control (Pinkerton and Davis, 2015). The impact of environmental degradation is frequently geographically and socially uneven, which impose negative environmental costs on some but not on others, often meaning that the powerful and wealthy that have gained financial capital, have the potential to locate away from the ecological problems (While et al., 2010). Acosta (2013) argues that poverty in many countries around the world is related to the existence of significant natural resources, in that countries that are rich in natural resources, and whose economy is based primarily on extracting and exporting one or just a few primary commodities, find it more difficult to develop. This is because capitalist extractivism has been a mechanism of colonial and neo-colonial plunder and appropriation (Acosta, 2013).

Nevertheless, economic growth is widely regarded as a key goal of national and international economic policies (Schmelzer, 2016). In the 1930s when Simon Kuznets, an American economist, designed the model of Gross Domestic Product (GDP), he warned against using the model to measure quality of life (Costanza, et al., 2014), because GDP only measures what is sold, it does not capture the value of what you have used or given up by doing that. Therefore, GDP was not originally designed to be a key policy goal. Since the 1960s, the Organisation for Economic Cooperation and Development (OECD) has created tables comparing one country against another based on their economic growth rate, which created a competitive system wherein being at the top of the table, through the highest growth rate, denotes inclusion in the G7 or G20²⁹ that convene at a geopolitical level (Schmelzer, 2016). Ergo, financial growth is based on extraction of resources, and growth denotes power through geopolitical positioning.

Shaped by the imperative to grow the economy, by liberalising trade and privatising natural resources, scholars increasingly document and analyse the resulting forms of neoliberal environmental governance (Brand and Gorg, 2003; Gorg, 2007), which has now become the dominant model (McCarthy and Prudham, 2004), or what Castree (2009) calls 'neoliberal nature', ultimately, leading to disjointed and power-dependant decision-making (Agnew and Corbridge, 1995; Peck, 2001; Liverman, 2004, McCarthy and Prudham, 2004; Parr, 2014). Where environmental policy at any given temporal and spatial context will be composed "*of a patchwork of partially overlapping and some-times contradictory laws, administrative rules, and programmes*" (Meadowcroft 2005: p.17).

Owing to neoliberalism's commitment to the extension of markets with a profound antipathy to all kinds of collectivist strategies (Heynen, 2005), neoliberalism has, over the last thirty years,

²⁹ The top seven and twenty countries with the most advanced economies

fragmented administrations in the United Kingdom (Phillips and Ilcan, 2004; Davis and Walsh, 2017), causing separation of policymaking (Gruening, 2001), thereby creating specialisations and silos with reduced capability to handle complex cross-cutting issues, and furthered estrangement between legislative and regulatory frameworks for different sectors (Christensen and Laegreid, 2013; Scott and Holtby et al., 2022). Different vocabularies and jargon exist across these silos (sectors, organisations, groups, departments, and natural and social scientists – as well as across agencies and organisations that deal with the marine, coast and terrestrial space), hindering cooperation and interdisciplinary effort (Bracken and Oughton, 2006; Reed, 2008). Lowndes and Wilson (2003) stress the complexity of institutional arrangements within, between and around organisations, and the interaction of formal and informal rules in an increasingly fragmented and differentiated world of governance. Collectively this shapes a highly contested and (dis)integrated arena in which purposive attempts at change are hard to achieve.

As Moore (2014) points out, the succession of productivity and plunder, at first unrestricted in its accumulation, is only to fetter over time as the great expansion and accumulation by appropriation disappears. This is echoed in the recent Dasgupta Review (2021: p.114), which finds that globally ‘produced capital’ per head doubled, but the stock of ‘natural capital³⁰’ per head declined by nearly 40% in the period between 1992 and 2014. Therein, human impact on the world has grown exponentially year on year through continued and increasing economic activity, through invading hitherto unexploited and underexploited ecological niches (Porritt, 2012). However, the continuous movement towards rising capital and declining ecological surplus squeezes the rate of accumulation as opportunities for new productive investment dry up (Moore, 2014).

³⁰ The stock of natural assets (Pearce, 1998). A further considered concept within ESc, in section 3.7.

Whilst self-regulation by industries is theoretically possible (and often the preferred system under neoliberal modes of regulation), there is usually an expectation that the modern state will intervene to address or avert potential environmental or ecological crises (While et al., 2009). However, the state evermore has vested interest in capitalist ventures: therefore, the demands on the state for environmental regulation, and the subsequent response to those demands, are likely to be complex and contradictory across time and space (While et al., 2009). Underlying all evaluations is the basic principle of unfettered capitalism: the view that money-making should always be valued higher than democracy, human rights, environmental protection, or any other value. The environmental protection movement has suffered under this paradigm, experiencing multiple setbacks and challenges to its development, hindering progress.

3.5. Environmental protection: advancements and contradictions

After World War II, facilitated by new technologies, the marine environment took on greater political, social and economic importance (Ray and McCormick-Ray, 2014). The oceans became a supplier to meet expanding human demands in an era Ray (1970 and 1998) termed the 'Marine Revolution'. Previous revolutions such as the Agricultural Revolution (~1500 - 1800), and the Industrial Revolution (~1760 - 1840), each championed human well-being as it also transformed natural systems and depleted natural resources (Ray and McCormick-Ray, 2014). Recognition of the profound influence of humans on marine and coastal systems has, over the last sixty years, created a plethora of international unions, conventions, and frameworks (Table 2), which are applicable at international, national and local levels; and national laws, regulations, and policies. An English example is further provided (Table 3) to

highlight the domestic environmental framework for governance and decision-making in the marine and coastal space.

Table 2. International events, unions, conventions, and frameworks that further marine protection, including application in the UK.

Date	Event, union, convention, framework	Significance for marine protection
1958	Four Geneva Conventions on the Law of the Sea (Continental Shelf; High Seas; Fishing; and Conservation of Living Resources)	International framework established
1959	Intergovernmental Maritime Consultative Organisation - later to become the International Maritime Organisation (IMO)	Control and prevention of pollution from ships
1962	First World Conference on National Parks	Considered the need for marine and coastal protection
1970s	Marine Program of the International Union for the Conservation of Nature and Natural Resources (IUCN)	Fundamental to the creation of multiple further international conventions
1971	Convention on Wetlands of International Importance - Ramsar Convention	Provided specifications for nations to establish MPA's
1972	Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO)	Provided management for protecting areas of global importance. Protect cultural and natural heritage
1972	UNEP tasked to ensure any emerging environmental problems received adequate consideration by governments. Regional Seas Programme established.	Provided a framework and information base for considering issues. Currently 14 RSPs covering all of the marine environment
1973	Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Regulate international trade of species
1973-77	Third UN Conference of the Law of the Sea	Provided a legal basis from which MPA's could be established
1975	IUCN conference on MPA's in Tokyo	Called for a system of well monitored MPA's representative of the worlds marine ecosystems

1979	Convention on the Protection of European Wildlife and Habitats - Bern Convention	Protection of wild plants and animals
1979	Convention on the Conservation of Migratory Species of Wild Animal - Bonn Convention	Protect migratory species
1980	IUCN, WWF, and UNEP publish World Conservation Strategy	Importance of marine environments and ecosystems for sustainable development
1982	United Nations Convention on the Law of The Sea (UNCLOS)	Establishes a comprehensive framework for use of the ocean and its resources. Defines duties within exclusive economic zones
1983	UNESCO organised the First World Biosphere Reserve Congress	The need for integrated, multiple-use MPA's recognised
1984	IUCN published "Marine and Coastal Protected areas: A guide for Planners and Managers"	Standardised guidelines created
1986-1990	IUCN create the position of vice chair marine to accelerate establishment of global MPA system	Global seas divided into 18 regions
1987	World Commission on the Environment and Development (WCED) published "From One Earth to One World - Our Common Future"	Highlighted: serious and continued threats to marine environment; conservation efforts lagged behind terrestrial; need to integrated approach. Sustainable development defined
1988	General Assembly of IUCN adopted a policy statement with a primary goal defined "marine protected area"	Identified a series of specific objectives and called for the establishment of MPAs by nations
1992	Establishment of Convention on Biological Diversity (CBD)	Framework for biodiversity conservation
1992	OSPAR	Holistic environmental protection in north-east Atlantic
1995	First Conference of the Parties (COP) (Ongoing, usually annually)	Decide and review legal implementation of the CBD
1997	Koyoto Protocol	Convention on Climate change and reduction of GHGs

2000	Millennium Development Goals (MDGS)	Eight international development goals for the year 2015 (Environmental sustainability goal 7)
2010	CBD Conference of the Parties 11 Aichi Targets	10% of the marine environment protected by 2020. Biodiversity Strategy 2011 - 2020
2015	2030 Agenda for Sustainable Development	UN SDGs x 17 (Marine goal 14)
2020	Biodiversity Strategy 2030	Post 2020 Biodiversity framework and targets
2021	Global Ocean Alliance 30 by 30	30% marine protection by the year 2030

Table 3. Environmental legislation and regulation currently effecting the English marine and coastal environment.

Coast				Coast and Marine								Marine					
Town and Country Planning Act (1947: 1990): Planning permissions. EA	Coastal Protection Act (1949): Coastal protection. EA and LA	Harbours Act (1964): Harbour authorities	The Flood and Environmental Protection Act (1985): Licences for dredging	Water Resources Act (1991): Sea defences. EA	Water Environment (Water Framework Directive) (2003): Regulations (2003): Inland and coastal waters to reach GES. EA	Flood Risk Regulations (2009), Flood Risk cross border (2010), Flood and Water Management Act (2010): Flood risk maps, flood risk plans. EA and LA	Town and Country Planning (EIA) Regulations (1999): EIAs for Development consent	Environmental Assessment of Plan and Programmes Regulations (2004): Environmental assessment for plans and programmes with significant effect	Climate Change and Sustainable Energy Act (2006)	Climate Change Act (2008): Net Zero. National adaptation plans. Establishment of the CCC	Natural Environment and Rural Communities Act (2006): Conserve biodiversity. Establishment of NE and reconstitution of JNCC	Habitats and Species Regulations (2010): Natura 2000 sites, SACs protect habitats and species, SPAs protect wild birds. SPAs related to part 1 of Wildlife and Countryside Act, also SPA and SACs linked to Wetlands of International Importance. EA, NE, JNCC, MMO	Environment Act (2021): Targets plans and policies for environmental improvement. Establishment of OEP	Marine and Coastal Access Act (2009): Marine planning, licensing, fisheries. Establishment of MMO and IFCAs, and MCZs	Marine Strategy Regulations (2010): Achieve GES. Overlaps with WFD in coastal areas. MSD implemented through MaCAA 2009	Marine Policy Statement (2011). Development of marine plans. MMO.	Fisheries Act (2020). Joint Fisheries Statement. Fisheries Management Plans. MMO, IFCA, fishing community

Marine protection has lagged significantly behind terrestrial initiatives (Jones, 2002). Marine systems are fundamentally different from terrestrial systems in relation to dispersal of both organisms and pollutants (Jones, 2002), and human impact on biotic communities. For example, in terrestrial systems, autotrophs and herbivores are commonly exploited, whereas marine exploitation is usually directed at top-level predators (Allison et al., 1998). However, marine and coastal protection is largely based on examples of antecedent terrestrial protection (Jones, 2002; Adams, 2004). Namely, protection of habitats in the form of Marine Protected Areas (MPAs), or protection of specific charismatic species (e.g., whales, turtles, and dolphins). However, marine ecological research continued to advance through new technologies, undersea exploration, satellites, computer analysis and modelling, highlighting how ecosystems were connected as interacting communities and processes (Worm et al., 2006; Stachowicz et al., 2007). Recognition that entire ecosystems and biodiversity were seriously under threat challenged the wisdom of protecting single charismatic or indicator species (Wilson, 1988; Hughes et al., 2005). Therefore, entire ecosystems rather than species management have become an explicit part of marine (and terrestrial) policies that feature in international treaties and national legislation (Fulton et al., 2003).

Several large international science programs³¹ were conducted to enhance the importance of wider ecosystem and biodiversity conservation; protecting biodiversity hot spots became imperative (Myers et al., 2000; Norse and Crowder, 2005), national parks emerged and biodiversity mainstreaming literature developed (see Whitehorn et al. 2019 for review of national strategies). Overall findings suggest that factoring biodiversity conservation into actions remains a challenge across much of the world and countries developing their National Biodiversity Strategies and Action Plans (NBSAPs) have found it challenging to mainstream

³¹ For example, the International Biological Program (IBP) focuses on the structure, function, and productivity of major global ecosystems (Lieth and Whittaker, 1975) and the Man and the Biosphere Programme (MAB) was launched in the 1970s, which focused on the relationship between human activities and the biosphere (Dyer and Holland, 1988).

biodiversity into economic development (Leadley et al., 2014; Karlsson-Vinkhuyzen et al., 2017; Whitehorn et al. 2019) due to economic sectors still considering biodiversity to be distant from their key interests (Whitehorn et al. 2019). Additionally, Garland (2008) and Thekaekara, (2020) suggest that, in practice, conservation organisations have sometimes championed the universality of the concept of biodiversity while continuing to prioritise their immediate objectives for rare species or wild ecosystems, with the resulting policy recommendations set up for exclusion of some groups towards a target of exclusive pristine islands. Muradian and Pascual (2018), and Lele (2020) further this to suggest the dominant call from a section of the conservation movement to protect biodiversity as pristine nature is most often made by those embedded within the modern urbanised world, who tend to ignore the views and values held about nature by local communities living in a much more symbiotic relationship, and much less destructive lifestyles.

Historically, the imposition of Euro-American ideas of 'wild' nature through neo-colonial regimes has had grim consequences for those who have a different relationship with nature, such as local (often Indigenous) communities practising shifting cultivation or hunting and gathering that incorporate multiple values of nature (Brockington et al., 2008). Thus, a single-minded pursuit of a narrow notion of conservation, when coupled with inattention to the social justice implications and the social position of the conservationists themselves, results not only in conflict and human suffering, but also in a loss of legitimacy for the wider idea of biodiversity conservation (Pascual et al., 2021).

Additionally, marine protection and conservation have, historically, been seen by many groups, such as fishers, as being counter intuitive to their livelihood and in that sense have received a hostile response and sometimes counterattack (Brown, 2002; Agardy et al., 2003; Gell and Roberts, 2003). Despite evidence that MPAs can be beneficial to fisheries through

spill-over of exploitable species (McClanahan and Mangi, 2000), the historical conflict is one reason why, until recently³² marine conservation and fisheries management have developed over the years with minimal direct interaction (Wolfrum and Matz, 2003). Marine protection is governed by the conventions, frameworks, targets for protection, and legal and regulatory measures as highlighted in Tables 2 and 3, and fisheries by separate organisations such as Regional Fisheries Organisations and Regional Fisheries Management Organization, who develop separate regulations on gear selection and effort restrictions, area restrictions, landing taxes, harvest quotas, minimum sizes, and by-catch (Nøstbakken, 2008).

In recent years, environmental protection debates have been further complicated by an additional trend within academic research and policy application about a perceived turn towards neoliberal forms of conservation (West and Brockington, 2006; Holmes and Cavanagh, 2016). A trend characterised by the rise of practices and discourses of marketisation, privatisation, and commodification within conservation governance (Igoe and Brockington, 2007; Fairhead et al., 2012). Neoliberal conservation projects can deliver benefits to local people such as payment for ecosystem services³³ (PES) models (Corbera et al., 2007, Kosoy et al., 2007, Pagiola, 2008, Wunder and Albán, 2008; Reed et al., 2008), which have emerged globally through payments to proprietors for carrying out particular practices such as biodiversity conservation, hydrological services, carbon sequestration, erosion prevention, or protection of scenic beauty (Farley and Costanza, 2010; Pearce and Moran, 2013). Also, employment opportunities for local people and revenue from ecotourism, which can sometimes empower local communities – for example, through greater civil society (e.g., Doyon and Sabinot, 2014), or fishing communities' involvement and community participation (Segi, 2014). Conversely, such conservation projects have also been shown to disempower communities and expose them to greater risk of harsh treatment, such as where

³² The Fisheries Act (2020) called for Fisheries Management Plans that have intention to manage fisheries for conservation – however, these have not been designed or instigated yet (as of writing)

³³ A considered concept within ESc, further unpacked in section 3.7.

tourism economies have led to local communities losing control over their land and suffering from violent enforcement of regulations (e.g., Benjaminsen and Bryceson, 2012) and restricting the livelihoods of artisanal fishermen (e.g., Brondo and Bown, 2011). Thus, numerous scholars have highlighted the essentiality of local community inclusion in MPA design, implementation, design, and management (Ferse et al., 2010; Bennett and Dearden, 2014), and community resource management (see Milupi et al., 2017 for review), and highlighted mitigation of negative consequences through establishing ostensibly more equitable policies and institutions (Dressler et al., 2010). This becomes ever more important because MPAs are necessarily growing in size (Leenhardt et al., 2013).

Historically, MPA designations have been small and fail to offer adequate protection to many species within the ecosystem (Agardy et al., 2011). Globally, the original 10% of protection target set by the World Summit on Sustainable Development (WSSD) and the United Nations Convention on Biological Diversity (CBD, 2010) has not been met and progress has been slow (Laughren and Pauly, 2008; Matthews and Spalding, 2010; Pauly and Roberts, 2012). There is a new target of 30% protection by 2030 as called for by the IUCN World Conservation Congress³⁴ and the Global Ocean Alliance³⁵. However, Jefferson et al. (2021) highlight, using decision support software, that a minimum of 40% of the ocean is required to adequately protect 68% of all aspects of biodiversity and 30% of IUCN Red List threatened species ranges.

³⁴ <https://www.iucncongress2020.org/programme/official-programme/session-55738>

³⁵ Led by the UK, a 73 country strong alliance, working alongside the CBD to champion ocean action <https://www.gov.uk/government/topical-events/global-ocean-alliance-30by30-initiative/about>
All supported by a new legal framework that was signed at the time of submission of this thesis, the 'UN High Seas Treaty' <https://www.newscientist.com/article/2362921-what-is-the-un-high-seas-treaty-and-will-it-save-the-worlds-oceans/>

In the UK 38% of territorial waters have some kind of protection, however, only certain habitats and species are protected; undesignated features are not protected and only the most damaging fishing activity is controlled, thus not providing ecosystem protection (van Rijn and Wakefield, 2020). Additionally, Young et al., (2019) found that there has been too much focus to date on designation of MPAs, whereas implementing active governance and management in these areas is lacking, largely due to a lack of long-term funding. This is echoed in Doctoral research by Mason (2019: p.347), who summarised that *“the UK’s failure to develop management plans for its MPAs falls far short of meeting its international obligations, such as adopting a precautionary approach³⁶ or an ecosystem approach³⁷. As a consequence, the sites can only be regarded currently as ‘paper parks’ rather than beacons of conservation excellence with powerful legal protection”*. Indeed, a recent report by Wildlife and Countryside Link (2022) found that a maximum of 8% of English seas could be said to be effectively protected for nature. Additionally, governmental reports highlight Good Environment Status (GES) is not being achieved for six out of eleven marine indicators (Defra, 2019); whilst there are multiple plans and strategies, there are major barriers to delivery on the ground.

Since the 1990s an emphasis on large scale MPAs, no-take MPAs, or marine reserves have been highlighted as effective at restoring and preserving biodiversity while increasing ecosystem resilience, and as essential to meet global targets (Halpern, 2003; Sala and Giakoumi, 2018). Though, regardless of size, it has been found that MPAs with community engagement and support are most effective. Giakoumi et al. (2018) highlights this point stressing that the principal drivers of success and failure of MPA effectiveness are related to

³⁶ The precautionary approach refers to the precautionary principle, which, according to Kriebel et al., (2001) provides guidelines in environmental decision-making, utilising four central components: taking preventive action in the face of uncertainty; shifting the burden of proof to the proponents of an activity; exploring a wide range of alternatives to possibly harmful actions; and increasing public participation in decision-making.

³⁷ Considered concept within ESc, further unpacked in section 3.7.

contextual factors, such as socio-economic factors and governance, rather than design attributes such as size.

Following the Benyon Review (2020) into Highly Protected Marine Areas (HPMAs), the UK Government has committed to introducing pilot HPMAs in English waters to provide the highest protection and allow full recovery of ecosystems [within them] to as most natural a state as possible, as they prohibit all destructive, extractive and depositional activities within the entire site (Benyon, 2020). However, Allison et al. (2008) states that reserves are insufficient protection alone because they are not isolated from all critical impacts. Indeed, the Benyon Review discusses how HPMAs should be introduced in areas of sea within the UK Government's competence, taking account of other objectives for the marine area, including maximizing the economic recovery of UK petroleum, which van Rijn and Wakefield (2020) remark is extraordinary given the climate crisis and international and national commitments towards Net Zero³⁸.

The conservation goals of a reserve plan will not be met if the reserve is designed or implemented in isolation of other factors (Halpern, 2003; Halpern and Warner, 2003); pressure alleviation in the wider marine system is also necessary (Lannin, 2021). De Santo (2013) argues that a focus on quantity targets over quality risks undermining the achievement of sustainable long-term environmental objectives by weakening the science-policy interface in environmental decision-making by prioritising political over ecological networks of protected areas. Also, De Santo states that high MPA targets with no human activities permitted may also undermine social justice for local communities and increase conflict, resulting in stakeholder distrust and alienation. Consequently, this can lead to infringements in the

³⁸ <https://www.un.org/en/climatechange/net-zero-coalition>

protected area down the line as well as future opposition to the designation of MPAs, highlighting the need to expand beyond technocratic roots to delivery to address the deeply divisive values at the heart of contemporary conservation challenges (Sullivan, 2020). Thus, environmental priorities need to be better mainstreamed into wider social justice priorities at the outset of protection debates to reduce conflict (De Santo 2013; Flannery et al., 2016; Jones and De Santo, 2016).

3.6. Sustainable development: a win win or lose lose solution?

The need to embed environmental protection alongside social justice and economic factors was popularised in the publication of *Our Common Future* (1987), a report by the UN World Commission on Environment and Development (WCED), also known as the Brundtland Report³⁹. The report stressed that the three pillars of environment, society and economy must be equally considered in policy and decision-making to achieve 'sustainable development'. The report provided the most frequently used definition of sustainable development:

“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland et al., 1987: p.40).

This definition was one of the first to highlight the need to include intergenerational equity into present day policymaking. It received wide acceptance, because it can be interpreted in numerous different ways; it is something to which everyone can agree (Pearce et al., 1989).

³⁹ Developed by the Brundtland Commission, a sub-organisation of the United Nations chaired by Gro Harlem Brundtland, a scientist and health specialist.

Albeit somewhat vague, the concept of sustainable development aims to maintain economic advancement and progress while protecting the long-term value of the environment touted by many as 'win-win' solutions (e.g., Elkington, 1994; Emas, 2015; Barbier and Burgess, 2017). However, the malleability allows policies, plans programmes, and projects (PPPPs) from local to global, concerning the environment or development, from institutions of government or business or civil society, to each project their interests and aspirations onto the banner of sustainable development resulting in dangers of greenwashing (Mebratu, 1998; Robert et al., 2005).

Therein, the ambiguity of the concept has also been a cause of concern and criticism to many scholars (e.g., Mebratu, 1998; Daly, 1995; Connelly, 2007; Adelman, 2018). It is argued the approach to sustainability only achieves sustainable futures for some organisations or sectors, and not really the environment (Stevens and Kanie, 2016). Institutions, organisations, and actors with different policies and decision-making frameworks often have competing interests, strategies, and targets but operate within the same geographical space. The distribution of marine and coastal resources is exploited and not at all balanced, as national or multi-national corporations frequently extirpate local or indigenous people's environmental sustainability but present their own policies as sustainable (McAfee, 1999; Fairhead et al., 2012). As Engelman (2013: p.3) states "*we live today in an age of sustainababble*".

Such as with conservation and protection projects, one of the major criticisms levelled against sustainable development is that it has seldom been owned by those subjected to it and too often been imposed on populations (Adelman, 2018). The Agenda 21 declaration from the Earth Summit (1992) asked governments to commit to preparation of national sustainable development plans, in particular Chapter 28 envisages local-authority-led action (UNCED, 1992). This contributed significant changes to the planning system, however, there has been

lack of significant resource and guidance and a continued apathy and difficulty obtaining consensus on meaningful indicators (Scott, 1999).

This was recognised in the development of the 2030 Sustainable Development Agenda and accompanying seventeen Sustainable Development Goals⁴⁰ (SDGs) (that succeeded, built upon, and expanded the eight Millennium Development Goals). The preparation of the SDGs was undertaken through a lengthy, open, and transparent process with many actors involved in the various levels of discussions (Stevens and Kanie, 2016; Tosun and Leininger, 2017). This had the aim to create an integrative agenda that includes environmental sustainability and social concerns with the poverty eradication agenda (Griggs et al., 2013), and integrate targets from other conventions, such as the CBDs Aichi Biodiversity Targets⁴¹. However, some actors feel that an agenda consisting of seventeen goals is too unwieldy to implement or communicate to the public in any meaningful way (e.g., Ford, 2015). Additionally, as Adelman (2018) argues, growth-driven development is intrinsically ecologically unsustainable because it destroys ecosystems and breaches planetary boundaries.

Strategies of green/blue growth divert attention from the social and political dimensions of sustainability and issues of social and international justice. In this way, it is sustainable development of neoliberal capitalism that is maintained (Wanner, 2015), and again, power imbalances delineate outcomes (Ruddle and Hickey, 2008; Berthe and Elie, 2015; Oshionebo, 2018). There is also consensus that in practice and in outcomes that social sustainability – including issues of wellbeing, health, quality of life; equality and justice; resilience and social capital; and sustainable communities, cohesion and diversity (Dempsey et al 2011; Gustavsson and Riley, 2018; Song et al., 2019) has been of a lower priority to both

⁴⁰ THE 17 GOALS | Sustainable Development (un.org)

⁴¹ And marine protection target as discussed in section 3.5

environmental and economic sustainability at the intersection of ecological scientific and economic growth-driven governance strategies and frameworks (e.g., Parlee and Wiber 2014).

While environmental deterioration is rarely the result of malicious intent, key drivers include over exploitation, neo-colonial, neoliberal capitalist regimes of conservation that largely exclude or have fair regard to local knowledge and values; and disjointed governance at international and national scales, that have poor communication (Balgos et al. 2015; Stephenson et al. 2019), and have not been set up to facilitate and legally oblige true sustainability as neoliberal fragmentation obscures responsibility (Dauvergne, 2018). These ongoing challenges are illuminated in the following quote (DBSA, 2008; furthered in Dalal-Clayton and Bass, 2009: p.32):

“It cannot be assumed there are a bunch of people out there who recognise the need for change and that what is missing are the tools for the change... We need to go back a step in this process, i.e. that the fundamental issue here is that current development/economic/political/social structures of ‘western capitalism’ (as the current dominant paradigm), built up over 100s of years (and thus all the tools etc are designed to assist this system, not change/oppose it, because that has been what has been valued and rewarded) simply don’t allow for long-termism, strategic planning (in terms of new/sustainability model), sustainability etc. Until and if the majority of measures (e.g., GDP) are changed to reflect this, and reward systems (e.g., World Bank loans not based on ‘good economic growth, but improved social and environmental performance!)) decision-makers will not change...”

Despite what we know about our current path, the measures are actually not just changing, but increasingly resisting the changes (witness the increasingly obscene payouts for top performing CEOs on only financial returns, not on social and environmental measures – i.e., the biggest drivers of unsustainability are the highest rewarded! It is much the same as with governments). When change becomes apparent, those with the power who need to effect the changes, resist the changes because they have the most entrenched interests in the current system, precisely because their power comes from the current system! Dictators do not (voluntarily) give power to the people; otherwise they lose that power and all the privileges which go with it”.

Sustainable development and resultant environmental regulation will reflect the “*strategic selectivity of the state*” (Jessop, 2002: p.31) as governments seek to balance the environment with other pressures and demands within wider society, whilst maintaining economic growth goals for those with capital to invest. Following Gramsci's (1971) terminology, sustainable development can be interpreted as a passive revolution, in the sense that change is managed through compromises but within limits, which neutralise any potential threat to economic and political power (Trantas, 2021). Again, this type of approach follows Krznaric (2017) reform trajectory. On the contrary, an emerging (yet still marginal) alternative degrowth paradigm is emerging.

Building on Herman Daly's 'steady state economy' (Kerschner, 2010), degrowth is associated with the work of Latouche, in particular, and emerged as a major European intellectual movement in 2008 (Foster, 2011). It is example of an activist-led science now consolidating into a concept in academic literature (such as Martinez-Alier et al., 2010; Victor, 2012; Schneider et al., 2011). Degrowth is not just an economic concept, rather, it is a frame constituted by a large array of concerns, values, goals, strategies, and actions. Some authors (e.g., Demaria et al., 2013), refer to degrowth as an ideology, and others as the mechanism through which actors engage in a collective action (Della Porta and Diani, 2006) as it is concerned with deeper democracy (e.g., Asara et al., 2013). In this context, the degrowth movement has forged strong connections with bioregionalism, permaculture, and some authors (e.g., Demaria et al., 2013) describe it in terms of a better meaning of life, in a critique of lifestyles based on the mantras of working more, earning more, selling more, and buying more. Where the contemporary context of neoliberal capitalism appears as a post-political condition (Swyngedouw, 2007).

This transition directly challenges the established orthodox growth narrative and the mechanisms of neoliberal capital accumulation. Thus, *“in contrast to the sustainable development discourse, it is difficult for the ‘power bloc’ to accommodate degrowth”* (Trantas, 2021: p.1). Whitehead (2013) agrees, the main problem with the dominant economic growth-based model is the power of a restricted group of (capitalist) actors, that benefit from maintaining the present model. This is where classic ideas of Marxism ring true. The dominating ideas of each age have ever been the ideas of the ruling class (Marx and Engels, 1845). Therefore, in this view, attempts of purposive change must also [initially] meet the requirements of those in power.

Boonstra and Joosse (2013) describe the paradox that although degrowth and capitalism are clearly incompatible, degrowth must emerge (out of necessity) from a capitalist socio-economic system through challenging power structures. Trantas (2021), furthers this argument to suggest in the current times of crisis, the dominant powers could indeed use some aspects of the degrowth discourse, assimilating and transforming them into elements that fit their new accumulation strategies, hegemonic visions and state projects.

In contrast, Van den Bergh (2011) argues against degrowth, stating most interpretations of degrowth are not meaningful in the context of environmental aims as they do not represent strategies which guarantee an effective reduction of environmental pressure or a transition to a sustainable economy. Van den Bergh highlights that global environmental problems cannot be tackled by voluntary action and grassroot initiatives alone. Therefore, the current paradigm necessitates monetary investment contribution from governments and the private sector into environmental priorities. Here, the Doughnut Economics model (Raworth, 2017) as briefly alluded to in the introduction chapter (1.1) is again highlighted as, arguably, it provides the route map to move away from traditional linear economic systems; to change from endless

GDP as the goal as it is deemed no longer fit for purpose for the 21st century. The Doughnut consists of two concentric rings: a social foundation, and an ecological ceiling, to ensure that humanity does not overshoot the planetary boundaries that protect Earth's life-supporting systems, while also recognising that livelihoods, innovation and advancement is important.

Another approach that has been highlighted as a method to elevate the importance of the environment is the natural capital approach (Turner and Daily, 2008; Raven, 2012; Bateman and Mace, 2020), where the concept of natural capital (NC) is gaining traction internationally as recognition grows of the central role of the natural environment in a sustainable economy, sustainable blue/green economy, and for improvements in social well-being (Costanza et al., 1997; Daily, 1997; MA, 2005; Díaz et al., 2015). NC is related to other ecosystem concepts that are individually divisive and collectively immature, though how they unfold and develop over the coming years is going to be crucial to their success.

3.7. Introducing ecosystem science and its theoretical and practical contributions

The concept of 'ecosystem' has grown from centring on relationships between organisms and the environment, material cycling, and energy flows (O'Neill et al., 1986; Matthews et al., 2011; Weathers et al., 2021) toward more systematic, integrative, and application-oriented studies that include human activities (Yu et al., 2021). Shifting from a primarily biology-oriented focus to an integrated multi-disciplinary scientific field, including social and economic perspectives, to provide systematic solutions to many of the major issues facing human societies (Yu et al., 2021). Slocombe (1993) and Barange et al. (2010) draw on ecosystem science as a

biophysical discipline to develop the concept of ecosystem-based management (EBM), as a broader holistic decision-making framework incorporating the ecological, social, and economic value of all the goods and services provided by ecosystems. Slocombe (1993: p.612) states “*ecosystem-based management, to planning and management, is partly a matter of redefining management units and partly a matter of building on the best ecosystem science*”.

‘Ecosystem science’ (ESc) was advanced by Scott et al. (2018) as a collective body of concepts and approaches rooted in SES thinking (including while also progressing from the biophysical focus). In their work they include the ecosystem approach (EcA), ecosystem services (ES), the ecosystem services framework (ESF), and natural capital. NC and ES have later been developed into the natural capital approach (NCA) for decision-making (see Bateman and Mace, 2020). Also linked to ESc is nature-based solutions (NbS) (IUCN, 2016; Turner et al., 2022), and net gain (NG) (Bull and Brownlie, 2017) concepts through the link between SES resilience and enhancement of NC. See Table 4 for commonly used definitions.

Table 4. Individual ecosystem science concepts and definitions.

Ecosystem Science (ESc) principle	Common Definitions	Key References
Natural Capital (NC)	<ul style="list-style-type: none"> • is the set of all environmental assets • is the soil and atmospheric structure, plant and animal biomass, etc., that taken together forms that basis of all ecosystems • is the elements of nature which either directly provide benefits or underpin human wellbeing. In this way, natural capital generates value for people 	<p>Pearce (1988) Costanza (1992)</p> <p>NCC (2017)</p>
Ecosystem Services (ES)	<ul style="list-style-type: none"> • are the benefits people obtain from stocks of NC, which includes provisioning services (such as food, water, and raw materials), regulating services (such as climate regulation, flood control, and waste assimilation), cultural services (such as recreational and spiritual values), and supporting services (such as photosynthesis and nutrient cycling) that maintain 	<p>MA (2003) UKNEA (2011)</p>
Ecosystem Approach (EcA)	<ul style="list-style-type: none"> • is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Utilising 12 core principles • generally understood to encompass the management of human activities, based on the best understanding of the ecological interactions and processes, so as to ensure that ecosystems structure and functions are sustained for the benefit of present and future generations 	<p>CBD (2010)</p> <p>UN (2010)</p>
Ecosystem-based Management (EbM)	<ul style="list-style-type: none"> • is an environmental management approach that recognizes the full array of interactions within an ecosystem, including humans, species, or ecosystem services in isolation • is a broad approach, involving the management of species, other natural commodities, and humans as components of the larger ecosystem • requires not only the greater ecosystem concept, it also requires a new inter-disciplinary framework to integrate research, planning, and management 	<p>Arkema et al. (2008)</p> <p>Sloccombe (1993)</p>
Ecosystem Services Framework (ESF)	<ul style="list-style-type: none"> • encompasses a comprehensive analytical and practical process which begins with a problem/issue identification stage in which ecosystem service provision and the social, economic and politico-cultural contexts are delineated and scaled. The chosen ecosystem and services are then modelled, mapped and valued. The management choices and their opportunity costs can be explored via scenarios of future states of the world and/or policy interventions • can be broadly divided into an assessment-oriented definition and into a governance- 	<p>Turner and Daily (2008); de Groot et al. (2010)</p> <p>Scott et al. (2014)</p>

Natural Capital Approach (NCA)	<p>oriented definition... includes attention to policy stages and tool applications within a wider environmental change context</p> <ul style="list-style-type: none"> • core requirement is to measure the extent, status and value of NC assets and the ESs and benefits derived from the NC • can include NC accounting to measure and quantify the capacity of ecosystems, by tracking the extent and condition of stocks of NC and ES flows in monetary and non-monetary terms 	<p>NCC (2017) Mace et al. (2015) Hooper et al. (2019)</p>
Nature-based Solutions (NbS)	<ul style="list-style-type: none"> • are actions to protect, sustainably manage and restore natural or modified ecosystems, increasing environmental aspects to address societal challenges (e.g. climate change, food and water security or natural disasters); simultaneously providing human well-being and biodiversity benefits 	<p>IUCN (2016)</p>
Net Gain (NG)	<ul style="list-style-type: none"> • is a measurable environmental target for development projects where impacts on biodiversity are outweighed by a clear mitigation hierarchy approach to first avoid and then minimise impacts, including through restoration and / or compensation • biodiversity NG is an approach to development that leaves biodiversity in a better state than before • taking the broader perspective of environmental (as opposed to biodiversity-only) net gain, and linking this to the natural capital approach offers advantages • it is also essential that marine net gain considers species as well as habitats 	<p>CIEEM, IEMA, CIREA (2016) Hooper, Austin, Lannin (2021)</p>

All these concepts have emerged over time and for different reasons with little attention as to how they join-up or integrate. There is no literature that brings the full suite of concepts detailed here together although pioneering work was done by Scott et al. (2021) in the grey literature regarding the link between NC, ES, NG and green infrastructure. Though there is literature on individual, or few selected concepts own relationship with ecosystem science and SES; they are typically discussed and/or utilised separately. Indeed, the terms are often used interchangeably, uncritically, and applied selectively ignoring the inter-relationships, thresholds, and dependencies (Spash, 2008; Haines-Young and Potschin, 2009; Jones et al., 2016). Often research and/or practice will focus on one or two ESc concepts and applications, from a specific viewpoint, rather than optimising the full suite of ESc or delivering solutions based on multiple disciplines (Scott et al., 2018). As Posner et al. (2016) and Scott et al.

(2018) note, there is limited research demonstrating how policy and decision-makers actively use these concepts in their decision-making processes. Because the wider literature largely treats the concepts as separate entities, the following review initially presents literature on each concept, highlighting key areas of debate. The small amount of literature where the some, but never all, of the concepts are interlinked is then highlighted.

Shumacher (1973) was one of the first modern economists to use the concept of NC⁴², he states natural resources are undeniably NC items that, if treated as such should be conserved and “*we should do everything within power to minimise their current rate of use*” (Shumacher, 1973: p.4). Furthered by Pearce (1988), who refer to natural resources as “*the set of all environmental assets*” stating “*sustainability requires a constant stock of natural capital*” (Pearce, 1988: p.599). Thereafter, the ecological economics movement (e.g., de Groot, 1987; Costanza, 1992 and 1997) furthered the concept to highlight the value of global NC and flows of ecosystem service (ES) benefits where healthy ecosystems can provide a set of essential services that deliver increased human wellbeing (Beaumont et al., 2007; Díaz et al., 2015; Potschin and Haines-Young, 2013). On the contrary, degraded ecosystems can lose their capacity to provide services (Culhane et al., 2019). This is an advanced way of framing the decline in ecosystem and biodiversity as previously discussed in the protection section (3.5), now specifically relating the loss of ecosystems elements and functions as detrimental to humans. Failure to ensure that NC stocks and ES flow are used and managed efficiently leads to over-use and degradation of environmental resources; understanding these processes is therefore a central requirement for sustainable development (Bateman and Mace, 2020). Later contributions from Porritt (2005) highlights the ‘Five Capitals Model’ which

⁴² Early definitions of natural capital focused on land from a socialist perspective (Considerant, 1848., p20-21), hegemony of landed property and its consequences for social justice (Jones, 1849., p.6, 19, 20), and land and mines (Royal Statistical Society, 1904., p. 688). Additionally, early distinctions were made between natural capital as available material, and artificial capital as useful goods that derive from this (Walras, 1860; Johnson, 1909). The closest to present meaning was Schaffle (1861., p.43), an Austrian socialist and political economist who defined ‘Naturkapital’ as all natural resources and forces such as water, light, air etc., which furnish productive services (see Missimer, 2018)

illuminates NC as the basis for all other capitals i.e., manufactured capital, financial capital, human capital, social capital (Porritt, 2005).

In the late 1970s and 1980s several authors started referring to ecosystem functions as 'nature's services' or 'ecological, environmental, and ecosystem services' highlighting those functions of nature served human societies (Odum and Odum, 1972; Westman, 1977; Braat et al., 1979; Ehrlich and Ehrlich, 1981; Kellert, 1984). The utilitarian framing of beneficial ecosystem functions as 'services' was to capture nature's value to human existence and demonstrate how the disappearance of NC affects ecosystem functions that underpin critical services for human well-being. ES terminology is used to identify and assess the value of the natural environment through the quantification and qualification of the multiple societal benefits received from finite stocks of NC (Bateman et al., 2013; Raffaelli and White, 2013).

NC and ES gained increasing traction as a policy-shaping framework, largely through the Millennium Ecosystem Assessment (MA) (2003) and TEEB (2010) (see also Costanza et al., 2014; Guerry et al., 2015). This catalysed significant national responses within dedicated national ecosystem assessments (e.g., UKNEA, 2011) and associated policy papers (e.g., the Natural Environment White Paper (Defra, 2011)) and the 25 Year Environment Plan (Defra, 2018), which contain UK Government commitments to the use of NC as a natural resource management approach, tested through four Pioneer projects, which led to the first Marine Natural Capital Plan (Ingle and Stainthorp, 2020).

More broadly, convergence around high-level classification of services developed within the provisioning, regulating and cultural categories. However, research applications (e.g., Beaumont et al., 2007, 2008; Everard et al., 2010; Atkins et al., 2011; Dickie et al., 2014; Norton et al., 2018) have rarely used these overarching frameworks without first modifying

them to suit specific circumstances (Hooper et al., 2019). This suggests that these overarching frameworks provide a strong conceptual basis for assessment, but do not provide a standard operational classification that can be universally applied in practice (Hooper et al., 2019). The Common International Classification of Ecosystem Services (CICES; Haines-Young and Potschin, 2013; 2018), and the European Union's Mapping and Assessment of Ecosystem Services (MAES) initiative, which links to the European Nature Information System (EUNIS) and Marine Strategy Framework Directive (MSFD) classifications (Maes et al., 2013), are the most commonly used habitat and species classification systems and have been used by government agencies as well as academics (e.g., La Notte et al., 2017). However, the difficulties of successfully developing a universally accepted system are well documented, with some authors questioning whether this could ever be achieved (Costanza, 2008; de Groot et al., 2002; Fisher et al., 2009).

The ecosystem service framework (ESF) developed to look at whole ecosystems in decision-making, including human dimensions (Turner and Daly, 2008; de Groot et al., 2010; Scott et al., 2018), and was based upon a conceptual model adapted from Haines-Young and Potschin (2010) and Maltby (2009), which applied to marine/open ocean, coastal systems, wetlands, rivers/lakes, forest, deserts and urban systems. However, this has proven difficult to define in a simple manner. Maund et al. (2020) found that decision-makers were not able to include multiple ecosystem value types, and Bull et al. (2016) found that implementation of ESF was hampered by inconsistent application and incomplete science due to insufficient funding and a loss of political will. This was similar to critiques of the ecosystem approach (EcA,) with its 12 principles. Waylen et al. (2014) speculates that there was an intangibility of some EcA principles and lack of guidance and case studies demonstrating success in policy and decision-making (see also Posner et al., 2016).

The NCA represents a further blending of ecological and economic terms, with associated market-based instruments and policy tools within a dominant neoliberal narrative of nature (Buscher et al., 2012) and has become overall more prominent than the ESF and EcA. There are multiple different understandings of the NCA, many of which misuse or omit key features of its foundations in natural science and economics (Bateman and Mace, 2020). The core requirement is to measure the extent, status and value of NC assets and the ES and benefits derived from them (NCC, 2017). This information then provides the baseline against which the impacts of management and development options can be evaluated in the context of defined objectives for environmental exploitation, protection, maintenance and restoration (Hooper et al., 2019). An asset and risk register of the chosen area can be developed as inventory, or the baseline of natural assets in an area and their condition, to which management measures and impact can be assessed against (NCC, 2017). High level assessment at the UK national scale was developed by Mace et al. (2015), and local marine examples can be seen in Rees (2019) and Rees et al. (2022). These examples are based on the commonly used management tool of a risk register, to highlight natural assets whose condition places benefits at risk (Mace et al., 2015). The latter local marine example uses freely available habitat data sets from Natural England and modelled data from EMODnet and EUSeaMap, which are data layers in ARC GIS, to show the present habitats. ES provision was then reviewed using matrix data provided in Potts et al. (2014), and Saunders et al. (2016). At this stage, the assets or services are not necessarily monetised.

Other mapping-based initiatives include participatory mapping of ES as direct means of co-producing knowledge with stakeholder and community interests at its core. Burden et al. (2019) utilise GIS⁴³ maps in visual workshops to see and discuss whole ecosystems, and to avoid social complexity and political negotiation. Stakeholders are able to provide local, spatially explicit information about local NC and ES provision, use, and value (both monetary

⁴³ Geographical Information Systems

and non-monetary, where possible), negating the need to use proxy data derived from literature or modelling (Brown & Fagerholm, 2015). As a process participatory mapping provides a platform for the consideration of multiple values, as well as providing a potential mechanism for conflict resolution when addressing potential trade-offs between ES and users (Ruiz-Frau et al., 2011; Brown et al., 2014). It is argued that NC and ES concepts can facilitate participation in decision-making by explicitly describing the role of the environment in sustaining society. However, Hinson et al. (2022) find that only a limited number of case studies performed robust participatory methods and highlight the essential need to ensure stakeholder engagement is efficient, productive and useful to all involved. Communication is paramount for delivering a NCA in partnership due to the requirement to influence all associated parties (Cosgrove, 2020). For the majority of the decision-making processes, people are likely to be influenced by external and unobservable factors, in preference to being evidence led. Therefore, Cosgrove states that bounded rationality in decision-making must be assumed the norm and acknowledgement should be given to the limited capacity for evidence to dictate decision-making.

To draw together evidence NC 'accounting' is increasingly being used to measure the extent and condition of NC stocks and flows of ES provision typically in monetary terms (de Groot et al., 2012; Costanza et al., 2014; Mace et al., 2015; Vardon et al., 2017; Hooper, 2019). The United Nations has led efforts to meet commitments for integrated accounts through the System of Environmental-Economic Accounting (SEEA) and the complementary Experimental Ecosystem Accounting (EEA). In addition to international-level accounts, national-level accounts include the Office for National Statistics (ONS) NC accounts, which found the stock of the aspects of UK NC that can be currently valued was estimated to be worth £1.2 trillion (ONS, 2023). The Natural Capital Committee (2013) also advocates corporate NC accounting to support understanding amongst businesses and land managers of the risks to their supply chains and future growth opportunities from the deterioration or enhancement of related NC.

However, the ONS does not provide granularity to a specific location, and whilst it provides its methodology for calculations, the service valuations are high level (e.g., 'timber', 'fish biomass'), and from multiple sources needing interrogation, which makes it difficult for individual businesses or organisations to apply to their own work. Additionally, different metrics for different assets and services have been developed and are also evolving. Thus, there is no standard practice, to date. Furthermore, compiling a full suite of NC accounts requires substantial data and use of multiple biophysical models, where data may be in incompatible formats, or there may be barriers to obtain it (Hein et al., 2020).

An example of practical application of NC/ES values are found in the concept of Payment for Ecosystem Services (PES) as a way to pay for the societal benefits of sustainable resource management (Braat and de Groot, 2008). PES offers monetary incentives to individuals or communities to voluntarily adopt behaviours that are not legally obliged, and which improve the provision of well-defined and quantifiable ES that would otherwise not have been economically unviable to provide (Sommerville et al., 2009; Muradian et al., 2013). Neoclassical economics argues that if those responsible for managing provision of ES also benefit directly from them, the market should be able to protect and sustain these services (e.g., provisioning services, such as food). However, when benefits mainly accrue to others in society (e.g., downstream flood protection), markets often fail to reward service managers (e.g., upstream farmers). Conversely, some land uses and management activities provide benefits for landowners and managers at a particular location and time, at the expense of wider society. Some NC/ESs are valued for their direct usefulness to society, through immediate financial returns from market activities such as harvesting or ecotourism. Though much of nature is valued for its passive usefulness, i.e., its mere existence contributes to supporting, regulating or cultural environmental services, therefore, deriving non-market prices are challenging (Maher et al., 2020). Social and cultural ES including 'engagement with nature', 'place identity' and 'therapeutic value' are harder to define in monetary terms but can

be used, for example, to inform design and designation of protected areas (Bryce et al., 2016). More recent additions of the IPBES Assessment Report (2022) finds that the number of studies that value nature has increased on average by 10% per year over the last four decades, however, there is a dominant global focus on short-term profits and economic growth, often with the exclusion of multiple values of nature in policy decisions. The latest report, therefore, provides a typology of nature's values to highlight the way different people, with different world views and knowledge systems conceive and value nature for application in policy.

Critics of a NCA argue that there has been a move from the original emphasis of NC/ES as concepts designed to raise public and business interest for conservation and the interdependencies of nature and people (Guerry et al., 2015) towards increased emphasis on how to monetise NC/ES as commodities in potential markets (McCauley 2006; Spash 2008; Redford and Adams, 2009; Peterson et al., 2010; Sagoff 2011). NC accounting has been regarded as "*part of a widespread trend toward neoliberalisation within conservation governance*" (Fletcher et al., 2018: p.2); as part of a "*regime of green neoliberalism*" (Wilshusen, 2014: p.2134; as economic metaphor representing "*the further incursion of neoliberalism into environmental policy*" (Coffey, 2016: p.219). A growing body of literature has raised questions on how the utilitarian framing of ecological concerns and market strategies can modify the way humans perceive and relate to nature in a way that in the long run may be counterproductive for conservation purposes (Spash, 2008; Kosoy and Corbera, 2010).

The depiction in conceptual frameworks of linear chains or cascades from ecological processes through services to economic value in NC accounts may compound the notion that the overall objective of the NCA is to derive monetary values. However, other authors provide

contrasting views to these critiques highlighting that monetary valuation is not essential to a NCA, and it is increasingly being emphasised that all components of the approach should be considered holistically (Burdon et al., 2019; Hooper, 2019; Lannin, 2021; Rees et al., 2022). The measurement of the status of NC stocks (not just the marginal valuation of current flows of services and benefits) is vital to ensure that these are maintained and can continue to provide services into the future (HM Treasury, 2018; Hooper, 2019). Additionally, it is stressed that effective delivery of NCAs at local and national scales necessitates greater linkage between habitat condition and ES delivery (e.g., Rees et al., 2022; Watson et al., 2022) and optimisation and uptake of extra parameters such as sensitivity assessments for ES (Hooper et al., 2017). Furthermore, there is a need for greater inclusion of social (e.g., Raymond et al., 2009; Bateman and Wheeler, 2018) and cultural values (e.g., Daniel et al., 2012; Milcu et al., 2013). Indeed, Plant and Ryan, (2013) stress the ultimate proof of usefulness is whether it actually enables and contributes to better individual and collective decision-making. They suggest that institutional reform could focus on more explicitly embedding NC/ES thinking in participatory planning processes at local and regional scales (such as Burdon et al., 2019), rather than aiming to balance private interests. Cork et al. (2001) agrees, suggesting NC/ES can create a unified language that permits open discussion among stakeholders when setting priorities for preserving ecosystems. A NC perspective can be a useful way to put the value of ecosystems on par with other social and economic values in an EBM decision context (Russel et al., 2020). Building trust through collaboration, institutional development, and social learning enhances efforts to foster ecosystem management and resolve multi-scale society–environment dilemmas (Armitage et al., 2009).

Scientists have been developing an EBM on land since the early 1950s (Leopold 1949; Grumbine 1994; Christensen et al. 1996; Slocombe 1998); whereas interest in marine EBM has grown in more recent years (Cury 2004; Pikitch et al. 2004). Policy makers, management agencies, and academic scientists have shown increasing interest in EBM, yet the extent that

EBM principles are adopted by managers is still uncertain (Arkema et al., 2006; also previously discussed in relation to ICM and MSP section 3.2., and MPAs section 3.5.). Although the scientific literature outlines specific ecological and social principles of EBM, they are only loosely incorporated into plans and actions and the gap between the scientific literature, legislative frameworks and plans suggests that these concepts need to be more effectively translated with operational tools to make scientific principles easier to put into practice (Arkema et al., 2006). Thus, providing knowledge and metrics of NC/ES, their interactions, and how they are affected is crucial for EBM (Schultz et al., 2015). Indeed a NCA is best addressed at a whole site approach (Rees et al., 2019) and thus, applying EBM to decision-making towards ecosystem-based adaptation would ideally have a NC asset and risk register as a baseline for ongoing monitoring. A NCA should also consider behavioural responses and human adaptation to decisions as well as wider objectives such as the intra-generational distribution of costs and benefits across society (Bateman and Mace, 2020), which necessitates adaptive governance of linked SES, informed by a clearer understanding of resource and ecosystem dynamics, responding to multi-scale environmental feedbacks and for managing resilience (Hughes et al., 2005).

In this context, NbS have been put forward by practitioners (in particular the International Union for Nature Conservation, IUCN) referring to the sustainable use of nature in solving societal challenges. The IUCN (2023, online) defines NbS as *“actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature. Nature-based Solutions address societal challenges through the protection, sustainable management and restoration of both natural and modified ecosystems, benefiting both biodiversity and human well-being. Nature-based Solutions are underpinned by benefits that flow from healthy ecosystems. They target major challenges like climate change, disaster risk reduction, food and water security, biodiversity loss and human health, and are critical to sustainable*

economic development". ES are often valued in terms of immediate benefits to human well-being and economy, whereas NbS focus on the benefits to people and the environment themselves, to allow for sustainable solutions that are able to respond to environmental change and hazards in the long-term. NbS go beyond traditional biodiversity conservation by specifically integrating societal factors such as poverty alleviation, socio-economic development, and governance principles (Cohen-Shacham et al., 2016), and active restoration and habitat creation (Fernandes and Guiomar, 2018), and work best when they are strategically and spatially planned (Bowe et al., 2021). However, an ethical challenge relates to NbS being a human-centred utilitarian concept, as the NbS term clearly refers to societal challenges and problems as defined by humans (Eggermont et al., 2015).

Consequently, in some cases, this has led to the planting of non-native monoculture trees for carbon credits in previously biodiverse land (e.g., Leltz, 2022). NbS that do not harness wider ecological-based principles and support biodiversity are more vulnerable to environmental change in the long term and may also produce trade-offs among ES. In contrast NbS that protect and restore natural ecosystems and/or make use of diverse native species can play a key role in adaptation, mitigation, and enhancement, while also contributing to social livelihood, and cultural ES such as inspiration and learning from nature. Ecosystem-based approaches of NbS place particular emphasis on participatory community-based conservation and restoration of ecosystems, as part of an overall adaptation strategy that takes into account the multiple social, economic and cultural benefits for local communities. If governed and managed inclusively, NbS focus on 'solutionism' for the environment and people (Dorst et al., 2019), involving simple language and positive framing that is easier to grasp by non-technical audiences (Barot et al. 2015), which, may result in systemic solutions rather than sectorial ones (van der Jagt et al., 2023).

NbS are seen as multifunctional and cost-effective innovations delivering sustainability, but they are not yet mainstream (Davies and Laforteza, 2019; Frantzeskaki et al., 2019; Dorst et al., 2021; van der Jagt et al., 2023) due to lack of collaborative governance, inadequate knowledge and limited funding availability (van der Jagt et al., 2023). Riisager-Simonsen et al. (2022) states definitions are elusive and reminds that for successful operationalisation and to avoid green/blue washing, criteria is needed. Nonetheless, the core idea of the NbS concept is the use of nature to provide solutions to global challenges where nature is treated as a remedy rather than an obstacle to human activities. The 'power of nature' here is a valuable framing.

Net gain (NG) is a relatively new concept in environmental and spatial planning regulations (van der Jagt et al., 2023), dominantly in England. NG heralds from the broader, and more international concept of no net loss (NNL) (Maron et al., 2018), and sits as a part of the mitigation hierarchy. Both NNL and NG give rise to mechanisms by which certain unavoidable biodiversity losses associated with development are quantified, and compensated with comparable gains (e.g., habitat restoration). The former seeks a neutral outcome for biodiversity after losses and gains are accounted for, whilst the latter seeks an improved outcome (Bull and Brownlie, 2015). For example, the National Policy Planning Framework (NPPF) encourages planning authorities to pursue a 10% biodiversity NG through spatial policy, which means that urban development contributes to biodiversity through on or off-site nature-based measures, or payments for measure. Additionally, marine plans for England are promoting a wider approach with the expectation that “*environmental net gain for marine or coastal natural capital assets and services*” will be delivered as compensation by proposals that may have significant adverse environmental impacts (MMO, 2020a: p.44). Currently, marine NG is not precisely defined, and is instead described as “*an evolving concept that will expand biodiversity net gain approaches to include wider benefits*” (MMO, 2020b: p.247), with the further clarification that measures to deliver NG can include increasing ES provision;

improving NC assets; and the restoration, improvement or creation of NC assets and services (MMO, 2020b; Hooper et al, 2021).

This brief review has highlighted that ESc concepts are gaining traction internationally as recognition grows of the central role of the natural environment in sustaining economic and social wellbeing (Bateman and Mace, 2020). There are direct and indirect connections between the concepts, however, there remains a disconnect between academic research and integration into policy frameworks and subsequent decision making (Laurans et al., 2013; Primmer et al., 2018; Barton et al., 2018). Along with defining and trialling ESc principles and approaches there has been a parallel process of redefining the fundamental role of humans in nature (Grumbine, 1994), and consideration of the ecosystem in terms of resilience and complexity (Gunderson and Holling, 2002; Gunderson et al., 2012). ESc, as part of SES thinking, highlights that human systems and natural ecosystems are inextricably linked (Berkes et al. 2003; Díaz et al. 2006; Wu 2013). Thus, the study of ESc and complex systems are closely linked; therefore, reductive, linear, asset to economy approaches are likely to fail. A complex, adaptive environmental, social, and/or economic system is any system formed of many components whose behaviour is emergent (Byrne and Callaghan, 2014), where the behaviour of the system cannot be simply inferred from the behaviour of each individual element (Bar-Yam, 1997). The relationship properties and its environment are not fixed, but shift and change, often as a result of self-organisation (Bar-Yam, 1997). Further to this, complex systems portray a certain degree of resilience, which is variable dependent on factors such as external stressors and cumulative effects (Craig and Hughes, 2012). It is the ability of system to absorb disturbance or to preserve essential functions and characteristics following disturbance (Lockie, 2016).

The degradation of complexity in ecosystems and the reduction of the capacity of biosphere to supply resources, greatly restricts the sustainable existence of human society (Foley et al., 2005). However, there is a great resistance to drastic actions (such as de growth); sometimes because economic costs are concentrated amongst a powerful few as discussed; sometimes because the necessary changes involve lifestyle changes among the many (Percival et al., 2021). The potential for ESc to help mainstream environmental priorities is still unclear. Indeed, ESc concepts themselves are not yet mainstream and risks and uncertainty are prevalent for early adopters and the environments they aim to enhance (Cosgrove, 2020). Therefore, gaining deeper understanding of whether ESc can mainstream environmental priorities, and what the challenges and barriers are to mainstreaming ESc itself, forms the subsequent chapters of this thesis.

3.8. Conclusion

This chapter considered literature on governance and decision-making structures in the marine and coastal environment, including governance modes and the emerging concept of marine [spatial] planning to provide the setting for mainstreaming environmental priorities. Challenges that negatively affect the natural environment were presented, in particular the role of capitalism and neoliberalism in the demise of natural resources and contribution to fragmented governance, and in creating issues within movements and developments in environmental policy, including the protection movement and sustainable development. Thereafter, literature relating to individual ESc concepts were defined, and literature on their linkages and interrelations were presented. Finding overall, they are rarely treated as a combined package. Therefore, it is important to gain wider stakeholder views on the governance challenges in the marine and coastal environment, and how ESc concepts might

support or hinder decision-making and mainstreaming of marine and coastal environmental priorities across the marine and coastal system.

4. Chapter Four: Methodology

“We need a way to argue what we know based on the process by which we came to know it” (Agar, 1996, p. 13)

4.1. Introduction

This chapter describes and justifies the research philosophy and design. As outlined in the Introduction of this thesis, the aim of this research was to investigate ESc concepts and their role in mainstreaming environmental priorities across marine and coastal governance and decision-making. Two research questions and corresponding objectives are answered in this thesis:

1. What is mainstreaming, and why should environmental priorities be mainstreamed into marine and coastal governance and decision-making?

- 1.1. Synthesise mainstreaming theory to develop a mainstreaming conceptual framework.
- 1.2. Establish marine and coastal environmental issues to identify advancements and challenges in mainstreaming environmental priorities.

- 1.3. Develop advanced understanding (through a literature review, interviews and focus group) of marine and coastal governance and decision-making, including marine [spatial]⁴⁴ planning, to understand the enabling environment.

2. What is ESc, and how can ESc concepts mainstream environmental priorities into governance and decision-making?

- 2.1. Assess ESc literature, highlight individual concepts and establish evidence of any individual or collective advantage.
- 2.2. Gain intelligence (through interviews and focus group) from marine and coastal stakeholders on their views of ESc concepts, and their views on ESc concepts to mainstream environmental priorities.
- 2.3. Gain intelligence (through interviews and focus group) from marine and coastal stakeholders on their views of opportunities and/or challenges to mainstreaming ESc.
- 2.4. Based on participant views and the wider literature, utilise the mainstreaming framework to assess ESc concepts.

The research philosophy to address these questions is outlined first. Thereafter, the research methods are unpacked, describing in detail the research strategy for data collection and analysis. Subsequently, the chapter explains how consent was obtained from participants and how the associated records were protected. The research integrity and repeatability of the study is deliberated through examining the reliability, validity, and objectivity of the approach.

⁴⁴ Marine spatial planning is an emerging way of governing and managing marine activities. The spatial nature is not always applied. This is unpacked first in section 3.2.

In this section the axiology, role of the researcher, is also considered. Lastly, the limitations and critiques of the study are highlighted.

4.2. Research philosophy

Philosophical assumptions provide the architectural design by which to find and/or solve problems (Buckley et al., 1976), and provides the principles that guide practices to explain why certain methods or tools are employed in research (Wahyuni, 2012). At the beginning of the process, it was essential to ascertain how the present research fits within a view of reality (the ontology); what and how reality or knowledge can be known (the epistemology); and what approach can be used to know and understand this knowledge (Guba, 1990). As Anaïs Nin (1961: p.124) posits “*we see things not as they are but as we are*”; therefore, development of assumptions is integral to understanding results.

To answer the research questions, there was a need to interpret socially constructed realities from multiple, diverse perspectives of those who make policy and also those stakeholders who are affected by it in the marine and coastal environment. With a focus on views of participants living and working in these areas and their lived experiences, interpretivism was found to be most suitable because interpretivists posit that there are multiple realities, which are socially constructed by each individual (Crotty,1998).

Ontologically, interpretivist philosophy adheres to relativism, which this research supports as it is the view that reality differs from one person to another (Guba and Lincoln, 1994). Epistemologically, interpretivists adhere to a subjectivist view that assumes we cannot

separate ourselves from what we know, and that subjective interpretations have great importance to meaning. This subjective stance is particularly important when interpreting different realities as it supports the view that different people experience different realities, based on the multiplicity of worldviews that are subjective to each participants' life context.

This research captured and assessed different viewpoints and opinions, drawing attention to the nature of people's participation in life to understand and analyse the significance people confer (Chen et al., 2011). As an interpretivist researcher, social reality is viewed as being embedded within and impossible to abstract from social settings; reality is interpreted through a sense-making process. Furthermore, the interpretivist research paradigm asserts that a person's knowledge and personal truths are located in a particular context, situation, and/or time, and that they are open to re-interpretation and negotiation through conversation (Schwandt, 1994). This draws attention to both acceptance of multiple truths as outcomes for the research, and knowledge exchange leading to social learning. Reed et al. (2010) supports this aspect of knowledge exchange in environmental research, highlighting that social learning is increasingly becoming a normative goal in natural resource management and policy. While the research ultimately aimed to answer the research questions, interpretivism allowed for multiple truths to be acceptable in the construction of the research answers and final recommendations.

4.3. Creating knowledge

The research within this thesis interpreted different viewpoints and opinions through iterative inquiry, where knowledge formed out of the research process through an inductive approach. The research aim and research questions were used to guide the research as investigative

tools, rather than accepting or rejecting a predetermined deductive hypothesis. An inductive approach suits examination of marine and coastal SES's as they are complex and multi-layered spaces that manifest various outcomes such as nonlinearity, heterogeneity, emergence, and feedback (An, 2011).

This research focused on the social aspect of marine and coastal SES's that play a critical role in affecting the ecological aspect of such systems, with an aim to examine and interpret the lived experiences and opinions of participants. Therefore, a qualitative approach was employed as qualitative research enables the study of '*things in their natural setting, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them*' (Denzin and Lincoln, 1994: p.2), where "*qualitative researchers deploy a wide range of interconnected interpretive methods*" (Denzin and Lincoln, 2008: p.29). Further, Maxwell (1992) advocates that qualitative research works with the realm of meanings, motives, aspirations, beliefs, values and attitudes, which corresponds to a deeper space of relationships and processes. Qualitative approaches do not seek a single truth, but rather, aim to uncover multiple perspectives and interpretations to enhance understanding of how things work (Charnley et al., 2017). This enables a rich data set with multiple viewpoints to emerge and therefore, is suitable for this research with diverse participants. However, Queirós et al. (2017), highlight qualitative methods are time consuming and difficult to generalise, also it can take longer to process data and may have a longer verification process to extract comparable data.

That said, it is becoming more recognised that qualitative research within the human or social dimensions of environmental management is further needed (compared to the predilection for quantitative methods to policy development) to produce robust and effective policies, actions and outcomes (Mascia et al., 2003; Sandbrook et al., 2013). Qualitative approaches can

provide distinct insights and increase our understanding of how to improve decision-making (Bennett et al., 2019). Qualitative marine research has focused on single case studies (Ram-Bidesi, 2015); attitudes of marine professionals (McKinley and Fletcher, 2010; Rees et al., 2013); semi-structured interviews with knowledgeable participants (Scarff et al., 2015; Slater and Claydon, 2020); and multiple qualitative methods within one study (e.g., interviews, case studies and participant observations) (Wills, 2020). Such as these marine social science researchers that have generated rich narrative data from small sample populations, the primary data collection of this research utilised the inductive, qualitative approaches of semi-structured interviews and a focus group to create knowledge. These methods are now described in detail.

4.4. Research method

Having discussed and situated this research in interpretivism, which has created knowledge through an inductive, qualitative approach, this section moves on to discuss how the research was conducted. Initially, though not included in the primary data outcomes, embedded industry experience is detailed as a key aspect of the overall research strategy: fulfilling an initial embedded approach enabled better positioning for an interpretivist methodology. Thereafter, details about the semi-structured interviews and subsequent focus group are presented. Both qualitative research methods were employed as it was important to first enable in-depth discussion with individuals about their lived experiences and opinions in the one-to-one interviews. Thereafter, with a different group of participants, the focus group enabled problem solving relating to the challenges and opportunities that emerged from the interviews, and also enabled an interdisciplinary group discussion and wider knowledge exchange.

As such, the research strategy developed in three distinctive phases: phase one involved a preparatory phase of embedded industry experience. Phase two involved 2 rounds of semi-structured interviews (round one local stakeholders and round two policy stakeholders); and phase three involved a focus group (round three interdisciplinary stakeholders). This is highlighted in Figure 3. Each round of research built upon the last, in a deliberative approach to generating knowledge and learning. Deliberative research is a knowledge translation strategy that can serve to generate rich data and bridge research with action, where the purposefully informed conversations characteristic of deliberative dialogue generate data inclusive of collective interpretations (Plamondon et al., 2015). It is frequently used in health studies (e.g., Plamondon and Caxaj, 2018), and to create positive social outcomes for diverse stakeholders, and sustainability studies (e.g., Dassen et al., 2013), and democratisation of science in global environmental governance contexts (Berg and Lidskog, 2018). In this deliberative research, the preparatory phase illuminated research requirements and guided research design, questions and participants. Interview outcomes from the round one local stakeholder interviews informed the questions for round two policy stakeholder interviews. Thereafter, the outcomes from both local stakeholder and policy stakeholder interviews informed the focus group discussions.

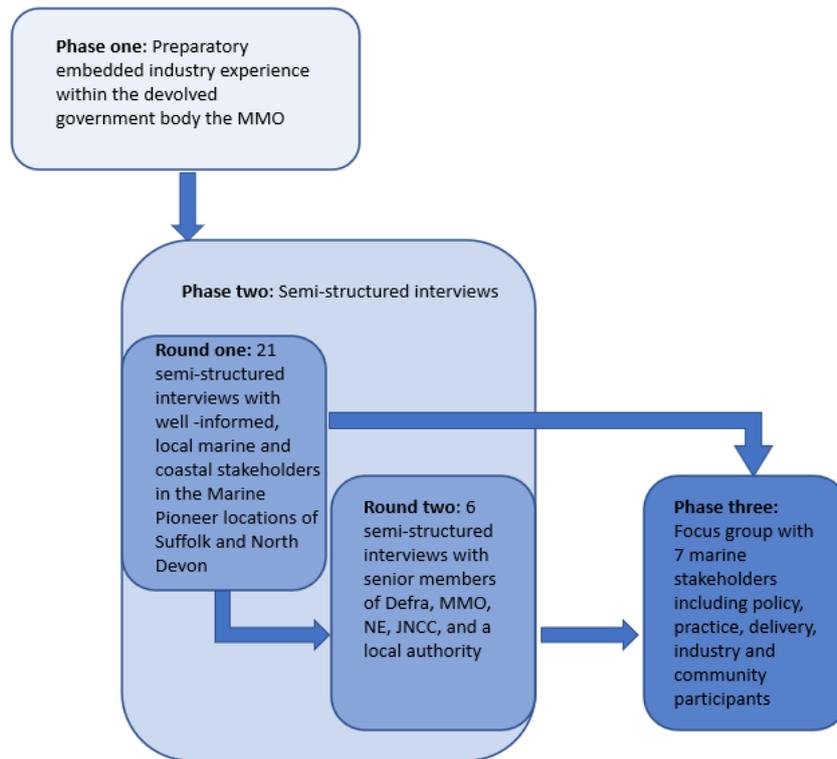


Figure 3. Flow diagram presenting the research strategy.

4.4.1. Phase one: embedded industry experience

At the beginning of the PhD project through various phone calls, emails and meetings I organised embedded industry experience within the devolved government body the Marine Management Organisation (MMO). A meeting was held between myself, the university supervisory team, and the MMO where the research proposal and all parties' involvement was discussed. It was decided that I would spend one day a week embedded within the MMO to gain industry experience and advanced understanding of marine and coastal policy and decision-making process. Also present at this meeting was a representative of the Royal Town Planning Institute (RTPI), who acted as a critical friend within the research project.

Within this preparatory phase one (Figure 3) with the MMO, various relevant duties were carried out to form my knowledge base and build general understanding of the marine and coastal policy-scape. The initial stages of the embedded industry experience did not produce any primary data. A confidentiality form was signed restricting ability to document explicit details, thus leading to embedded 'experience' as opposed to embedded 'research'. Embedded research more broadly would entail individuals or teams who are either university-based or employed undertaking explicit research roles within host organisations, legitimated by staff status, with the purpose of identifying and implementing a research agenda (McGinity and Salokangas, 2014). The embedded experience I attained bore elements of this description, in that I was university-based, and legitimated – to some extent – by staff status in the host organisation of the MMO (i.e., I was given a laptop and ID card granting me free movement in and out of the security locked building).

Embedded research has roots within both anthropological and sociological traditions, and thus is not tied to a specific methodological approach or to a singular discipline (McGinity and Salokangas, 2014). The literature largely focuses on embedded experience in health professions (e.g., Vindrola-Padros et al., 2017), and schools (e.g., Godfrey, 2017), with a notable addition of embedded research in order to facilitate transdisciplinary co-production of climate change services (Steynor et al., 2020), and Jenkins et al. (2012), who find embedded experiences increase conservation impact and policy relevance of research. Jenkins state that researchers who embed themselves in the daily working environment of other communities, such as government offices, to learn about the constraints and opportunities that influence conservation work in these communities create opportunities to build personal relationships that may improve the impact of their work, whilst also tailoring their research to meet the needs of such groups. Jenkins comment on Maxwell et al. (2011) who followed an embedded approach to redesign a more suitable marine protected area. While this embedded experience did not produce any primary data from phase one, the experience broadened the

research topic, allowed me to understand what may be needed from new research in a marine and coastal policy context, and importantly, provided access to key stakeholder participants for the next phase of primary data collection (semi-structured interviews and focus group).

During my embedded time spent within the MMO I worked within two areas: The Marine Planning team and the Marine Conservation team. Initially, thirteen months experience (one day per week) in the Marine Planning team involved stakeholder database management and stakeholder workshop facilitation in the Marine Plan-making process. Thereafter, three months experience (one day per week) in the Marine Conservation team involved looking at where Regulatory Impact Assessments could be adapted to include ESc language and theory to improve processes and justification of byelaws. It was after this initial volunteering experience that it became apparent that this doctoral research aligned well with areas of research in the Marine Pioneer team. Contact was made with the Marine Pioneer team, which is where the round one, semi-structured interviews, primary data was initiated.

The Marine Pioneer was a three-year project that tested delivery of the Government's 25 Year Environment Plan (Defra, 2018). Initially, discussions between myself and the Marine Pioneer lead, established where there was shared research interest between this doctoral research and the Marine Pioneer programme, specifically to align research interests in a mutually beneficial way. It was decided that a first round of semi-structured interviews would be designed to provide evidence to support outputs of the Marine Pioneer, through interviews with the Marine Pioneer local marine and coastal stakeholders, to ensure their views were fully captured and documented. Specifically, to research governance options for using a natural capital approach (NCA) in the marine and coastal environment, and participant views

regarding ESc concepts as tools to mainstream the environment⁴⁵. This was of mutual benefit as firstly, this doctoral research was concerned with ESc concepts, including natural capital (NC), and governance which also became a priority area of research interest that emerged from the literature review on mainstreaming. Secondly, developing better understanding of governance for using a NCA would advance knowledge in two of the four requests⁴⁶ from Defra to the Marine Pioneer, notably, to apply a NCA to decision-making, and to demonstrate integrated approaches to planning and delivery. Therefore, this research formed phase two, round one (Figure 3); semi-structured interviews with local Marine Pioneer stakeholders, which will be detailed further in the next section (section 4.4.2.1.)

Of noteworthy inclusion to this current section (though, the timeline of events is not linear), after the round one interviews, I joined the Marine Pioneer team on an official study break for nine months, to work alongside the programme lead. The purpose of this 'Marine Pioneer Senior Specialist' role was to help produce a summary and recommendations interactive document of all the research carried out within the Marine Pioneer programme (Lannin, 2021⁴⁷), by assimilating the varied scientific reports, data, and evidence that had been carried out by the varied and multidisciplinary teams. Based on these collective outputs, the role also involved workshop organisation, participation, and presentation to share the recommendations with other Defra family organisations, namely, the Environment Agency, Natural England, JNCC, and the IFCA's. Additionally, the role also involved participation in

⁴⁵ Alongside the results section, a research paper was produced from the first round of interviews Holtby, R. (2020) Marine Pioneer stakeholders: Governance Recommendations for a Marine Natural Capital Approach

⁴⁶ The four requests were: Test new tools and methods as part of applying a Natural Capital Approach in practice; demonstrate a joined-up, integrated approach to planning and delivery; Pioneer and 'scale-up' the use of funding opportunities; and grow our understanding of 'what works', sharing lessons and best practice (Defra, 2018)

⁴⁷ Summary and recommendations document produced by the Pioneer team (including myself) and Pioneer steering group contributors, see final page of Lannin (2021) for full list of contributors.

the design and delivery of a Marine Outcomes Systems Committee⁴⁸ conference, which was built around the outputs of the Marine Pioneer.

The preparatory phase one of embedded industry experience, volunteering within the Marine Planning and Marine Conservation team, followed by official work within the Marine Pioneer team, improved my understanding of policy and decision-making processes and increased understanding of current English marine management methods and priority workstreams. Importantly, it also enabled me to develop and build trusting relationships that ultimately facilitated round two of phase two (semi-structured interviews with policy stakeholders) and round three (interdisciplinary focus group) of the doctoral research (Figure 4) supporting the interpretivist philosophy to this research as a well-informed researcher. Dietz and Bozeman (2005) confirm this outcome in their findings that university scientists who experience intersectoral changes are provided increased social networks and scientific, technical, and human capital. In the case of this research, human capital was provided by way of access to knowledgeable and willing participants for primary data collection. The primary data collection of phases two and three is now detailed further.

4.4.2. Phase two: semi-structured interviews with local and policy stakeholders

A combination of the research literature review and the embedded industry experience achieved in phase one allowed for the primary research of phase two to arise. The aim of phase two was to first collect primary data through one-to-one semi-structured interviews with

⁴⁸ MOSC is a cross-government committee which aims to coordinate scientific knowledge, resources and communications to support marine policy decisions.

local stakeholder participants of the Marine Pioneer, in its two locations of Suffolk and North Devon (round one). Thereafter, it builds on and triangulates the round one interview outcomes by collecting further primary data through one-to-one semi-structured interviews with directors, planners and advisors within government agencies (round two). One-to-one interviews were purposefully carried out at this stage to enable in-depth, open and confidential discussion, and to build a diverse knowledge base of individual views and opinions. This involved local marine and coastal stakeholders who experience policy outcomes, to policymakers and decision-makers who plan for marine and coastal outcomes at a strategic level. Round one interview outcomes informed round two questions in a deliberative approach to knowledge building. Thereafter, results were analysed and compared.

Interviews are the most common form of data collection in qualitative research (Gill et al., 2008). They are used to find out things that cannot be directly observed such as thoughts, feelings, intentions, previous behaviours, and how people apply meaning in different contexts (Patton 2002). Semi-structured interviews were chosen because they enable loose direction through the interview framework (appendix 3 and 5). This took the form of a schematic of questions and topics to be explored (DiCicco-Bloom and Crabtree, 2006), which comprised of various principal questions with associated sub-questions/prompts related to the central question (Jamshed, 2014). When particular areas were of interest to the participants, further questions were posed on that subject. This meant not all questions in the framework were answered by all participants. However, this enabled freedom for interest areas to stand out, and also enable coding of the transcript and comparative analysis of data in order to determine patterns and differences (Galletta, 2013).

Semi-structured interviews align well with the interpretivist research philosophy. Slayter and Calydon (2020) both adopt this method when conducting research in relation to marine

planning aspirations and policies. In both cases interviews were conducted with key marine representatives of policy users and policy makers; with twenty-five participants consisting of developers, regulators, statutory consultees, scientists, and planners, and with representatives (quantity of participants not divulged) of marine applicants and marine decision-makers (Slater and Claydon, 2020).

4.4.2.1. Phase two, round one: local stakeholders

The first round of interviews was held in June and July 2019 using a purposive approach with twenty-one local marine and coastal stakeholders in the Marine Pioneer locations of Suffolk and North Devon. These included marine and coastal participants from conservation, regulation, nature authority, residential, charity, commercial business, recreation and tourism, academia, fishing, ports and harbours, heritage, non-governmental organisation, and community group backgrounds. This section of the research aimed to provide local opinions and collective recommendations for use of a NCA in the marine and coastal environment and enhance knowledge exchange from local areas to centralised policy areas through production of a final report to be shared within the Marine Pioneer outputs, as well as to form part of this thesis results.

Contact was first made with participants at two already occurring, pre-determined, Marine Pioneer stakeholder meetings, in March 2019: one for the Suffolk Marine Pioneer and one for the North Devon Marine Pioneer. The meetings were held by the local Marine Pioneer management groups for stakeholders that have already shown interest in the Marine Pioneer and where participants had previously inputted time, and/or opinions, and/or data into other Marine Pioneer workstreams. This was particularly advantageous as the stakeholders that

attended the meetings were already engaged in the Marine Pioneer project work. I delivered a short presentation at each of the meetings to inform stakeholders about the research. The presentations gave details about the research process and aims. Information on how to participate was also given. I had sign-up sheets for stakeholders to register their interest, and further information about the semi-structured interviews on flyers to give to interested participants.

Thereafter, communication with the participants was over email. Initially, a three-minute video presentation was sent to those stakeholders that had shown interest, with slides (see Appendix 1) with narration from myself, providing further description of the research. Once individual stakeholders had confirmed their interest in participation, emails were used to communicate and organise a suitable time and place (of the participants choice), for the face-to-face interviews. Interview slots were arranged within a four-day period in June 2019, in each Suffolk and North Devon location. It was possible to organise between two and four interviews per day.

There were ten interviews conducted in Suffolk, and eleven interviews conducted in North Devon. Each interview was private and one-to-one. The interviews followed an interview guide (Appendix 3) to keep focus but with allowance for divergence of specialist areas. The interviews lasted between 20 minutes and 90 minutes. Participants were initially asked for one hour of their time. After the interviews, follow-up thank you emails were sent to all participants, and the proposal of viewing and/or amending the data was offered. It was considered that handwritten notes during the interviews would be distracting and unreliable. Therefore, to capture the interview data verbatim, a Dictaphone recording of the interviews was made to secure all the information (ethical approval submission Ref: 13017). All details of use and storage was explained to each participant and consent from each participant was

obtained (discussed further in section 4.6.). The transcripts from of the interviews were written up to include both questions and answers to provide context. The transcripts were then coded (described further in section 4.5.1.). The results from the round one interviews shaped the round two questions, which is now described.

4.4.2.2. Phase two, round two: policy stakeholders

The second round of interviews were held in February and March 2021⁴⁹, with six participants including senior members of government agencies. This included a deputy director, scientific advisor, senior policymaker, and senior planning positions. This section of the research used and built upon results from round one interviews to shape the questions and establish plausibility and clarity around key topics.

Contact was made with round two participants via email, through connections made during the phase one embedded experience carried out within the MMO. The body of the emails were personalised with detailed information about the research process and aims, including the research carried out to date. Once the participants agreed to take part in the research, email dialogue was used to arrange suitable interview times, these interviews took place between January and March 2021. Due to the timing of the second round of interviews being during a Covid-19 lockdown, the interviews took place online via Zoom and were recorded on a voice recorder on a mobile phone.

⁴⁹ A combination of the Covid-19 lockdown, and previous nine-month study break to work full time on the Marine Pioneer is the main reason why there is two years gap between the round one and round two interviews.

As with round one interviews, the round two interviews were also semi-structured to allow freedom for participants' interest areas to stand out, whilst also enable coding of the transcript, and comparative analysis of data in order to determine patterns and differences. The interviews also followed an interview guide (Appendix 5) to keep focus but with allowance for divergence of specialist areas. Again, each interview was one-to-one and confidential. The interviews lasted between 30 minutes and 50 minutes. Participants were initially asked for 45 minutes of their time. After the interviews, follow-up thank you emails were sent to all participants and the proposal of viewing and/or amending the data was offered. The interview transcripts were written up to include both questions and answers to provide context. The transcripts were then coded. The results from both the round one and round two interviews informed and shaped the phase three focus group, which is now described.

4.4.3. Phase three: focus group with interdisciplinary stakeholders

A focus group is a technique involving the use of in-depth group interviews in which participants are selected because they are a purposive, although not necessarily representative, sampling of a specific population. Participants in this type of research are, therefore, selected on the criteria that they would have something to say on the topic, and would be comfortable talking to the interviewer and each other (Richardson and Rabiee, 2001). Scott (2011) asserts the relevance of focus groups as participative tools for policy development and planning, in particular for agendas with emphasis on using deliberative participative approaches, such as this research. One of the distinct features of focus-group interviews is its group dynamics, hence the type and range of data generated through the social interaction of the group are often deeper and richer than those obtained from one-to-one interviews (Thomas et al., 1995). Focus groups can provide information about a range of

ideas and feelings that individuals have about certain issues, as well as illuminating the differences in perspective between groups of individuals.

The focus group was held in September 2021 involving eight diverse marine and coastal stakeholders. In line with Nyumba et al. (2018), participants were purposefully selected from a group of individuals rather than from a sample of a broader population, to enable specified representation from different areas operating within the marine and coastal space. This included representation from academia with a specialisation in marine governance, a marine policy practitioner, a marine natural capital policy adviser, a senior marine planner, a senior marine consultant, a chief executive fisheries federation representative, a senior terrestrial planner and a coastal community and health and well-being representative. The aim of the focus group was to discuss the themes that emerged from both round one and round two semi-structured interviews, enable knowledge exchange between diverse stakeholders, and codesign interdisciplinary solutions and recommendations to the challenges and opportunities raised in the session.

Initial contact with participants was by email, through recommendation or previous communication during time spent in phase one embedded industry experience. The participants of the focus group had not been involved in the previous primary data collection; all focus group participants were new to the research. This was to enable further triangulation of the data and research outcomes. Following on from the interviews which were one-to-one, the interdisciplinary focus group was important to yield a different kind of information. In particular, the dynamics of group interaction to reveal participants' similarities and differences of opinion (Morgan, 1996; Kaplowitz et al., 2001), with the key feature being interactive

discussion of a topic by a collection of participants and a facilitator as one group in one place. It has been widely used by both researchers and practitioners across different disciplines (e.g., Morgan, 1996). The focus group and the data it produced align with interpretive philosophy as it was important to interpret the complex personal experiences, beliefs, perceptions, and attitudes of the participants through a moderated interaction (Nyumba et al., 2018).

The focus group was designed to work in a hypothetical space, a coastal town shaped by current challenges and priority areas for the participants, that were pre-determined by pre-focus group questions. This technique was used by Scott et al. (2013) in his work on the rural urban fringe. Once participants had agreed to take part in the focus group five questions were sent to the participants, which were designed to enable the participants to contribute to the structure and inform the design and delivery of the focus group iteratively, meaning each participant was able to contribute from the beginning of phase three. The questions and participant answers also highlighted priority areas of interest so that the focus group could be guided towards these interest areas (Appendix 7). The focus group lasted two and a half hours, and was recorded live as a video recording, for which consent was obtained from each participant. Participants were informed they could retract their input at any time. The transcript was then analysed. The data analysis of phase two and phase three is now presented.

4.5. Data analysis

In qualitative research, data analysis generally occurs alongside data collection in an ongoing, iterative fashion, requiring ongoing revisits to the data in order to ensue meaning (Galletta, 2013). After each set of qualitative data collection, in the form of dialogue, the data was transcribed, coded and thematically analysed to produced results, which contributed to the next phase of research. Qualitative data analysis is concerned with transforming raw data by searching, evaluating, recognising, coding, mapping, exploring and describing patterns, trends, themes and categories in the raw data, in order to interpret them and provide their underlying meanings (Ngulube, 2015). Patton (2002: p.41) refers to this process as inductive analysis and creative synthesis. The production of transcripts are, in themselves research activities, rather than simply technical details that precede analysis (Atkinson and Heritage, 1984), particularly because in transcribing, the researcher is able to build a relationship with the data and start to understand it in detail.

The round one interviews were transcribed by hand from the Dictaphone into Word documents. Due to the passing of time and advances in technology the second round of interviews were recorded and transcribed at the same time using Otter.ai. The transcripts produced by Otter.ai are approximately 75% correct when computer generated from speech, so it was necessary to listen to the recordings and read the transcripts at the same time to make corrections to the transcripts before coding. This reproduced the familiarity to the data. However, this was a much faster way of recording and processing the data.

While general themes were recognised from as early as the interview stage and the transcribing and reading over the sentences in each Word document formed part of early analysis, once the transcripts were in Word format, the determination of the themes became

more structured through applying Thematic Analysis (Braun and Clark, 2006; Madill and Gough, 2008). Thematic analysis is a method for identifying, analysing and reporting patterns in data, known as themes (Braun and Clarke, 2006). Thematic analysis is not tied to any pre-existing theoretical framework; however, it supports an inductive research approach (Patton 1990) as themes developed out of the data. Use of thematic analysis on both the semi-structured interviews and focus group enabled identification of overarching patterns through coding the whole data set.

4.5.1. Coding

The determination of the analytical categories began with an intensive and repeated reading of the material. Initially by reading over the qualitative data and highlighting key areas of interest with different colours and 'comments' in the Word document - the initial aim was to become immersed in the data. This process of immersion is used to attempt to become more fully aware of the 'life world' of the respondent; to enter, as Rogers (1951) would have it, the other person's frame of reference. In the first stage of open coding categories were freely generated (Berg, 2007), through detecting all themes that occurred throughout the data set. This process of immersion was used to generate the headings and category system for the overarching themes to apply each code to. Such as McKinley et al. (2020) describe in their thematic analysis of a marine social science workshop, similar topics and themes were then grouped together to identify dominant themes within the discussion using an emergent thematic coding process.

Once all the transcripts had been read and loosely coded, the process moved from the particularity of a single interview to observable characteristics within the data set. As the relationship among codes were explored, thematic clusters were formulated. Codes began to carry weighting of relevance and importance, as well as frequency and context. The aim here, was to reduce the number of code categories by collapsing some of the ones that were similar and by attaching them to themes. This was a non-linear, iterative process, where more codes were generated as needed. The transcripts were re-read alongside the list of codes and higher-level themes to establish the degree to which the categories cover all aspects (Burnard, 1991) of the interviews and focus group, and where needed, recordings were re-listened to, to stay close to the original contexts, tone and meaning meant by the participants.

The first series of coding were descriptive, and the subsequent series of coding brought in the interpretive philosophical inquiry with nuanced organisation and prioritisation of themes and representative/illustrative and impactful quotes to utilise in the resulting narrative. As data was thematically analysed and coded after each phase of research, to build results into the next phase, new codes were added to the themes if the initial codes did not encapsulate the participant's meaning. In doing so, previous data analysis from preceding rounds or phases was revisited to ensure all patterns and differences within the data was coded and analysed thematically. Once all of the themes were decided upon, the writing up process began. During this process evidence of areas that could be condensed became evident. Throughout the writing up process, and when using representative quotes to highlight the themes, all participant details were anonymised. Participant consent and data protection is now briefly highlighted.

4.6. Consent and data protection

As per the Northumbria Ethics in Research Policy Statement, beneficence: the requirement to promote the interests and well-being of others, and non-maleficence: the principle of 'not doing harm' was applied to all entities directly or indirectly affected by the research. Written authorisation to conduct the research from both the MMO and the Marine Pioneer Lead was signed-off before research commencement. In relation to the participants, ethics, as per Northumbria University standards was obtained (ethical approval submission Ref: 13017) to research the particular participants, and both their physical and personal autonomy was respected. The research was viewed as low risk to both researcher and participants as there was no physically invasive procedures. However, understanding any possible problems that could arise was important. The first problem that the researcher was aware of was regarding how many participants would want to be involved in the research, perhaps there would be no interest. This was overcome by presenting at meetings where participants were already, to a greater or lesser extent, involved in the research area. Additionally, the researcher spoke to participants one-to-one after the presentations to build rapport around the importance of the research outcome to themselves as individuals. Once participants were signed up to the research process, the next anticipated problem was retention of the participants. This was maximised through honest and ongoing contact.

Their participation in the research was on the basis of fully informed consent, and their right to confidentiality was guaranteed. Details of the research was provided to each participant in an information pack, so that opportunity for any questions relating to the research or storage of data and information could occur. Consent forms (see Appendix 2 and 6), as per Northumbria University standards, was obtained from participants of round one interviews and

the focus group before research began. Round two interview consent was gained through email and recorded verbal confirmation.

Handling confidential or sensitive information, as well as for assessing the reliability and validity of transcripts, must be established prior to research (Kvale, 1996). The collection of data records from each participant is a valuable asset to the research and therefore efficient management of the records are necessarily. The recordings were uploaded from the Dictaphone after each interview and immediately deleted from the Dictaphone once uploaded, to a purposeful and secure University One drive account that only the researcher has password access to. Equally, the transcriptions, coding and analysis of these recordings were held on a university computer needing both password-protected log in detail. Each individual participant's real name was not important for the data collection or analysis; thus, anonymity of the participants was ensured through a coding system. This system was applied to each individual participant and their data records - the recordings, the subsequent transcriptions, and analyses. This consent and data protection is essential to adhere to the trust that participants place on the research, and also to maintain the research integrity.

4.7. Research integrity

A number of leading qualitative researchers have argued that reliability and validity were terms pertaining to quantitative research and are not pertinent to qualitative inquiry (Altheide and Johnson, 1998). Therefore, new criteria for determining integrity in qualitative inquiry were developed (Lincoln and Guba, 1985; Rubin and Rubin, 1995). What is considered worthwhile knowledge is different in different paradigms; consequentially, each paradigm requires specific criterion (Morse et al., 2002). Guba and Lincoln (1981) noted that within quantitative research,

the criteria associated with rigor are internal validity, external validity, reliability, and objectivity. They then proposed that the criterion in qualitative research is to ensure "trustworthiness" through credibility, fittingness, auditability, and confirmability (Guba and Lincoln, 1981). These criteria were subsequently refined to credibility, transferability, dependability, and confirmability (Lincoln and Guba, 1985). Guba and Lincolns authenticity criteria were unique to constructivist assumptions but were amended to suit the interpretivist paradigm (Guba and Lincoln, 1989) and furthered in Lincoln (1995), and serve as guiding principles followed by this research.

Qualitative data analysis is "*always shaped to some extent by the researcher's standpoint, disciplinary knowledge and epistemology*" (Braun and Clarke, 2014: p.175). An interpretivist 'axiology' assumes the researcher has an understanding that realities are facilitated by the perception and comprehension of individuals (Fischer, 1990). Accordingly, I endeavoured to appreciate the differences between participants (Saunders et al., 2009), and had awareness that understanding the realities of individuals was conditioned by my own perspective and positionality (Packer, 1985). Through critical subjectivity I did not suppress my primary subjective experience, as I accept my own knowing is from a perspective. Embodying critical subjectivity also means that I was aware of this perspective, and of its bias, and I articulate it in my writing and communications (Reason, 1994), always looking out for archetypal patterns which may manifest in my work (Hillman, 1975). According to Holloway (1997) and Charmaz (2006) interpretive research needs to be reflexive. Levy (2003: p.94) agrees, stating this is "*not in order to suspend subjectivity, but to use the researcher's personal interpretive framework consciously as the basis for developing new understandings*". A key tool for reflexive research is a research diary, which was kept and written in throughout the writing and research process. This enabled me to reflect upon different aspects of carrying out the research and my role within the construction of knowledge and research outcomes.

During this research, I considered myself to be part of the data collection instrument in that my observation and interpretation skills, trust with the participants, and ability to extract the information determined the research outcomes. According to interpretivism, it is this involvement that enables researchers to have a thick description of the situation (Holliday, 2007). Further, for some periods of the research I was embedded within the social context that was being studied through volunteer work (as described in section 4.4.1.). Personal insights, knowledge, and experiences of the social context were critical to accurately interpret the research area of interest. The investigator and the object of investigation are linked such that who we are and how we understand the world is a central part of how we understand others, and the world in general. By theorising a reality that cannot be separate from our knowledge of it, the interpretivist paradigm posits that researchers' values are inherent in all phases of the research process: truth is negotiated through dialogue (Cohen and Crabtree, 2006).

4.8. Critique

Interviews alone can only produce a partial interpretive understanding, Lewis-Beck et al. (2003) argue that interviews must be supplemented by other methods, hence a focus group was also adopted to triangulate data. However, focus group members may fail to exchange all information they have, and groups may focus only on shared information (Levine and Moreland, 1995). Hence a combination of the two approaches works well.

The process of transforming speech into specific words is not without challenges. Speech elisions, incomplete sentences, overlapping speech, a lack of clear-cut endings in speech, poor recording quality, and background noises are just a few of the issues that could be

encountered. In addition, care must be given when deciding where punctuation is required, so as not to change the intent or emphasis of an interviewee's response or comment (McLellan et al., 2003). Once transcribed, ideally, all the data should be accounted for under a category or subcategory (Glaser and Strauss 1967). However, in practice there may be elements of interviews that are unusable in an analysis. Field and Morse (1985), refer to this data as 'dross'.

Additionally, the views of participants, though represented by sector or role, are not representative of all people that work within that particular sector or role. The study here presented aims to provide insight and answers to questions on the English marine and coastal system and does not attempt to answer governance at the international level, though there may be transferable knowledge.

4.9. Conclusion

This chapter justified using the interpretivist research philosophy to approach the two rounds semi-structured interviews and focus group. This qualitative research was inductive, where research outcomes emerged through dialogue with participants and researcher analysis, the methods of participant recruitment, data collection and thematic data analysis were also highlighted. Also detailed in this section was the embedded industry experience within the MMO to gain advanced understanding of marine and coastal policy and decision-making process and enable fair interpretations of the results. The following chapter now presents the results from the primary data collection.

5. Chapter Five: Results

5.1. Introduction

The marine and coastal environment is largely in significant and sustained decline (e.g., IPBES, 2019, 2022; IPCC, 2022 etc.). This thesis aim is to understand how to improve mainstreaming of environmental priorities across all policy and decision-making that affects marine and coastal spaces. In particular, the role of ecosystem science (ESc) concepts was viewed as a potential hook to facilitate this. The literature review highlighted ESc has multiple interlinking concepts⁵⁰, with opportunities and challenges in identifying and delivering for environmental priorities. As detailed in the methodology chapter, two rounds of semi-structured interviews and a focus group were carried out in this research to illuminate these challenges and opportunities. Round one Local Stakeholder (LS) and round two Policy Stakeholder (PS) (Table 6) interview (for interview framework see Appendix 3 and 5 respectively) outcomes were analysed and are presented concomitantly under the following overarching themes:

1. Perception of ecosystem science.
2. Ecosystem science to improve mainstreaming of environmental priorities.
3. Challenges and opportunities to mainstream ecosystem science.
4. Governance and decision-making in the marine and coastal environment: are they adequate to use ecosystem science?
5. What could be done to improve governance and decision-making?

⁵⁰ As detailed in section 3.7. ecosystem science (ESc) is a collective body of concepts and approaches rooted in SES thinking (Scott et al., 2018) that includes natural capital (NC), ecosystem services (ES), nature-based solutions (NbS), net gain (NG), the ecosystem approach (EcA), the natural capital approach (NCA), ecosystem services framework (ESF), and ecosystem-based management (EbM).

The major themes that emerged from both round one and round two interviews formed the topics for consideration in the round three Interdisciplinary Stakeholder (IntdS) focus group (Table 6). Additionally, the IntdS focus group participants were sent a pre-focus group survey, with the questions and answers intended to enable participants to contribute to the focus group design from the outset (see Appendix 7). Analysis of round one, round two and pre-focus group survey outcomes established three main sections for the focus group format, and results are presented under the three sections as themes:

1. What would improve collaboration and enable you to more easily work with other organisations and different sectors to address key issues and put environmental health to the forefront of decision-making?
2. How can ecosystem science concepts be used as connecting tools to advance collaborative governance and decision-making?
3. How can 'environmental connectors' assist collaborative working and further the use of ecosystem science to mainstream environmental priorities?

Throughout the research, participants names have been anonymised and replaced by the sector that they represent (round one and round three), or the job title they have (round two). In the interview analysis round one participants are quoted as (LS. Location. Sector); round two participants are quoted as (PS. Job title); and round three participants are quoted as (IntdS. Sector).

Table 5. All stakeholders involved in round one, two, and three.

One-to-one Semi-structured Interviews			Focus Group
Round One Local Stakeholders (LS)		Round Two Policy Stakeholders (PS)	Round Three Interdisciplinary Stakeholders (IntdS)
Sector	Location	Job Title	Sector
Academia	S	Chief Scientist	Coastal Community
Academia	ND	Deputy Director	Environmental Academia
Academia	ND	Director	Fishing Federation
Activist	S	Lead Planner	Natural Capital Policy
Conservation Charity	S	Scientific Advisor	Marine Consultancy
Commercial Business	S	Senior Advisor	Marine Planning
Community Group Rep	S		Marine Policy
Conservation Authority	S		Terrestrial Planning
Conservation Authority	ND		
Fisheries Authority	S		
Fishing	ND		
Heritage	ND		
Multi Partnership Agency	ND		
Nature Authority	ND		
NGO	ND		
Planning	S		
Ports and Harbour	ND		
Regulator	S		
Regulator	ND		
Tourism and Recreation	S		
Tourism and Recreation	ND		

5.2. Semi-structured interviews: local and policy stakeholders

Presented in this section are the themes that emerged from the semi-structured interviews with local stakeholders (LS) of the Marine Pioneer⁵¹ and with policy stakeholders (PS) from Defra and arm's length bodies. The themes of the first round of interviews informed the second

⁵¹ Local stakeholders to the Marine Pioneer programme cover a wide range of sectors and were selected due to their geographical location within the programme areas (Suffolk and North Devon). They all had previous knowledge of and some communication with the Pioneer projects.

round of interview questions in a deliberative approach to research as discussed in the methodology (Chapter 4) and are discussed comparatively throughout the text.

5.2.1. Perceptions of ecosystem science

There were contrasting and contested responses from both local stakeholders and policy stakeholders to ecosystem science (ESc) and associated concepts. Most frequently the natural capital approach (NCA) was identified and discussed in a positive⁵² vein. Most participants used natural capital (NC) and ecosystem services (ES) together, while some participants spoke about different terms interchangeably, notably, merging “ecosystem thinking”, “ecosystem approach” and “ecosystem management approach”; and “natural capital approach”, “capital gains” and “natural capital accounting approach”. Throughout the results, where participants spoke about a specific concept this is noted, otherwise the umbrella term of ESc is used (see section 3.7. literature relating to the concepts and interactions between them).

The majority of participants agreed that ESc concepts have the potential to improve decision-making and increase financial investment in the marine and coastal environment. However, areas of contention emerged relating to the language and values inherent in using ESc concepts, in particular the perceived ‘monetisation’ of natural assets. Frequently, participants stated ESc concepts can increase strategic planning and partnership working. These key responses are now unpacked.

⁵² Feelings of optimism, and progression from previous approaches

5.2.1.1. *Potential to improve decision-making and investment in nature*

Participants from both LS and PS interviews stated ESc concepts have the potential to improve decision-making (twelve out of twenty-one LS and three out of six PS). The most frequently mentioned reason was that NC or using a NCA highlights, elevates, and justifies the importance of the natural environment and in doing so enables improved discussions:

“It’s the foundation on which everything else rests... Natural capital putting the environment, not just at the heart of things, but as the basis of things” (LS.ND. Multi Partnership Agency)

“To demonstrate the benefits provided by existing environmental features, or potential environmental features, and so in that case, it just means not complete suite, but a fuller suite of benefits provided by existing environments or a potential environment is considered at the planning stage (LS.ND. Academia)

Where previously the environment has been *“an undervalued element in society”* (LS.S. Conservation Authority), ten out of the twenty-seven interview participants’ responses (nine LS and one PS) suggested that ESc concepts help identify and illuminate the benefits to human welfare received by nature. This argument was advanced by one participant who wanted attention focussed more on the future potential of ES rather than what currently exists from nature can be maximised:

“It’s inappropriate for government policymakers, in general, to be thinking about the current status of environmental resources as a base case, when they’re thinking about ecosystem services that can be generated by natural capital... When decisions are being made, it’s almost based on what could be possible rather than what is the minute... The sort of benefits that a fully functioning and healthy ecosystem provides... Thinking about the potential for coastal ecosystems to provide benefit to society” (LS.ND. Academia)

It was said that *“in the past, it’s [the environment] always been a constraint”* (PS. Lead Planner). However, the advancement of ESc concepts reframes decision-making to *“see the environment as almost second opportunity”* (PS. Lead Planner). It was also said *“I would personally like to see the environment be represented be a stakeholder in in a lot of these processes, and structures...Natural capital sounds like an interesting opportunity [to do this]”* (LS.S. Activist). Nine out of the twenty-seven participants supported the contention that because ESc takes more benefits received by the natural environment into account in decision-making and relates benefits to beneficiaries, it should attract more investment and highlight priorities for investment:

“We can change the way that society looks at investments, investing in the environment, we can only do that if we identify and quantify the benefits to those individuals or businesses” (LS.ND. Regulator)

This included the possibility for increased investment in *“climate resilience or mitigation... defence schemes... bathing water”* (LS.ND. Regulator), and *“using the natural capital, as a as a tool to work out where there are pockets that are still worth protecting, or where you need to or where you can or where you should start to build up again, to invest in, to restore, to rebuild”* (LS.ND. Multi Partnership Agency). Different sources of funding were also mentioned as a positive driver of environmental action, albeit with some limitations: *“from other sectors”* (LS.ND. Regulator); *“city money”* (LS.ND. Heritage); *“the Treasury”* (PS. Chief Scientist); and *“continued public funding of investment in the natural environment”* (LS.ND. Nature Authority). However, the difficulty in attracting investment was raised by two participants, suggesting that *“generating a good return on investment from the natural world is pretty tricky”* (LS.ND. NGO), as it is *“very difficult to see where the long-term income stream comes from”* (LS.ND. Heritage). Both of these participants, and also a participant from a nature authority suggested the scale of projects that the environment sector is used to designing and delivering is typically small, and therefore to better attract investment, alongside using a NCA, smaller scale projects

should join together to increase investment opportunities. Additionally, one participant suggested instead of investments in nature expecting a return, “*corporate social responsibility that is more of a one-off payment*” (LS.ND. NGO), could be a better way to invest in nature. However, other participants expressed concern with the prospect of NC terminology being used in decision-making to enable investments that may lead to the monetisation of nature, as highlighted in the next section.

5.2.1.2. *Ecosystem science language and values are controversial*

The language and values associated with ESc concepts were mentioned by fifteen out of the twenty-seven participants. There were divergent feelings in regard to terminology and its effectiveness, universality and accessibility, but most participants thought it helpful overall. As alluded to in the previous section, some participants (four LS and one PS) expressed concern with the economic language and values inherent in NC, suggesting “*as a word is quite off putting*” (PS. Scientific Advisor), and “*it probably would frighten some people like oh god, capital!*” (LS.S. Planning). The main point of the participants’ concern is that we should value nature, for its intrinsic value, and that it is important we don't move to a model where we only have to demonstrate a perceived economic value for wildlife. The LS quote below highlights this through their own narrative, albeit accepting that ultimately NC language and values can be useful:

“Alarm bells ring among certain communities about you know... You can't put a value on nature, you shouldn't be trying to, its anthropogenic way of conceiving of things... [but] We lost the argument, we tried to persuade people that the environment was important, look at it, but no one listened. And it takes the white knights of economists to come in and say, you know, we rule the world now. We got you into this mess, we're the ones who can get you out of it. Yeah, it just feels like okay, that that's where it's got to be. From a from a practical point of view, you know, things are pretty bad... It's a

shame that it's had to resort to this... So yeah I'm behind it as a concept as a, you know, as a way of getting people to value the role the environment plays, and underpinning the economy and underpinning life and well-being” (LS.ND. Multi Partnership Agency)

Often participants expressed some tension in their responses, as reflected in the above LS quote. Most participants expressed how degraded the environment has become due to poor historical governance and decision-making and see a NCA as a hopeful new method with associated tools to make better decisions *“because we’re a selfish species and the way we’ve created our culture and legislative framework, we have to relate benefits to humans” (LS.ND. Nature Authority).*

A strong view from both LS (six participants) and PS (three participants) was that NC and ES terminology provides a greater vocabulary for wider groups to discuss the value of the environment and improve the status of the environment in policy and decision-making processes. It was said *“things are so hard to measure and to put a value on, but speaking to the economics, in a language that is tangible, is probably really important” (LS.S. Academia),* because it provides *“the right language to connect the different teams” (LS.ND. Heritage),* to enable conversations using shared language and values that different groups can understand, as highlighted by the LS quote below:

“It’s important we think, that we should actually be able to put some financial sort of overlaps into, but some financial value onto things like a view or a particular landscape, both from the economic and from the environmental point of view, because otherwise, you’re putting forward arguments against development perhaps or in favour of something, and you’re making claims such as this is important, important, peaceful, tranquil place to be, but you have no evidence” (LS.S. Community Representative)

Historically, the environment has been positioned as an afterthought to decisions once they were made or treated separately by environmental practitioners only. Instead, it was said that ESc highlights the levelling up importance of nature *“to bring it in on a more or less equal basis”* (LS.S. Community Representative). The quote from the PS below agrees, highlighting that the NCA can be understood and used by different groups to show the linkages between social-ecological and economic values, and associated trends and potential options:

“Quantifying the impacts and quantifying how much of what value we get from nature, and whether it's increasing or decreasing and whether it's a cultural value or whether it's an actual goods value. It does help with that. So natural capital helps quantify those things. But also, it's because it's in kind of, pounds and pence. It's something that everyone kind of, you know, the, the expert in it but also Joe Bloggs can understand” (PS. Senior Advisor)

However, this viewpoint is challenged in the following quote from a LS which suggests instead that NC is useful in contexts where decisions are made using monetary terms, but that it does not resonate with wider publics:

“If you're talking to someone from in the business sector, or if you're talking to, elected representatives who are trying to make decisions on, broadly speaking, the use of resources... Perhaps it makes decisions easier... But if you're talking more generally to the public about in a broader sense you know how you value the environment. I certainly don't think natural capital has gained much of a traction” (LS.ND. Multi Partnership Agency)

It was suggested by one PS this is because NC is not *“universal enough in a term”* (PS. Scientific Advisor). One other PS suggested production of NC and ES values *“aren't compelling arguments to take to a minister”* (PS. Deputy Director), because putting monetary values on non-marketable items, in their view, is *“incredulous”*. However, a different PS disagreed instead saying that NC terminology is useful *“in monetary terms and that's what we think the Treasury can understand”* (PS. Chief Scientist). Both of the PS participants agree

that it is the intrinsic values that are difficult to convey and that there is a need for really clear wording, targets and policy interventions.

Four participants (two LS and two PS) suggested there is not very clear messaging of ESc concepts, because the description in policy documents lack sufficient clarity:

The simple phrase of ecosystem management is so vague and so unclear to people without the specialist training that I'm not sure it's an overly strong direction for policy
(PP. Deputy Director)

It was expressed that this can be confusing, which leaves stakeholders feeling uncertain as to what is required. One other PS participant stated *"I don't really care what we call it as long as it's defined properly. So, doesn't have to be called capital, it could be called something else but as long as it's defined, and the way in which it should be used is defined"* (PS. Senior Advisor). Clear definitions of ESc concepts and how to use them are important because *"people are running with the idea of natural capital in their in their various little silos"* (LS.ND. Multi Partnership Agency), and there is not *"a common method to use that concept of natural capital"* (LS.S. Conservation Authority). This may lead to a further disparity and diversity in language, values and approaches. The methods to attain values were also briefly mentioned by one PS and one LS in relation to over-complicating the process and moving away from the core principles of enabling better environmental decisions, to quantification biases:

"I think the economy concepts and ecosystem services and approach are really sound. However, I think that the, the way in which is being applied this sort of the complicated formulas and you know all the rest of it, that is kind of building up around, it has the potential to be counterproductive, and we'll switch people off because they'll just start arguing about the numbers. Instead of focusing on the principles, but I absolutely believe that we need to take, you know a whole site approach" (PS. Director)

Important points were also made by four LS and two PS participants that the current values that are being used to measure natural capital are not yet representative enough to make sound judgments, as *“there’s still some way to go in fully understanding, how we define and measure that natural capital”* (LS.S. Conservation Authority). In particular *“it doesn’t work as well, in terms of the metric for, say biodiversity”* (LS.ND. Nature Authority); also, there is not *“much focus on non-use values in government agencies or their recommendations for how to think about prioritising coastal marine expenditure”* (LS.ND. Academia).

Additionally, it was argued by two LS and one PS participant that the social and cultural values are not yet fully captured. Indeed *“how do you measure the value of somebody that walks to the sea every day and makes them feel better?... We’re not there yet”* (PS. Scientific Advisor). Each mention of social values by either LS or PS participants related to the importance of capturing social values alongside natural and economic values, within the social-ecological system, but that ESc language and methodologies are not (yet) able to encapsulate and present values in a way that fully represents the true significance of the environment to society. However, one other LS participant differed, slightly, suggesting instead that NC and identification of ES can highlight shared values and build *“that shared evidence base, [to then] work through to establish shared priorities, and having done that, then agree about where the collaborations are going to be”* (LS.ND. Nature Authority). In that sense, there was a feeling amongst interviewees, ESc concepts can help with strategic planning and partnership working.

5.2.1.3. Strategic planning and partnership working

It was agreed by ten participants (seven LS and three PS) that ESc enables “*joined up thinking and joined up planning across organisations*” (LS.S. Academia), and that it “*has a lot to offer in terms of being able to lay out that strategic evidence base*” (LS.ND. Nature Authority), by promoting discussion around shared resources and establishing shared priorities, which facilitates “*working in partnerships*” (PS. Lead Planner). Significantly, no participant from either the LS or PS interviews said that ESc made joined-up working worse. Indeed, most participants that highlighted the potential for integration spent time unpacking how, or where this join-up is needed:

I mean the basic premise between ecosystem thinking is, is joined up, of course, either at the environmental level or many other levels. And the most significant lack of join-up, we have is that marine science and fisheries science tend to be separate. And there is pressure to bring these together... Actually, it's become really apparent in the last few months, I think that's very important (PS. Deputy Director)

The quote above from the PS, highlights that ecosystem thinking has aided perceptions of the environment as a more connected whole, which is helping to bring together currently separate policy areas. The LS response below agrees, highlighting, in this case, why a NCA is a useful approach to enable join-up:

“Because it's so broad and covers all the assets and the services, the wider partnerships can really understand what element of it they're particularly interested in... Then agree about where the collaborations are going to be, and how individual organisations are going to align their investments to enable that collaboration to work” (LS. ND. Nature Authority)

The concept of partnership is particularly important here “as a way forward, because you can't do everything on your own” (PP. Lead Planner). It was also recognised how important it was to not only help environmental groups understand how to integrate NC into policy, plans, and decision-making, but also to enable other government departments, and industry to do so:

“And so 25 Year Plan is very good, I think, at involving all sectors, NGOs, as well as industry, in integrating environmental outcomes in decision making... Bringing it to the forefront where we can be in the same conversation and at the same table... Taking a natural capital approach or including that capital, in your six capitals when you're making business decisions, I think really helps (LS.ND. Regulator)

Participants felt ESc can improve strategic planning and partnership working by joining up different sectors and enabling collaborative dialogue around all of the areas important for society. It has been highlighted in this section that ESc has the potential to improve decision-making by raising awareness of the environment, and by highlighting the benefits received by nature to different groups, which can generate wider investment in nature. It was also said that the language and values inherent in ESc is mostly positive notwithstanding some limitations. Therefore, it does suggest that using ESc can provide additionality to improve mainstreaming of environmental priorities into non-environmental⁵³ sectors, which is now further unpacked.

⁵³ A non-environmental sector is defined (by the researcher) as an industry or organisation that carries out daily activities largely irrespective of environmental impact – be that in a local area or through a global inter-regional connectedness.

5.2.2. Ecosystem science to improve mainstreaming of environmental priorities

The previous section highlighted that participants perceived ESc to improve decision-making and collaborative working, however the word “capital” and its use had mixed reactions. This section builds on this and details how participants felt regarding mainstreaming of environmental priorities into wider sectors that would not, historically, have considered environmental priorities in their policy and decision-making. Fifteen participants (fourteen LS and one PS) explicitly spoke about mainstreaming into non-environmental sectors. Of these, four participants had mixed feelings. However, the dominant thought, of those participants who explicitly spoke about mainstreaming into non-environmental sectors (ten LS and one PS), was that mainstreaming ESc has significant potential to mainstream environmental priorities into the policy and decision-making on non-environmental sectors:

“Because I think, you know, some of those, you know, knock on benefits that come from protecting our natural capital, that aren't always recognised by other sectors... So I think being able to show people that bigger picture to show that kind of value of natural capital and how it feeds into those non immediately environmental concerns can be, you know, hugely important” (LS.S. Conservation Charity)

“I think that the natural thing for big businesses to do is to try to grow and to consume resources and, and use resources to profit. That's, that's the natural. That's, that's the nature of things... [however] there needs to be some constraints that they need to understand. So, we can use natural capital as a way of expressing those constraints” (LS.S. Activist)

By showing constraints and concatenation of events, ESc engages different, sometimes new audiences in dialogue. It was said that factoring NC into policy and decision-making “*should apply kind of across the board*” (LS.S. Academia), as “*it needs a whole society approach*” (LS.S. Conservation Authority) to achieve the goals of reversing biodiversity decline and reversing the climate crisis, indeed “*environmentalist will not be able to do it on their own*”

(LS.S. Conservation Authority). A PS agreed, furthering that the NCA should be mainstream and is particularly useful in “*discussion around net gain, so understanding what capital is in the marine, understanding how it can be impacted, and so what are our losses going to be so we can then calculate, well, what's our offset, and therefore, what do we need to do more. And then, because that's all been done in the metric actually monitoring it based on the net gains as well*” (PS. Senior Advisor). In that sense, mainstreaming of different concepts within ESc may help to mainstream other concepts under the ESc umbrella, which ultimately, can improve the natural environment.

However, one participant was wary that a NCA could introduce a perverse impact due to perceived “*more red tape*” (LS.ND. Academia), because they suggested non-environmental companies would “*do more initially, in order to design projects which don't require them to comply with additional environmental regulation, because all of those compliance procedures are costly*” (LS.ND. Academia), which ends up having a negative overall environmental impact. It was said that “*there's a massive education thing needed, probably around natural capital and ecosystem services*” (LS.S. Planning) before it could be a mainstream way to include environmental priorities into decision-making. Indeed, environmental education and ESc skills proficiency are some of the main challenges or opportunities, as discussed in the following section.

5.2.3. Challenges and opportunities to mainstream ecosystem science

Throughout the interviews both LS and PS participants mentioned challenges and opportunities for mainstreaming ESc. Current challenges can also be opportunities if the correct actions are taken going forward so they should not be seen as mutually exclusive and as such, the results are not split into specific positive or negative sections. These themes

relate to skills proficiency, individuals that have the power to be champions or gatekeepers, data availability, and the legal and regulatory system.

5.2.3.1. *Skills and understanding*

Ten participants (seven LS and three PS) identified the skills challenge (capability and capacity) which was currently inhibiting more widespread use of ESc, as highlighted in the following LS and PS quotes:

“Not enough expertise in which to do these things... it's not a straightforward thing to do as far as I can gather. There are certain people who have expertise in doing it, firstly in doing the actual asset mapping in the first instance working out what's there... Once you've done that, seems even more limited in terms of how you might begin to value that, in terms of who has the expertise to do that... there's only a limited number of those people... You want to roll it out but who's gonna, who's gonna do all this?”
(LS.ND. Multi Partnership Agency)

“There aren't that many people out there who can actually do it. And the people you would need to do it, are either in academia or in government doing the policies... So the big barrier in our organisation is just availability of the people with the technical know-how” (PS. Senior Advisor)

The core priority was that *“there needs to be some training”* (PS. Scientific Advisor), to increase competency across staff members. It was said that ESc is an *“academic process”* (PS. Deputy Director), that is currently *“very theoretical, and even the applications of it it's still very theoretical”* (PS. Senior Advisor), which presents a challenge as to exactly what everyone should learn and how theory works in practice in delivery mode. This *“needs coordination”* (LS.ND. Multi Partnership Agency) to be effective across regional assets and to ensure

different groups are learning and using the same methods and metrics across geographical and organisational boundaries.

One LS participant suggested an opportunity to increase skill levels would be to roll out a small team of educators *“that you can equip with a PowerPoint... and then you go out with the idea over the next two years... It would pay for itself in the way that communication would flow much better”* (LS.ND. Heritage). Whereas a different LS participant suggested its *“got to be digital, it's got to be online. And then maybe, you know, you send the links out to everybody”* (LS.ND. Ports and Harbour).

There is opportunity for the current lack of skills in the workforce to be overcome by training programmes. However, six LS participants expressed a greater challenge to mainstreaming environmental priorities, which is that often people outside of environmental sectors do not care or do not know whether their actions positively or negatively affect the environment *“they're not too bothered about it, if they're not being affected by it”* (LS.ND. NGO). It was felt that greater connection and *“more ownership”* (LS.S. Conservation Charity) over decisions and outcomes could get people to care about the marine and coastal environment and change behaviours that negatively affect it:

“At the moment, there isn't that sense of linkage and the value that natural capital brings. So, it feels there's a whole kind of programme of education and awareness raising, to bring that forward. And I think, you know, if combined to that, that could lead to a greater sense of people then having an involvement and engagement with the decision making” (LS.S. Conservation Charity)

An urgent need was identified for an improved understanding of human and business dependencies on the natural environment and improved stakeholder engagement in environmental decision-making processes for the NC upon which society relies; *“gotta make*

being environmentally friendly be relatable” (LS.ND. Ports and Harbour). A key part of this process may involve the initial researchers and decision-makers who instigate or champion the approaches.

5.2.3.2. *Champions and gatekeepers*

The importance of champions and gatekeepers who play a key role progressing or hindering ESc acceptance and uptake featured in responses from one LS and three PS participants. The first quote from a PS highlight's that there are champions of ESc who are currently mismatched in terms of pace and ambition with government gatekeepers where, in this case, Defra and/or government are seen as lagging behind local partnerships and industry aspiration:

Coastal partnerships, some of them, or indeed industry, are wanting to go at a much greater pace than Defra is able to facilitate at the moment... It does need time, it needs the alignment of the various parties, in order to give it the best chance of long-term success... Once you've got that, you know, clear vision, you've got the policy basis, they can secure legislative time which then provides the, the framework around which it can progress. But you know, there are local areas that are already working, albeit in a quiet limited and somewhat challenged way with the system as it currently operates. And thank God for those passionate people” (PS. Director)

There is appetite from local partnerships and some industries to start using ESc in their daily working practices. However, the previous quote shows that Defra and /or government are not ready to facilitate the process as there is currently not a strong enough legal framework to drive forward use of ESc concepts across government departments. The quote also reveals that some passionate organisations try to carry out the work in spite of the current system, which hinders progress. The same PS participants also suggested that some champions are *“providing that lobbying to government, to say, actually this is really important to us, and we*

think you need to prioritise it" (PS. Director). This highlights the potential powerful impact of collective stakeholder and grass roots involvement, echoed in the following PS quote:

"We really mustn't underestimate the effects of stakeholders and by that I mean, our constituents. People, the man on the bus, to use that phrase. Industry in particular, both in new industries coming in, especially in offshore wind but the old established industries and fishing. The nongovernmental organisations and MPs, these, these groups they play, they have huge influence and actually government is remarkably responsive to their views" (PS. Deputy Director)

The following PS quote also highlights another key aspect of a champion role involving effective translation and communication of knowledge, which helps support government being receptive to key concepts (e.g., NCA within Governments 25 Year Environment Plan):

After the Valuing Nature Network [conference] government weren't very interested [in the NCA] ... [however, name of influencer] said he'd got a senior government person and he explained to him what natural capital really meant, and [name of influencer] said his intervention led to the Natural Capital Committee that led to all of this. So, if that's true, then I think that that shows you how being able to make connections, do things at the right level can actually mean, if that really truly was what led to the chain of consequences, then that's very impressive (PP. Chief Scientist)

This highlights the importance of people being able to access the right people at the right time for progress to be made. This sentiment is further echoed in the LS quote below:

"Influential members speaking to a receptive decision maker, with the right evidence demonstrating the right benefit... how do we design a model to create a receptive decision maker that listens... How do you create a culture around receptive, decision makers and how do you create enough evidence, understanding of how to communicate benefit. That would be the model that would be of interest... It's complex, and why it has never happened before, it's complex in terms of legislation is complex in terms of community and culture (LS.ND. Regulator)

The quote highlights additional enabling factors for progression, which includes the receptiveness of key decision-makers, the availability of data and evidence, and a legislative culture that enables/promotes ESc concepts. These are now further unpacked.

5.2.3.3. *Data and evidence*

It was said that to use ESc in policy and decision-making requires evidence that is “*backed up by sufficient data*” (LS.S. Community Representative). However, it was argued by one LS that, whilst there is potentially a lack of knowledge on which to base decisions, even if there was more data it can be difficult to achieve consensus “*because there will be winners and losers*” (LS.S. Fisheries Authority). It was also said, if there are opposing parties to the PPPP they might “*challenge the plan on the basis of the evidence*” (PS. Director). Participants that mentioned data (five LS and two PS), albeit with some contestation, said there was currently not enough to carry out ESc effectively:

“It can be difficult to achieve. There's a lack of knowledge on which to base decisions
(LS.S. Fisheries Authority)

In particular, using a NCA in “*the marine environment is a little more difficult, because there's less data*” (LS.ND. Regulator) upon which to make decisions. It was agreed by two LS participants that there has been cut back on government spending on data collection and monitoring “*so we don't actually know what's going on in some of our marine protected areas* (LD.ND. Academia), and “*the science isn't done*” (LS.ND. Fishing) to provide organisations or individuals with the knowledge base they need.

Conversely, three participants (one LS and two PS) felt there is enough data but that it is not available to everyone because it is behind paywalls, or is in disconnected databases, or is not collected in comparable formats:

“There are organisations or industries out there who do a lot of surveying, but it’s again it’s a competitive market, so they don’t want to share their data with anybody else” (PS. Director)

“And that seems to be one of our big barriers, at the moment is either we have data but it’s in lots of different data databases, so we’re not quite sure where it is, or it’s owned by industry. And then when you get over that hurdle, and they’re not in a standard format (PS. Senior Advisor)

It was said to overcome this challenge *“technical resource”* and *“political will”* is needed to mandate that *“after this date you’re going to have to comply to these additional requirements”* to develop a *“core data set, so you’d have natural capital as a core data set”* (PS. Senior Advisor), which government departments, developers and planners, as well as NGOs and conservation authorities can use.

Two LS participants argued that it is important not to get too fixated on having enormous amounts of detail. It was said *“practitioners just have to understand that an order of magnitude might be enough to qualify or quantify the evidence base you’re using”* (LS.ND. Regulator). Importantly, it was highlighted that *“things are getting worse while you’re waiting for the data, by the time you’ve, you know got the data things, the data are out of date, because things have got worse”* (LS.ND. Multi Partnership Agency). Therefore, the key message of these two participants was about data proportionality; not to wait until a full suite of data is available to be decisive for the environment; indeed, a full and up-to-date data set might never be plausible.

5.2.3.4. Legislative drivers

Mainstreaming ESc was related to legislation and policy by twelve LS and three PS participants: all describing it as an essential element of the enabling environment. It was said *“it's got to be some, somewhere legally binding”* (LS.S. Activist), because *“it has to have weight”* (LS.ND. Ports and Harbour). It was suggested that *“if you get it embedded in key documents coming out of government, then it's a really, it's a good starting point”* (LS.S. Planning). The LS quote below agrees and also highlights the challenge that ESc is not a formal requirement at present. However, legislative and policy frameworks were viewed as opportunity spaces:

“We've got quite a responsive structure, so long as it was fed in as a requirement, then yes, if it is, if it is something that has to be considered, it becomes another consideration in the decision-making process... But as I said, at the moment it isn't formally embedded in the process, so at the moment it isn't happening. But I can't see any reason why, given a sufficient desire for to happen at a high level that it wouldn't effectively be applied to become another factor that we have to consider in the decision making... It would have to become a legislative driver (LS.S. Fisheries Authority)

The LS and PS quotes below agree regarding the need for high-level desire together with a strong political steer (five LS and two PS participants specifically mentioned this), interestingly with nature-based solutions (NbS) as a hook for discussions in the PS quote:

“We need a strong steer from government via the legislation or what is known as a ‘Defra steer’ which is something that they send along to us to give us another direction as to where to go” (LS.S. Regulator)

“The main drivers is political will. One of the main themes for the G7 taking place in June in Cornwall is nature-based solutions. So, I think, you know, that will give this ability” (PS. Scientific Advisor)

There was also a governmentality approach at work here in order to secure much needed funding. It was said that *“you want to align your thinking with Defra, even if it's just from a trying to get money point of view”* (LS.ND. Multi-partnership agency), because government assigns funding, they decide what is resourced and therefore what opportunities can be realised:

“The natural capital approach needs to come from the very top government and influence every decision making. So yeah, when I've talked to people that are working in and around government, and you say, why doesn't this happen? They always say, it's the Treasury, it's the Treasury, they have enormous influence” (LS. S. Conservation Authority)

The above LS quote argues the Treasury has the power to ensure all areas of Government, elevate but also business, housing, transport, etc., use a NCA, or include NC in their policy and decision-making but there are conflicting priorities. Another theme that emerged with regards to the legislative framework was in relation to licensing, which is currently felt to be a barrier to aspects of ESc delivery (by four LS participants) but it was said it has potential to be an opportunity (by one PS participant). NbS projects were given as an example of experienced barriers. For example, three LS participants separately mentioned net gain (NG) salt marsh restoration projects. It was said that there is *“lots of frustration... Getting the relevant licences from the MMO is just so difficult for small organisations”* (LS.S. Conservation Authority) to carry out restoration projects because of the price of licences, which *“has just gone through the roof, licences are up to 300% in value to what they were only a few years ago, it's crazy what's going on”* (LS.ND. Fishing), also *“they won't tell you how much the licence costs until you apply for it, which is a back to front way of doing it”* (LS.S. Commercial Business). In regard to NG specifically it was said:

“There is a debate that's going on at the moment about things like net gain, and whether licencing consent decisions, for example, should have a requirement to ensure that developers, not only are reducing minimising or mitigating the impacts that they have on the environment but they also are putting in a positive contribution. At the moment, that is not underpinned by any legislation” (PS. Director)

The above PS quote highlights licencing is a potential opportunity to ensure NG, because developers and non-environmental organisations would be required to contribute to environmental restoration, enhancement, or creation alongside their developments. However, there is not currently the legislative framework to support this, so it does not currently happen. Conversely, the NbS saltmarsh restoration proposals which aim to enhance the natural environment struggle to go ahead because the conservation and local groups and businesses cannot afford the licence. As one PS described *“environmental legislation at the moment is not particularly helpful... It's a very negative way of viewing how things can be delivered”* (PS. Director).

Another regulatory driver that was mentioned was impact assessments, which are frequently part of the licensing process. However, there was a difference in opinion as captured in the following two quotes:

“I think for me ecosystem management approach, I think that will become more and more ingrained into, more into the assessment rather than data. Right, so people will start to take that approach, especially in terms of kind of impact assessments” (PS. Senior Advisor)

“I think it's helpful, but to a limited extent, in trying to put a price on the air we breathe or in friendship on anything else, which is basically not marketable. I think it has far less value than people may realise, and these aren't compelling arguments to take to a minister and not compelling arguments in an environmental impact assessment (PS. Deputy Director)

The first quote reflected the more popular view that ESc concepts will be further engrained into impact assessments because these are “*quite broad*” (PP. Director) and in-depth processes already carried out under legal requirements. It was said there are research projects under way to establish the possibilities for this. The opposing view was that the specific values used to present ESc figures might disrupt progress and do not aid discussions or impact assessments.

This section has highlighted that legislation and policy could be an effective driver to mainstream ESc. However, at present there is not the right governance or legislative framework or political will in place to promote ESc, so it currently represents a barrier to implementation. This can be overcome through effective communication and translation by champions who are in the right place at the right time. Current marine and coastal governance and decision-making structures are now further unpacked.

5.2.4. Governance and decision-making structures in the marine and coastal environment: are they adequate to use ecosystem science?

The consensus amongst both LS and policy PS participants was that current governance arrangements that affect the marine and coastal space do not sufficiently prioritise the environment and are not currently “*fit for purpose*” (LS.S. Community Representative) to apply ESc. It was said that “*governance has evolved and changed over time, therefore, it's very unlikely to be the most efficient or effective means of making decisions*” (LS.ND. Regulator). A major theme apparent was the fragmented architecture of the numerous organisations that currently operate in coastal and marine environments. Additionally, it was said that

governance is out of balance, with economic sectors being the priority. These themes are now unpacked.

5.2.4.1. Governance is out of balance

There was a strong belief amongst seven LS and four PS that the environment is out of balance with the economy at a governance level, and “*natural capital is not being given enough weight in decision making*” (LS.S. Conservation Authority). Therefore, governance and decision-making structures are not currently well suited to use ESc concepts, because the environment is not currently weighted equally with economic sectors:

“The decisions are very much skewed in a traditional economic, in an economic way, not factoring in the value of natural capital and the other benefits that that brings to society... Progress is defined by an expanding economy. And I think, yeah, at some stage we have to realise that we’re using up all our natural capital” (LS. S. Conservation Authority)

It was said that over-consumption of natural resources and damaging activities has to stop but there is an “*unholy alliance between sort of big business and the central or local government*” (LS.S. Activist) and a “*culture of obsession with economic growth*” (LS.S. Academia), which is prioritised over the environment. It was said that the current paradigm is not sustainable, as highlighted by the following LS and PS quotes:

“The paradigm of economic growth is completely mismatched with the interests of natural capital... A lot of people talk about the need for our fundamental economic models to be changed if we are really looking to achieve a sustainable future. Because at the moment, the value of the environment and the services it provides aren’t I think,

perceived adequately to be recognised in the decision-making processes” (LS. S. Academia)

“Governments and local authorities will generally prioritise, it's about economic prosperity. So, the word sustainability is used a lot but, in my view, generally, its economic, environmental; economic, social (PS. Scientific Advisor)

Additionally, as the LS quote below highlights, through a fisheries quota example, the economic model itself is perceived as out of balance, where local economies and stakeholders feel they do not receive a fair share, or transparency in decision-making regarding the available resources:

“It only favours the very few. I gotta be careful cause you're recording me, but I was told something like 90 percent of the fish is owned by 2 or 3 percent of ownership and the rest of the 10 percent is owned by the 97 percent of the fishermen... To me its corrupt” (LS. ND. Fisheries)

Nonetheless, there was also a feeling of hope from one LS participant, who felt that there is a “*strong recognition*” of the challenge of resource distribution amongst stakeholders and the need for balance between the environmental, social, and economic sectors, but that ultimately “*we're not there yet*” (LS. ND. Nature Authority). However, this PS response signals caution with a notable imbalance in evidence regarding the economy and the environment post-Brexit, highlighting that trade had trumped environmental considerations:

“Those decisions are the ones taking place now. So as of today, those decisions are looking at trade flows and making sure trade flows are working better... And then the next generation of questions that come after that will be much more to do with how we look after the environment. So, the environment will come back into parliament next session” (PS. Deputy Director)

This separate treatment between trade and the environment at the very highest levels of decision-making, exposes the general disconnect and frustration felt by participants throughout their replies to governance issues.

5.2.4.2. *Governance is disconnected*

It was said, by fourteen LS and all six PS (with a mixed disposition from one LS and one PS) that governance *“all seems to be disconnected”* (LS.ND. Heritage). Three LS and one PS participant argued that governance is disconnected vertically from government policy and decision-makers to local working and delivery levels, as highlighted in the below LS quote which illuminates the feeling of disjuncture felt by some local people when thinking about who is making decisions. Also, attention was drawn to vertical disconnection of policy intentions. as shown in the below PS quote:

“The people we're talking to, saying yes or no what we can do, don't even know where it is” (LS. Commercial Business)

“There just isn't those linkages between high level policies and between local policies” (PS. Scientific Advisor)

Together these quotes expose the perceived separation between people and policies. It was also voiced by the majority of LS and PS participants that governance is disconnected horizontally across organisations operating in the same general location:

“There are so many different organisations and regulatory regimes that are all operating in the same space, but are not necessarily joined up or aligned” (PS. Director)

According to six LS and one PS this is because there are too many organisations, which makes *“it complicated in terms of who has responsibilities”* (LS.ND. Multi Partnership Agency). Because of the severalised organisations across and within the marine and terrestrial environment *“everybody's making different plans and strategies. And those aren't necessarily married together on the same time scale”* (LS.S. Academia), which can lead to *“conflicting policies... everyone has their own priorities”* (PS. Senior Advisor), and *“sometimes those things are kind of in competition for resources”* (LS.S. Academia). It was said it is *“quite territorial because that's the way that the spending review is”* (PS. Scientific Advisor). Two LS and two PS participant specifically used the word ‘silo’ to highlight that organisations do not currently work well together, as captured in the following LS quote:

“Because of siloes or under appreciation or, or lack of appreciation of dependencies, and consequences of decisions in one sector affecting another's unintended consequences of decisions. So, there's no single governance structure... So, I think my answer is that at the minute no, its not the most effective means of making decisions about natural capital assets in the marine environment... No, not the most effective, too many different groups making different decisions that don't communicate very well with each other, and certainly don't make the most of each other through the different sectors or even different statutes, spatial planning, and terrestrial spatial planning and marine spatial planning... there's no single body (LS.ND. Regulator)

The disintegration between marine and terrestrial governance was highlighted by four LS and one PS. It was said that the inability to control drivers of change across the marine / terrestrial political jurisdiction represents the *“biggest challenge”* (LS.ND. Academia) to marine management because land use decisions are made by organisations or sectors that do not have a marine focus. One PS participant said, the *“Duty to Cooperate, was working really well until White Paper suddenly says we're going to scrap it we're not doing that anymore”* (PS. Lead Planner), which was the main policy driver for cross-consideration of plans. It was

also said that boundaries for jurisdictions and plans are difficult to understand because they get overlain over time, and that initiatives are rarely considered at a connected ecosystem level:

“There’s boundaries all over the place and there’s nothing consistent... There’s nothing consistent about it and it gets confused in terms of county boundaries... Don’t always align with natural processes, well they rarely do, but you know, governance works at a, at a political level, but natural process worked at a sort of different level” (LS.ND. Multi Partnership Agency)

The above LS quote highlights the multiplicity of initiatives that in some parts cross-over whilst in other areas there are gaps. The majority of participants felt governance is overly complex; however, it was also said by one LS and one PS that the complexity is understandable because of the need for *“specialisms within those different sort of government agencies”* (LS.S. Conservation Authority), and the diverse number of activities taking place:

“Huge number of issues that do require some form of governance for the marine and coast, and we ought to be quite pleased we’ve got a system that actually works. But, yes, it’s complicated, But there’s so many issues it’s inevitable” (PS. Deputy Director)

It was recognised by all participants that there are lots of different organisations working within the marine and coastal space; most participants stated there is a significant lack of joined-up decision-making between them which *“needs work to get better”* (PS. Senior Advisor). However, *“we don’t have that governance, no one’s worked out that governance structure yet”* (LS.ND. Nature Authority). Therefore, the next section unpacks what would improve governance and decision-making.

5.2.5. What would improve governance and decision-making?

Following on from the described challenges to current governance and decision-making, participants identified ways to improve governance to progress environmental and social outcomes in the marine and coastal environment. There was strong consensus from both LS and PS that there needed to be greater connection and alignment of organisations and PPPs through collaboration and partnerships, and also connecting roles or bridging organisations. Additionally, there was a need for more active and earlier engagement and inclusion of local people in decision-making. It was highlighted that nested local plans that encompass marine, coast and terrestrial groups could improve governance. It was stressed that government steer and development of policy hierarchies would be advantageous. Also, interestingly, there seems to be difference in who is perceived to have power and accountability.

5.2.5.1. *Connection and collaboration*

Ten LS and all six PS stated that greater connection and alignment of organisations and their attendant PPPs would improve governance and decision-making. It was said “*genuine collaboration*” (LS.S. Academia), and “*cooperative approach and good communication*” (LS.S. Tourism and Recreation) are essential going forward to meet needs and demands, as highlighted in the following PS quote:

“You can't do everything on your own... it's not trying to sort of see yourself in isolation, it's how you, we, can look do something that complements what others are doing but sort of helps them to deliver their objectives and vice versa” (PS. Lead Planner)

This was seen by two LS and one PS participant to be best enabled through the application of a systems approach:

“Looking at whole system and kind of managing the system rather than individual pockets along the coast... which might have a detrimental effect somewhere; looking at looking at it from systems point of view” (LS.S. Academia)

Three key methods were identified in responses to achieve more connection and collaboration: working in partnership (mentioned by five LS and one PS); connecting roles as individuals (mentioned by four LS); and connecting roles as bridging organisations (mentioned by three LS and four PS). It was suggested that *“partnerships allow individuals and groups of voices to be heard”* (LS.ND. Regulator). However, *“it’s very time consuming and difficult”* (LS.ND. Multi Partnership Agency). Additionally, *“the problem is funding facilitation... [therefore] must contribute to and appreciate the value of partnership working... [and] demonstrate the benefits that would flow from partnership working”* (LS.ND. Regulator).

Connecting roles were mentioned for either people or organisations that are able to see the bigger picture, identify strategic goals and are able to facilitate other people or organisations involvement in governance and decision-making. It was felt *“those connectors have to have a language”* (LS.ND. Conservation Charity) to be able to talk to different groups at local and national levels, and also across different sectors, and be trusted and influential. This is well captured in the two LS quotes below:

“Local knowledge and connections and, and keeping on top of things, you know, there has to be some somebody or some organisation that can, you don't need a faceless man, or lady, you know a faceless person. You need somebody who people trust” (LS.ND. Conservation Charity)

“That connector that person that's connecting all these people that are involved in finding a way to connect; to me seems important. One of the most important connectors is finding a way to connect with finance” (LS.ND. Heritage)

The more frequently mentioned way of joining up different sectors and tiers of governance by PS participants related more to an “*umbrella organisation*” (PS. Senior Advisor), or a “*sort of a hub in the middle*” (PS. Lead Planner), to look across governance and identify areas for collaboration or where they may be conflicts and provide decision-support. It was suggested “*something like the OEP could and should take something like that forward*” (PS. Senior Advisor), or “*the Crown Estate*” (PS. Director) in relation to a NG trust⁵⁴. One participant added, “*I think there's huge opportunities to do a lot more within the MMO*” (PS. Scientific Advisor).

One unique PS perspective was encountered that suggested “*there's opportunity for some consolidation... I suspect a future government will merge organisations... And, you know, that's a big step for government to take... it's not the sort of thing that anybody volunteers to do*” (PS. Deputy Director). Although consolidation was an individual view, it is still converges with other participant views highlighting the need for alignment and better join-up. No single entity has the ability or authority to address complex matters across the marine, coastal, terrestrial environment. Therefore, there is a corresponding need to create both formal and informal ways to work more effectively across sectoral boundaries and political jurisdictions. Participants recognised that working together is not always about finding the best solution (there is not likely to be one best solution), but, it is about discovering mutually agreed ways of proceeding that are acceptable across multiple participants with diverging perspectives and priorities. This necessitates exploring more social science perspectives of values and behaviours as highlighted below:

⁵⁴ Essentially an organisation who could manage net gain contributions to enable a joined-up approach to receiving and allocating net gain payments

“The weakest area of government policy, particularly in marine is insufficient social science and sufficient social considerations of value, and until that happens, I don't think it's very easy to get better cohesion with other policies, if that makes sense” (PS. Scientific Advisor)

The PS quote highlights the need to better understand different perceptions of value, across broad policy areas, to enable cohesion of governance. To do so there is a need to be inclusive of multiple and diverse perspectives.

5.2.5.2. *Inclusion and engagement*

Thirteen LS and one PS supported the view that governance and decision-making in the marine and coastal environment needs to be more inclusive and *“community and stakeholder engagement is critical”* (LS.S. Conservation Charity). Specifically, six LS supported the view that *“not enough information reaches grassroots level”* (LS.S. Community Representative). It was said that *“every time we try to make the attempt, try to reach out and do that, people comment about how much better they feel and never been talked to before”* (LS.S. Fisheries Authority). The following PS quote reinforces this with strong support for effective stakeholder engagement:

“Stakeholder engagement is so absolutely key, and doing it the right way, doing it in language that they can understand... Crucial thing is determining how they can be communicated with, and that has to be done, that has to be done by social scientists” (PS. Chief Scientist)

It was suggested by one LS participant that *“local knowledge and experience is important”* (LS.ND. Academia), *“because I think we have far more experience of the areas than maybe*

what they have because we've worked it all our lives" (LS.S. Commercial Business). It was also highlighted that it is *"absolutely critical to have those people involved in a project right from the beginning, not just as participants, but as drivers of a piece of work to ensure that right from the beginning, the piece of work has immediate relevance and use"* (LS.S. Academia).

It was recognised by two LS and one PS that engagement can be more time consuming initially, but also that *"it gives you a stronger, more robust, and we hope more acceptable decision at the end of the day"* (LS.S. Regulator), saving time in the long run due to longevity of a more acceptable PPPP. However, two other LS participants highlighted that it is actually really difficult to get people to engage and get everyone to agree one thing to move forward with *"unless it is for the absolute wider benefit of all"* (LS.ND. Tourism and Recreation).

Ideas of how to engage effectively were suggested, which include *"unite people around, you know, coalesce around a topic"* (LS.ND. NGO); *"visualisation... to excite people about the sort of marine life"* (LS.ND. Academia); *"encourage young people"* (LS.ND. Fishing); and *"reframing, being a custodian of the system"* (LS.S. Academia). These suggestions highlight the importance of marine education so that people have better knowledge to engage effectively. Also, the need for improved marine stewardship and ownership to empower and encourage people to take care of the marine system. A LS participant spoke of inclusion and encouragement through passing on knowledge, sharing and incentivising:

"Encourage young people... All the Skippers I've been involved with have got a share of in the boat. We encouraged them to have shares in the boat, you know, work their way into it... What we try and do is say that you work here, you do your job good, and you turn up and all the rest of it, you will then become a shareholder of that boat. So, a bit like a cooperative really" (LS. ND. Fisheries)

The earned ownership of the boat and therefore decision-making of the business is shared on the basis of good work and, in that way, models fairness. It was also highlighted that anonymous survey tools and social media surveys could be potentially useful, simple and fair decision-making tools as *“people can speak more openly, because they know it’s anonymous”* (LS.ND. Ports and Harbour). It was lamented by three LS and one PS that consultation processes are currently not substantial and often come too late in the process as captured in the following two responses:

So, we started saying, now can we start? Can we work with you? Currently they are saying just no, no, it’s far too early. It’s far too early. It’s far too early. But we know, you know, that as soon as the signatures have been put on... That will be almost a done deal, and they’ll say, here we are, public consultation, that’s it, you know, but it’s not really come from a, there’s no real engagement, there’s no real consultation. You know, it’s they like to sort of tick the boxes and say that they, almost as an afterthought” (LS.S. Activist)

“I mean, there’s a bit of sort of, there’s a bit of fig leaves going on but you know there’ll be a public consultation... [for example] The HPMA’s, it went out to consultation and lots and lots of people fed in and said this would make a great HPMA and so on, and that seemed like it was quite transformative. Yeah, well, as soon as they got those in and they just deleted everything wasn’t already put forward by Natural England. Okay. So, I think there’s a lot of fake transparency, to be perfectly honest” (PS. Chief Scientist)

In the first response it was felt by the LS they are not allowed to engage too early because developers or planners are worried their plan will be disrupted. Whereas the PS quote highlights that consultations do not necessarily lead to more inclusive decision-making, or information being reflected in the final outcome. The PS quote, also agreed by three LS participants, identifies the *“lack of transparency”* (LS.S. Activist) in current decision-making processes.

An illuminating comment was made regarding capability and capacity for consultation drawing on a NG consultation that was carried out in 2018/19 *“we were hearing back from stakeholders*

that people really had an appetite for more of that proactive activity... What came back through the consultation was a wide range of views, clearly an awful lot of interest. But fundamentally, the position was that it was just too soon... So that's one of the elements that we have had to amend going through the response to the consultation and, in order to take it out, which is a bit disappointing" (PS. Director).

Together, all these quotes highlight that whilst current consultations aim to gauge public views, the results are often disregarded. It was highlighted that for engagement and improved inclusion in truly transparent decision-making, there needs to be more honesty in the information given to wider publics:

"I think you have to make the systems more transparent... I think we just need to be a lot more aware of the hidden costs or the costs that people don't want us to think about when in the decision-making process. Let's actually be honest about the full impact of different options, be that transport, be that, construction materials, and things like that, you know, and then really see what the true value of these things are, you know, open and transparent. I just think that people need to be able to make their decisions based on more honest information" (LS. S. Planning Officer)

It was agreed by eight LS and one PS that inclusion in local decision-making would improve governance of marine and coastal resources and enable improved representation of local and diverse stakeholders. The following LS quote recalls experience of local decision-making:

"Everybody had their say, not at length and not over and over again, but everybody was allowed to have their say, it was a forum... In between time I did a lot of face to face, going places meeting people going to events... In a small community this is, you know, I mean, you can't do that nationally, but in a small community, that is the way to do it... When we made decisions, we voted it had to be a democratic... So we would make decisions as to plans of action, as to how we were going to address a particular issue, which probably meant going to the council or going to somebody and making a case with them, and then reporting back. Very democratic and inviting, perhaps, somebody along to the meeting so that they could present on what it was we were concerned about or we were excited about" (LS.ND. Conservation Authority)

This quote echoes sentiments of the connecting role as previously described; as a person that can facilitate other people's inclusion in decision-making and meet with people to gather and relay information. The above LS quote also states that this process is easier in smaller areas or communities; hence some participants felt nested, local plans would aid local decision-making and better outcomes for the environment.

5.2.5.3. *Local nested plans in marine planning*

Six LS and two PS responses indicated that improved local plan processes and policymaking that actively involve and encompass a wide variety of stakeholders would improve governance and decision-making for the marine and coastal environment. It was felt there is *"lots of activity at the top level with people talking to each other there, I think that could be shifted down a little bit so that the emphasis is on actual, on the ground delivery* (LS.S. Fisheries Authority), another LS participant suggested *"devolved responsibilities"* (LS.ND. Regulator). A PS participant agreed and furthered this point:

"I think we would allow some type of local unit of marine and maritime governance, but some aspects of it would have to be within a national plan. So, I think beyond devolution, below, I think devolution down to sort of local levels in the sea, so there has to be some kinds of non-detriment regulations, larger scale, but the precise things like marine spatial planning, I think they should come down to largely local governance" (PS. Chief Scientist)

An example was given by a different PS, in the below quote, based on how marine plans could progress to be akin to terrestrial plans:

“In the terrestrial space you've got nested series of you know character plans, local development frameworks and then community plans. So, there's absolutely no reason why that couldn't [for marine]. Which again, has the opportunity to then say, not only where we think the opportunities for development are but also where we think that there are areas that are of real importance for the local community to not have developed, whether that's because of an ecological or an amenity value, that would also be really useful I think” (PS. Director)

Three LS participants agreed with the above PS quote regarding nested plans to highlight the importance of different local aspects for local people. It was said local decision-making can make sure *“the benefit is you know, for the local people”* (LS.S. Tourism and Recreation). It was pointed out that *“there's always tension between very large national infrastructure projects, which will have an in-service significant impact locally, and not necessarily to the benefit local, locally... There has to be a balance between large scale projects, which have to happen somewhere, and if those large-scale projects are happening in your backyard, that it's only fair the local populace or the local area to benefits from those large-scale projects as well”* (LS.S. Fisheries Authority).

As there are multiple targets and policies, for example both increasing renewable energy and increasing local livelihoods; where prioritising is not possible or acceptable, understanding the science of *“coexistence and colocation, so making sure that you know that any development is as effective as it can be for multiple benefits, not just thinking things through on a single sector type of basis”* (PS. Director) is important.

Two LS participants and three PS spoke of marine planning in an evolving and progressive manner; one stating *“hopefully things are going in the right direction to try and address some of the previous problems”* (PS. Lead Planner). This participant was speaking directly to the point of previous siloed working, with the expectation that marine plans, and the policies within, create the possibility to work on this challenge. While another participant stated they did not

like the term 'marine planning' *"because it tends to just focus on the sea, per se, rather than reminding us, you've got to have it from both perspectives"* (PS. Scientific Advisor). This PS believes that the wording of 'marine' planning, by default, sections it away from coastal or terrestrial planning, therefore limiting the ability of marine plans to reduce siloed working and emphasise marine planning for the benefit of local people. A LS participant echoes this sentiment, highlighting the coast as an important link between the marine and terrestrial space:

"I think the coast is sort of seen as this zone in between land and sea, but actually, I think it's a gateway, I think it should be seen as a kind of a place of opportunity... those systems, salt marshes, for example bridge the gap" (LS.S. Academia)

This quote highlights that identifying and assessing future opportunities at the coast could enable join-up, to address the challenge of currently disconnected governance. It was said it is easier to tailor decisions to a local area across the marine – coast – terrestrial space in smaller nested areas, where *"the small size of the population means that lots of organisations know each other, have contacts in each other's organisations... [and] have a better chance to know each other"* (LS.ND. NGO).

When thinking about future planning it was said that a *"huge stumbling blocks that we've come across... what are referred to often as political expediency and short termism. So, at the moment, political cycles, economic planning and so on happens in a relatively short-term cycle. And that's quite detrimental when you're thinking about the long-term impacts of climate change, and how natural systems and how you respond to change, and the two aren't married"* (LS.S. Academia). Seven LS participants supported the contention that local decision-making would improve ability to respond to change and increase adaptive capacity in light of future climatic predictions, as described in the following LS quote:

“We need to ensure that our protection of habitats is adaptable enough to enable you know, us to migrate the habitats as required, that our work with communities and other stakeholders is advanced enough, again, to bring them on that journey to kind of understand how we collectively reach those decisions about how to adapt our coastline... It will work most effectively if people feel that ownership, and everyone feels collectively involved in reaching that decision, and that it meets the needs of all the various stakeholders involved” (LS.S. Conservation Charity)

Here each area is unique and therefore, will have specific areas of interest and priorities:

““The individual organisations and places vary so much... A lot is dependent on the development drivers in a place on the local economy, what's happening with people in society. So, it's going to vary tremendously... [need to] listen to what places are expressing as their priorities and take that into account so it's an iterative process between place-based priorities and the evidence and being able to bring it together and say, well, okay, we're investing public money so lets, it's shaped by the evidence found by local place-based priorities” (LS.ND. Nature Authority)

An alternative viewpoint challenged this: *“I don't believe that you can put big decisions down to the lowest common denominator and leave it with the community and hope for the best”* (LS.S. Community Representative). This view did command support with eight LS and two PS on the need for a good balance of top-down and bottom-up processes highlighting the need for government steer alongside nested local planning and decision-making:

“National steer is to be consistent nationally, and then places and local priorities should shape the delivery in given localities, according to, you know, what their priorities are, what their drivers are” (LS. ND. Nature Authority)

5.2.5.4. Government steer

It was said by six LS and three PS that there are certain decisions or types of decisions that should be made by government or that government needs to give direction on “*where maybe there's different political agendas that have to be considered or, you know, budgets and all these things, I suppose change has to come from the top doesn't it*” (LS.S. Planning). Additionally, “*you would hope that government, because of the democratic system that we have, would be representing society's ambitions*” (PS. Senior Advisor). However, responses highlighted the risk that “*the power goes to those who squawk loudest*” (PS. Chief Scientist). Therefore, those with large platforms or extensive finance are able to persuade government, but it does not necessarily mean this leads to moral or environmentally sustainable outcomes. It was argued that government should be receptive to knowledge and participation from local levels and other organisations but, where needed, provide oversight and direction, as captured in the PS quote below:

“The government has to think about it for its citizens. Presumably mediated by those things like NGOs, and I think it's up to the government probably to take a sort of path between different kinds of NGOs... it's going to have to be a fair amount of balancing going on there between different users, different demands, but the ultimate decision making has to come down to the court's parliament” (PS. Chief Scientist)

There are many competing interests with high targets set across all sectors, therefore, two PS participants suggested government should provide a policy hierarchy, as described in the below quote:

“I do think it is the role of government to provide kind of policy hierarchy within which would then provide the structure that says okay we might have different groups or organisations or whatever but if we're all working to that same kind of policy hierarchy that might help. Not necessarily give everybody what they want, but it would at least provide clarity, because at the moment I think a lot of conflict comes, where, you know,

where we've got potentially conflicting government priorities that says you know, we want all of this net zero, and we want a thriving fishing community, and we want to improve the environment, etc etc. And I don't believe you can have at all. So, we need to be saying, but actually this thing comes first, and then you fit around with that, and so on" (PS. Director)

Those in policy roles desire a framework to work within that lets them know their own decision-making is acceptable; a framework of priorities that provides security and is irrefutable. It was said by four LS and two PS that government hold the power, therefore they need to provide the steer because stakeholders feel powerless and feel that they need to be assigned capacity. This is highlighted in the following PS quote:

"It's very much it's the moment we've got a very centralised system, governments controlling exactly what you can and can't do more or less; not giving any flexibility to do things. Hopefully that changes but I don't, I don't believe for a minute that they're going to give up power... We can't do it unless or until we're allowed to do it right... because we're not, we're actively not allowed to set targets that are different from the national targets... We need a better steer" (PS. Lead Planner)

The above participant was saying that they would like more power; they would like to be able to make decisions, but do not feel as though they can. Power and accountability were linked together by two LS and one PS participant, both agreeing that *"with the power, obviously, then you got the accountability"* (LS.ND. Ports and Harbour), which is why final decisions can sometimes be avoided so as to not upset or disappoint stakeholder groups. It was also felt:

"When people know that they've got the accountability from the decisions that they're making, then they make sure that decision is the right one, because they're going to be accountable for it. Too many times there's too many committees, that they have no accountability, because they've got no real power, and they go ah its a really good idea, I'll pass it up the chain. And suddenly you're looking at the actual people who have got the accountability, sitting there with what 150 proposals, and they've got two hours so it'll be passed to next time pass to next time" (LS.ND. Ports and Harbour).

This LS participant was highlighting the layers of bureaucracy before something is permitted by the people in government with actual power, important decisions for local areas are not made because those people with power have not had the time to address the issue.

A PS who was likely the closest to the inner circles of government, provided two interesting but unique takes on who they believe holds power and accountability. In the first quote the PS examines the role of international bodies in governance. This quote is interesting because the PS participant is looking up to the next tier of international governance for better steer, just as other LS and PS participants look to government for steer:

“The body that I’m most concerned about is ICES⁵⁵, which to my mind takes a wholly limited and blinkered view of its remit. I feel very concerned that the body that is supposed to advise on fisheries sustainability appears to limit itself, almost entirely to providing basically advice around MSY⁵⁶. It does very little to recognise the environmental effects of fishing... ICES is mute, entirely silent on that issue. I am astonished that they have not taken more responsibility for the fact that, although they’ve produced literally decades of advice on MSY, nonetheless, most species are in a critical state. There is intense lack of self-analysis on the way they have worked. So, for me in looking across the scientific landscape, ICES is directly advising governments on their regulatory duties. And it’s advising governments on that regulation for an environment which is intensely affected by the cooperation of different nations. I think there is a case for them to take a broader view of their remit rather than simply the very narrow focus that they’re told to do by their governments, they have more autonomy than they realise, or attempt to take.” (PP. Deputy Director)

This participant questions ICES limited advice on MSY leading fisheries policy that, according to the quote, is not working well. This sentiment is echoed in a different PS quote when speaking about government, who feel they need to work within government constraints, stating they are “*very much wanting a green local plan, as much as the government will let you get away with*” (PS. Lead Planner). This highlights both of these PS participants would like to

⁵⁵ The International Council for Exploration of the Seas

⁵⁶ Maximum Sustainable Yield

make more environmentally conscious decisions but feel the power structures are not creating the enabling environment.

The second interesting quote from the PS was the view that the government did not have as much power as stakeholders think; instead stating that change happens when stakeholders work together:

“The day-to-day experience I have is that the government is a small part of the machine. An important part and the high-profile part, and a very publicly accountable one, but nonetheless a relatively small part and change comes when stakeholders come together... I think there's always this view that government needs to be leading change. And I'm not sure that's how it actually works in practice, although it's an appealing model (PS. Deputy Director)

Stakeholders see government as the body that holds the power, whereas the participant within government suggests both stakeholders and international bodies are more influential. Here *“everyone brings something slightly different to the table”* (PP. Senior Advisor), and *“there’s huge amounts of institutional knowledge there”* (LS. S. Conservation Authority). In that sense, both local decision-making and government steer are important. To improve governance and decision-making in the marine and coastal environment greater inclusion and engagement in knowledge building, and governance and decision-making at smaller local scales, supported by the weight of government on larger challenges is needed. Across the governance structure(s) connection and collaboration supported by connecting roles were promoted. Hence, in the focus group presented in the next section, key areas of interest to explore were in relation to collaboration and connecting roles, and how ESc may be used in this way to support improved collaboration.

5.3. Focus group: interdisciplinary stakeholders

This section details the results of the round three Interdisciplinary Stakeholder (IntdS) focus group, held as the final section of the primary research. The aim of the focus group was to solidify practical solutions for improved collaborative governance and decision-making, building from intelligence gained from the previous rounds of interviews thus providing an assessment of the potential of ESc as a tool for mainstreaming the environment and the resulting implications for governance and decision-making processes. The focus group was based in a hypothetical coastal town named Adapt Coastal Town (ACT) (Figure 4) to create a safe space for freedom of speech and to help participants transfer knowledge and experience to the hypothetical space. A briefing paper was sent out to all participants with questions to help them prepare for the session (refer to Appendix 7). The answers sent back to the researcher also helped the preparation of the focus group session itself enabling participation in focus group design. In particular, the highlighted challenges and priorities on Figure 4, which was used on the shared screen in the focus group to discuss ACT, are all derived from participants via the pre-focus group survey. The focus group was split into the three sections, with a broad question at the start of each section to promote practical solutions:

1. What would work to improve collaboration and enable you (as a stakeholder in ACT) to more easily work with other organisations and different sectors to address key issues, and put environmental health at the forefront of decision-making?⁵⁷
2. How can ecosystem science concepts be used as effective connecting tools to advance collaborative governance and decision-making?
3. How can 'environmental connectors' assist collaborative working and further the use of ecosystem science to mainstream environmental priorities?

Adapt Coastal Town (ACT)



Figure 4. Presented at the beginning of the focus group, highlighting IntdS participants perceived challenges and priority areas (as established from the pre-focus group questionnaire).

⁵⁷ In this first focus group section, collective quotes pertaining towards solutions are showcased at the beginning of each theme in a speech bubble.

5.3.1. Ways to improve collaboration in the marine and coastal environment



Figure 5. In this first focus group section in discussion of “what would work to improve collaboration and enable you (as a stakeholder in ACT) to more easily work with other organisations and different sectors to address key issues, and put environmental health at the forefront of decision-making” collective quotes pertaining towards solutions are showcased here in a speech bubble. Here, collective solution-based quotes from IntdS participants have a focus on improved collaboration.

At the beginning of the focus group a comment from the fishing federation perspective remarked on “a big big division”, referring to the different priorities represented in the virtual room⁵⁸. However, throughout the focus group discussion, the challenges and solutions were largely shared and agreed amongst all participants, as will be highlighted throughout this chapter. At the end of the focus group the same fishing perspective commented “Yeah, I absolutely agree with how the discussions gone really” (Fishing Federation).

⁵⁸ The focus group was help in Microsoft Teams with cameras on.

All participants were keen to discuss the subject, as is highlighted by the following quote that is a direct response to the section's leading question - What would work to improve collaboration and enable you (as a stakeholder in ACT) to more easily work with other organisations and different sectors to address key issues, and put environmental health at the forefront of decision-making?

“One of those times feel like saying I'm glad you asked that question”
(Terrestrial Planning)

All participants agreed on the importance of collaboration, of being inclusive and creating time and space for collaboration. Participants highlighted challenges they experienced in relation to the current status quo and offered ideas for solutions that could address these challenges. Most frequently participant challenges were around fragmentation and siloed working, with solutions leaning towards an inclusive systems approach:

“We live quite siloed lives in general, pursuing our own interests. Yet the issues on this picture [Figure 4] are very interconnected, so it's about understanding other perspectives and not just perspectives or opinions, it's about understanding how other systems impinge on our own interests work” (Marine Academia)

In this section, the theme of collaboration is broken down into specific areas participants felt could be improved upon. This includes the role and necessary multiscale evolution of marine planning, and building shared priorities, working in partnerships and developing connecting roles, sharing data and evidence and recognition of complexity.

5.3.1.1. *Marine planning at different scales*

“It should be hierarchical and there should be scope for local area plans. It could be nested within regional plans”

“A single local environment improvement plan to overcome the fragmentation of environmental governance”

“Got to have a nested approach to collaboration and decision making”

“Nested spheres of decision making”

“Lots of decisions can be managed relatively locally”

“Integrating forward planning into our marine planning systems”

“When you've got an overlap...make sure that there's that compatibility element, both overlap of plans, but also compatibility of adjacent plans”

“If regional plans actually had more explicit policies and things like that and then at a local level there would be the scope maybe to fine tune some of that, and then deliver stakeholder priorities”

Figure 6. In this first focus group section in discussion of “what would work to improve collaboration and enable you (as a stakeholder in ACT) to more easily work with other organisations and different sectors to address key issues, and put environmental health at the forefront of decision-making” collective quotes pertaining towards solutions are showcased here in a speech bubble. Here, collective solution-based quotes from IntdS participants with a focus on marine planning and decision-making at different scales for improved collaboration.

Marine planning was a prominent topic in the focus group. However, a key challenge was first presented with the planning organisation, in regard to its power to mobilise different government departments. It was said there is limited ability for the planning process to tell other government departments what they should or could do in an area; instead, regional decisions come down to the priorities of local parliamentarians:

“So one of the challenges in the MMO as an arm’s length body of Defra is to be able to be heard by the other departments... [there is] a statutory duty to engage with the general public, and so the general public do input to the marine planning process. But when it's another policy area that the MMO have no control of as an arm’s length body, can't go back to whichever government department is responsible for that policy area and say, yeah, the people in wherever don't like this, so it can't be delivered here. So, when you're thinking about how you enact regional representation of national policy objectives. Well, it kind of comes back to who you voted for in the election and what their policy objectives where” (Marine Planning)

Every IntdS participant either explicitly articulated, or agreed with a previous participants comment, that marine planning should also have different spatial scales with hierarchical governance and decision-making, to work on environmental challenges at different levels. Here, nested plans were seen as critical for improved collaborative working and for positioning local environmental priorities at the forefront of decision-making as highlighted by the following discussion:

“We're dealing with different issues you know, when it's climate change that's dealt with at a global level, and other things like fisheries are at the national level or regional, and then there are things at the local level that that people care about. But we have a system of marine planning which is currently only at regional scale... When we made our recommendations to Defra about marine planning, we said it should be hierarchical and there should be scope for local area plans. It could be nested within regional plans, but that's never been progressed, but I think those are important issues” (Marine Consultancy)

“I'm kind of echoing what [Marine Consultancy] was saying there but I just yeah agree with the point, dependent on scale” (Marine Policy)

“I'd share [Marine Consultancy's] view with the idea that you have nested spheres of decision making... you've got to have a nested approach to enable collaboration and decision making” (Fishing Federation)

However, some concerns were raised about the funding for these:

“Having more nested local coastal plans, and I could just be an agent provocateur about that, I'd be totally for it, but just thinking about the resource implications, you know how many partnerships would that be and how would you know, UK plc feel about costing them up? It seems it seems quite problematic” (Marine Academia)

This point was agreed with nodding of heads and the discussion was furthered:

“I think the biggest challenge, speaking quite frankly of local marine planning will be funding. And we see that happening in Scotland... The national plan is great, you know, covers everything at high level and then there were subgroups and some of those lost funding or didn't go anywhere... There's disjoint between what's required at national level and what's being funded at a local level. Funding disappears halfway through the planning process, so quite a lot of the work can be done based on goodwill and someone working in their free time. And I don't think that that's sustainable” (Marine Planning)

On the development of nested plans, it was suggested *“I think that there's still scope to do that, it's within the legislation, it's possible”* (Marine Planning). It was highlighted that the marine plan process is iterative and *“it is a process of continual improvement”* (Marine Consultancy). It was also said that *“we need ways of integrating forward planning into our marine planning systems”* (Fishing Federation). This participant is commenting on future iterations of marine planning having the ability to incorporate and plan for future scenarios and better utilise marine plans for planning over short and long temporal scales. An example of local plan development, and a potential opportunity space for collaboration, was offered by the terrestrial planner:

“We are advocating single local environment improvement plans (LEIPs) to overcome the fragmentation of environmental governance...to try and amalgamate all the different plans... to have a local environment improvement plan, which all the working level plans should conform, and which also is aligned with plans for things such as housing and transport. Now the one area we haven't ventured into is suggesting that

the LEIP would cross the low tide boundary, so I think you know one step at a time. So I think marine spatial plans would still need to be prepared separately, but with alignment and coordination with the LEIP... with all of the environmental plans I think we begin to lose public interest, and it will be much simpler and will give the environment much stronger kind of focus at the top table, certainly local government, if there was a single environmental plan which you could really make an emphasis to encourage people to get involved in, that would then deal with this question of fragmentation and the conflicting objectives that you were talking about... it would be easier if there was a single local environment improvement plan, because you'd only have to read one thing... because my members were saying it's bad enough if you work in an inland area because of the number of things you have to read, anyone of which if you can't claim to have read, you're liable for a judicial review from people who don't like your plan... so the fragmentation of our environmental planning is, you know, really does need addressing, then one of my Members says it's double that if you live on the coast because we also have to do everything in the coast too" (Terrestrial Planning)

This proposition was clearly supported by other participants who were nodding heads and were *"encouraged by what my colleague is saying"* (Marine Academia). An overarching environment plan, to which all other plans conform, better enables collaborative working because the connection, cross-over, compliments and contradictions can be established strategically, and shared priority outcomes can be established.

5.3.1.2. *Developing shared priority outcomes and working in partnership*

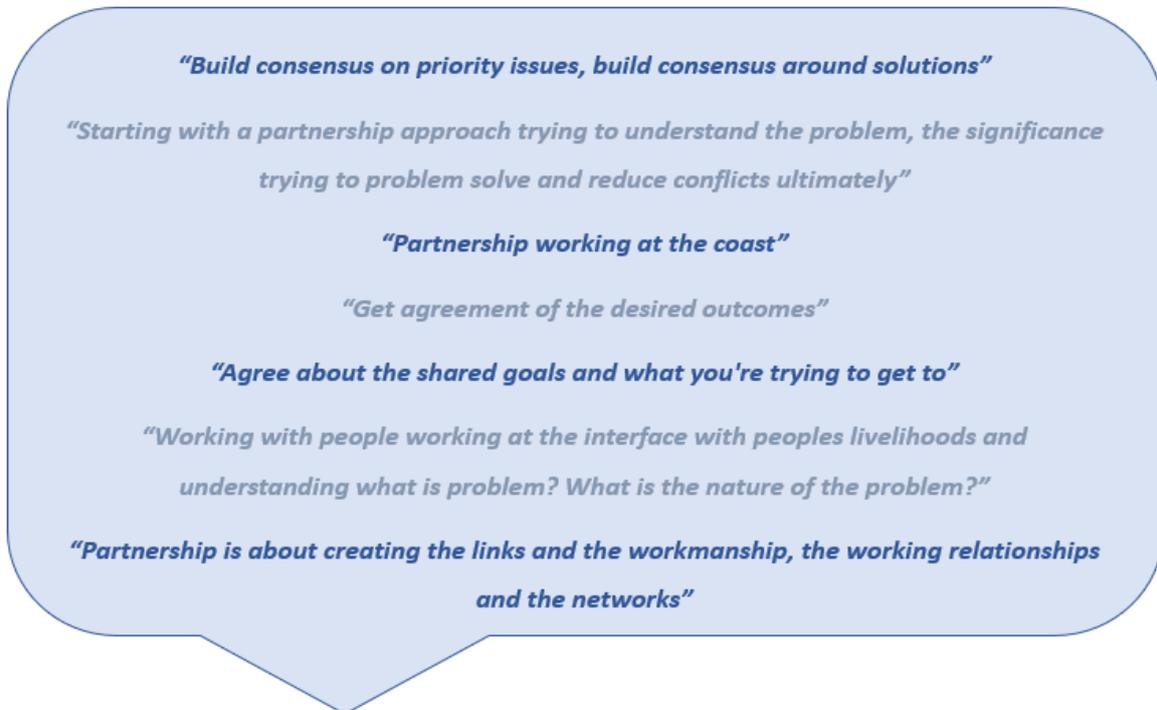


Figure 7. In this first focus group section in discussion of “what would work to improve collaboration and enable you (as a stakeholder in ACT) to more easily work with other organisations and different sectors to address key issues, and put environmental health at the forefront of decision-making” collective quotes pertaining towards solutions are showcased here in a speech bubble. Here, collective solution-based quotes from IntdS participants with a focus on developing shared goals and priorities and working in partnership for improved collaboration.

It was agreed vocally by three participants, with nodding of heads from the rest of the participants, that collaboration can be improved by developing shared goals or priority outcomes and understanding the steps that need to be taken to arrive at that result:

“We have to focus on the outcomes and then really the priority outcomes. Whether that's at marine plan level yeah or at local level. And work together to deliver solutions. ... Get agreement from what these desired outcomes are and then stakeholders can work towards it, but it's a heck of a lot of work to do that, but I think by trying to focus, build consensus on priority issues, build consensus around solutions” (Marine Consultancy)

A further response to this discussion stressed the need for more of a bottom-up, partnership approach(s) to policymaking to help build priorities:

“One of the other things for me is the way a policy comes about. There's a lot of policy that's rather top-down and not necessarily that inclusive of the individuals who are affected by those policies, versus more bottom-up approaches... Which is very much about working with people, working at the interface with people's livelihoods and understanding what is the nature of the problem... Starting with a partnership approach trying to understand the problem... Those different frameworks of how to look at the problems are important in trying to problem solve, and reduce conflicts ultimately” (Fishing Federation)

This participant suggests that bottom-up approaches are inherently collaborative because they are inclusive of different individuals in a local area from the beginning of policymaking, it was said *“the partnership is about creating the links and the workmanship work, that working relationships and the networks”* (Marine Academia). However, it was highlighted that funding for partnerships, or local acceptance for partnerships varies around the coast where *“coverage; it's not consistent”* (Marine Planning). Therefore, *“picking up on [Fishing Federation's] point, you know what if those, you know, local initiatives had already developed in a more bottom-up way... What if they could be more closely connected and brought together through facilitators to input better into the broader scale planning processes... Highlight what local groups are doing and maybe bring knowledge from things going on at a broader scale”* (Marine Academic). Hence, the need for connections to be facilitated.

5.3.1.3. Facilitating connections



Figure 8. In this first focus group section in discussion of “what would work to improve collaboration and enable you (as a stakeholder in ACT) to more easily work with other organisations and different sectors to address key issues, and put environmental health at the forefront of decision-making” collective quotes pertaining towards solutions are showcased here in a speech bubble. Here, collective solution-based quotes from IntdS participants with a focus on facilitators and connecting roles for improved collaboration.

In response to the first section’s question (what would improve collaboration and enable you to work more easily with other organisations and sectors...), and before describing to the participants what was going to be discussed in the third section of the focus group, which was dedicated to connecting roles, it was apparent that there was already interest from the focus group participants in connecting roles to aid collaboration. Noted in this section are the times participants mentioned connecting roles or facilitators, also noted here to highlight the interest in these type of roles before they were based around a guided discussion. In this first section it was said roles could improve collaboration by *“kind of fermenting that thinking across different silos... People who are kind of go between all these systems. I think that’s an interesting idea”* (Marine Academia), *“to have people that bridge between different*

organisations and hold that role” (Marine Policy). There is more unpacking of connecting roles in the third section of the focus group (section 5.3.3.) where it was then formally introduced.

5.3.1.4. *Integrated data*

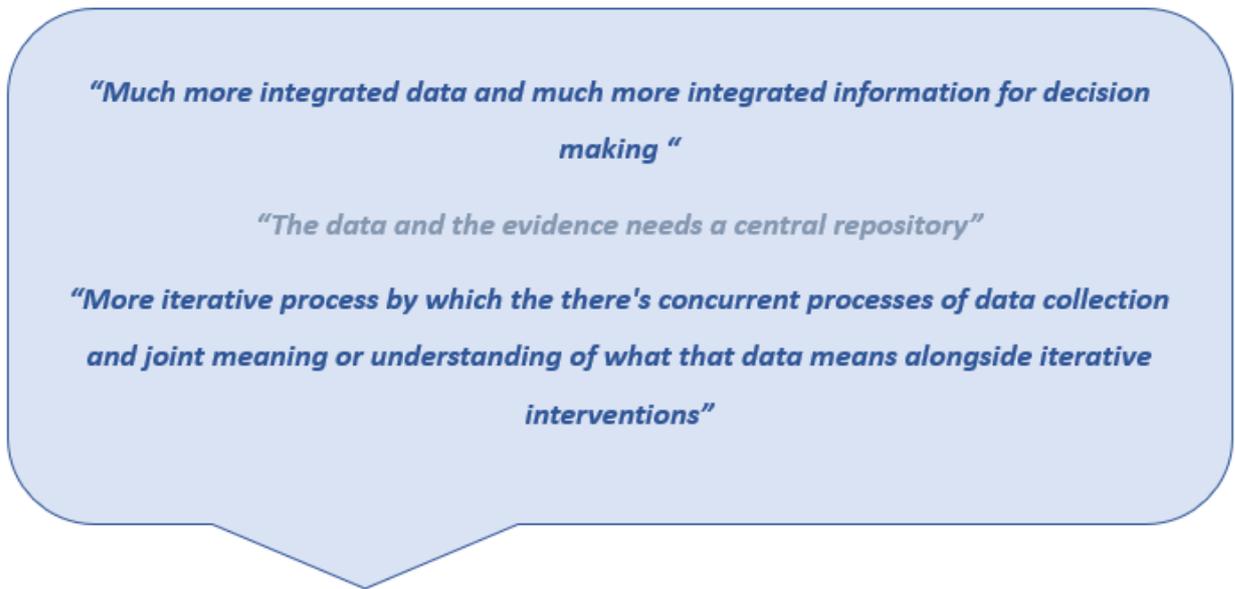


Figure 9. In this first focus group section in discussion of “what would work to improve collaboration and enable you (as a stakeholder in ACT) to more easily work with other organisations and different sectors to address key issues, and put environmental health at the forefront of decision-making” collective quotes pertaining towards solutions are showcased here in a speech bubble. Here, collective solution-based quotes from IntdS participants with a focus on data for improved collaboration.

Five participants commented on the need for better organised and/or more integrated data with the other three participants nodding, highlighting the agreement. As each IntdS participant mentioned data problems, there was agreement displayed through furthering comments or nodding of heads with some smile/smirks of shared difficulties from previous experience. The challenge of data seemed to be a real annoyance:

“We spend all our time chasing data... we are really hopeless at defining core data sets and then developing them and then you know serving them up... It's a huge impediment... We waste millions and millions of pounds each year... So much could be done there to make everybody's life easier” (Marine Consultancy)

Participants would like to spend less time searching for or paying for data and view that “*the data and the evidence behind it [collaborative working] needs a central repository as well”*

(Marine Academia), so that professionals are able to better carry out their roles within the environmental space. Here, it was recognised that it was not only people and organisations that was being siloed; data is also siloed:

“A lot of our actual information is quite siloed reflecting our ways of working, so we may have ecological information and we may have information, for example on housing and economic benefits, but they often sit quite separately and are rarely brought together, so it's actually quite difficult to assess some of the trade-offs... So, I think much more integrated data and much more integrated information for decision-making would be very helpful” (Natural Capital Policy)

Participants made it clear that to make effective decisions; to be able to put environmental priorities to the forefront of decision-making, appropriate data and evidence needs to be available to them. It was suggested that both the current lack of data and lack of integration across data types has real world/observable consequences on the environment and ability to meet targets, as this participant highlighted:

“We've not got a good environment status, so something is missing... We don't really have active policies to address things we don't understand” (Fishing Federation)

Indeed, there were significant gaps identified in key policy areas. For example, *“food webs are still very poorly understood”* (Fishing Federation), where there is not enough evidence to support a policy intervention. Furthermore, as one illuminating stand-alone quote highlights, even when you have sufficient data and policies in place, it does not necessarily address the on-the-ground challenge:

“The best example from this is marine litter from my experience. So, there's a descriptor on marine litter which you would think marine plans could do loads with, right? But we can't. We know what the problem is [marine litter], we know where the sources are, and we know that it's even, you know, being degraded in in the deep sea and we understand the science around, how it's moving and the oceanography. And yet in the marine plans that we currently have there's one or two policies that suggest

that beaches should be cleaned, which I think everyone else who's on this call understands, this is a drop in the ocean in addressing that particular issue [marine litter] and the reason for that is that the marine environment is a sink and it's a sink for everything that happens on land. So, if you're trying to achieve good environmental status... It's not always the marine plan that would be the appropriate policy mechanism. Sometimes you need a change to be made at higher legislative level. For example, the 5p charge on plastic bags arguably has done more for marine litter than any of the policies in marine plans” (Marine Planning)

There was nodding of heads observed in response but no specific replies. The quote highlights that the interconnected ecosystem from land to sea, necessitates interconnected data and legislation, to allow for interconnected decision-making and collaborative working. This is highlighted by the outcomes, both negative - the litter from land culminating in the marine environment, and positive - the market mechanism used on land that has a noticeable effect on the marine issue. Terrestrial policy does not currently directly address marine litter, even though it is largely the source of the problem. Instead, there is a benefit generated through the market mechanism which *“you know, we no longer use plastic bags because someone put 5p on the price of them, and that is quite efficient. That's very, we didn't have to do anything about that. Someone just changed the price somewhere else and all our behaviours changes”* (Marine Academia). This highlights the effectiveness of certain types of market mechanisms, and how intentional and proactive interventions in the terrestrial environment can lead to positive results in the marine environment. The quote also highlights the connectedness and the complexity across the marine, coastal and terrestrial environment, which necessitates appreciation of cause and effect and, again it is highlighted the need for join-up at the policy level (i.e., plan integration and/or a systems approach).

5.3.1.5. *Accepting complexity*

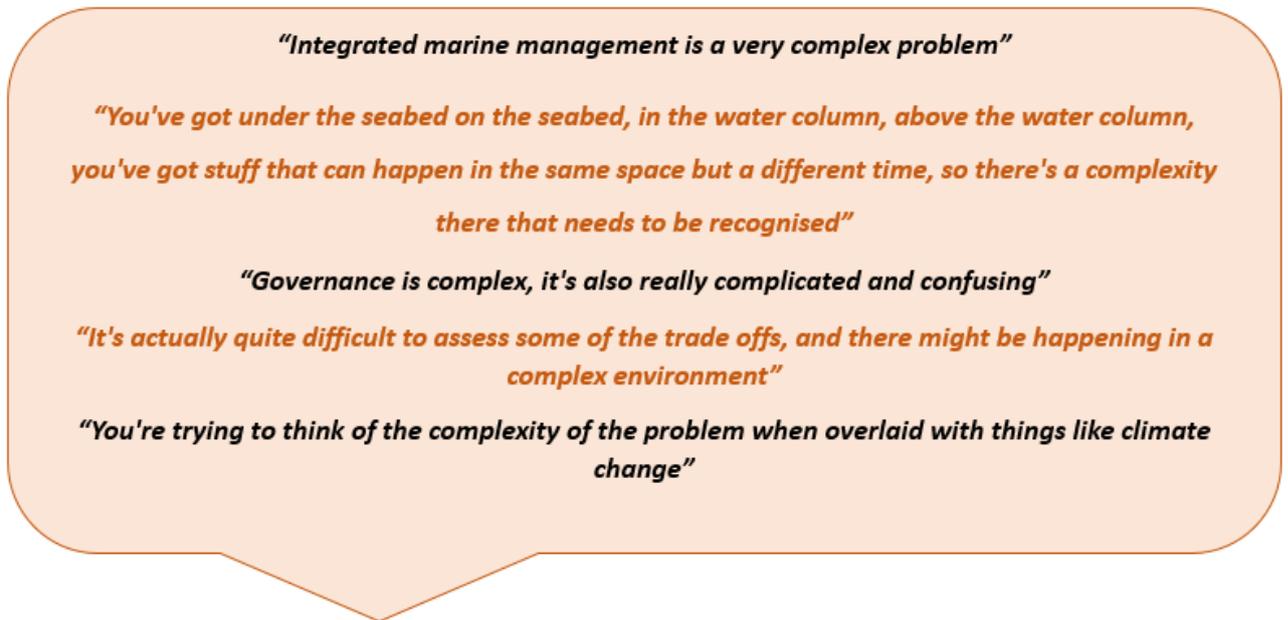


Figure 10. In this first focus group section in discussion of “what would work to improve collaboration and enable you (as a stakeholder in ACT) to more easily work with other organisations and different sectors to address key issues, and put environmental health at the forefront of decision-making” it was frequently said that areas of marine governance and decision-making are complex.

Throughout all of the discussions around what could improve collaboration, it was repeatedly stated and reinforced that the marine, coastal, adjoining terrestrial space is complex as highlighted in the speech bubble (Figure 10, this time in orange to emphasis these are not the solutions). Here, it was said that, often times, ways of working were based on oversimplistic linear models. The following quote describes a participant's reflections on this:

“I just had a comment about, a bit of an observation about, from the idea of working as a system and complexity so people have used quite a lot so far, the word complexity, but they’re also has been a lot of talking about, sort of fixed plans that would come together be decided and then enacted. But if we’re talking about complex systems, they are dynamic and adaptive. And actually, whilst there can be an idea of direction or the kind of the direction or that kind of what would like to be achieved, there needs to be a like a much more perhaps a more iterative process... That actually whilst people are talking about complexity that also using a lot of language which is much more linear

and doesn't take into account the actual dynamic nature of complexity" (Coastal Community)

The discussion progressed with another input reasoning to why actions are taken as they currently are:

"You can see complexity the characteristics all over the marine environment and the marine governance environment. You know you've got adaptation or the need for adaptation. You've got feedback loops, emergence path dependencies, all these sort of buzzwords. But the system itself, if the system itself is segmented then it's hard to consider it as this whole wide dynamic complex system. So where do you draw your boundaries in that system? I think I think organisations try and simplify that complexity to enable them to take action because if you try and consider it all at once and try and take on all of the complexity all at once within your own organisation, even though it might be happening in your head and in everyone's heads, you know, you've still got to take action and you've still got to reach the targets that are set within your organisation... So it's just thinking, yeah I think it's clear that we have a complex system, but I would say within organisations what may be happening or seems to be happening is to try and simplify the complexity a bit to enable action to be taken (Marine Policy)

Thus, organisations try to simplify the complex system to enable action. However, it can be seen that these actions are individual and siloed with the connections between elements being missed. The discussion moved on with an important intervention in the chat function:

"I would like to make a further point about complexity; this town /system isn't complex because we choose to frame it in that way (or not). It is intrinsically complex. Complex systems are inherently unpredictable/unknowable; therefore, we don't have to fully understand them - we must act and observe our effect on the system (iterative try and learn), then do more or change our action depending on whether that action take us closer to our desired outcome. Organisations working in silos to their own targets act in a way that ignores complexity is of itself a barrier to collaborative working. The paradigm of new public management (targets etc) is not compatible with complexity" (Coastal Community)

The above contribution highlights that the ability to collaborate is hindered by individual target setting, as the complex nature of interactions are not factored into decision-making or the intended outcomes. The challenge is going beyond the rhetoric that is used to address the reality of conflicting priorities. Another participant went on to clarify this point further:

“People in this scenario [Figure 4] want to have their cake and eat it because on one side you want to see more effective decision making and leading to you know pro environmental action. But on the other side they want it to be efficient and less resource intensive and I think that's a really challenging circle to square in a way because I think a lot of the process of making these things work takes the time of listening to one another... Get towards understanding one another better, and you know find some nature-based solutions that that suit us all” (Marine Academia)

Here the introduction of nature-based solutions is important to solve both environmental and societal challenges set within their different geographical and place-based contexts. These are mechanisms to develop shared priorities for an area and increase collaboration through aligning strategies from across sectors and departments to collaboratively work towards the outcome of increased nature and, in doing so, aid all other areas of society. Therefore, the next section discusses how ESc and associated concepts can advance this process.

5.3.2. Ecosystem science concepts as connecting tool(s) to advance collaborative governance and decision-making

The IntdS participants highlighted ideas for how ESc, in particular a NCA can improve collaborative working. These are themes of integration across domains to co-develop knowledge and aid discussions, and to establish project focus. However, participants also highlighted the challenges involved in these areas, such as data gaps and economic framing.

5.3.2.1. *Integration across domains to co-develop knowledge and aid discussions*

In response to the second section question - How can ecosystem science concepts be used as effective connecting tools to advance collaborative governance and decision-making? the following series of quotes highlight that some participants felt a NCA could be a connecting tool to improve collaborative governance because it helps integration across different domains. The following discussion highlights its potential:

“Natural capital approach it is kind of attractive in the sense that it seeks to be integrative, more explicitly seeks to incorporate what might be environmental externalities into decision making, which is good... It tries to bring in a lot more from yeah, evidence that might otherwise be external to the decision” (Marine Consultancy)

“Agreeing with all that... The key thing is that they're providing some sort of analysis that crosses the social to the environmental domain, and I think that's really significant ... the natural capital assessments they think about, you know those flows and relations between those domains” (Marine Academia)

“I've not had a great deal of experience with natural capital yet. It's not really something that's becomes major in the world fisheries. I can see some advantages of course that's been raised by others like [Marine Academia] on the linkage between nature and social considerations” (Fishing Federation)

The quotes highlight that including additional information e.g., social values and service users, into environmental decision-making is advantageous for collaborative working and a NCA can help with this. It was also said that it is important to develop and advance the approach across sectors *“because if just the public sector use the natural capital approach and the private sector aren't using that capital approach, then again, you've got that segmentation that siloed decision making there everyone working in one way in one sector, and working in another way in another”* (Marine Policy), which would not lead to collaborative governance. The below two quotes further the discourse to agree that a NCA can and should integrate the different

sectors, domains and values, but also highlights there is a social and cultural knowledge gap, or a gap in ways to represent these values:

“I think it speaks to some of the comments that have been made... You've ecosystem services approach, then the natural capital approach, they haven't always resulted in necessarily different outcomes because we really do need to include the social and cultural values in the assessments... It's actually quite a lot further behind... The cultural services were always problematic and I don't think those, a lot of those approaches were never really developed to the extent they needed to be for effective decision making in in policy, and especially at the national scale... Those social cultural service flows, benefits and values really do need to be captured” (Natural Capital Policy)

“I agree about the sort of social and cultural aspects, but yeah, they're poorly defined” (Marine Consultancy)

It was also said that the knowledge exchange aspect of co-developing data to use in a NCA is important; in developing data and values with stakeholders the process also informs and shares knowledge and approaches with other stakeholders:

“The process, I think of collecting some of the data, about more use of participatory GIS to actually go to the stakeholders at the at the local level to get a better handle on some of the cultural services, and at the same time as helping them contribute that data have helped them themselves understand more about these interactions and linkages” (Marine Academia)

Together, these quotes highlight that a NCA can help collaboration if there is contribution from multiple sectors and audiences and inclusion of multiple values: *“Unless natural capital assessments really do consider a whole portfolio of ecosystem services, then it's no good, because otherwise you're not really thinking about all the different trade-offs”* (Marine Academia). Otherwise, the NCA will develop to suit single sector objectives and only exacerbate current fragmentation. However, in response it was questioned *“are people willing to make the decisions that are required around trade-offs?”* (Marine Planning). At this point, it was asked by the researcher/facilitator *“if using a NCA would inevitably lead to the*

environment being prioritised, which all other decisions could cascade from, e.g., every local plan, marine plan, shoreline plan, housing plan, business plan, etc., had a top line policy that was the environment and then everything else was under that: is that how the NCA could be used?” The marine planning participant reply was noteworthy introducing more negative perspectives:

“Idealistically, yes, it could be. Realistically, I think there's a long way to go, particularly with the fact that marine planning delivers cross governmental policy priorities. So uhm, BEIS Department for Business, Energy and Infrastructure Strategy, probably aren't thinking about natural capital in the same way that, for example, Defra would be; and the Ministry of Defence will have a different take on it. So actually, what you're talking about is a real step change across all government departments. You're talking about Cabinet Office level buy-in for this sort of thing... I think cynically I can say that the environment does not tend to be that bigger hitter in government (Marine Planning)

A further contribution stressed the way the NCA can act as an initial lens but with risks of excessive policy complications:

“So it kind of goes back to what [Terrestrial Planning] has been saying [regarding the Local Environmental Improvement Plan (LEIP)]. We want to deliver environmental outcomes. Let's hard wire them into the decision-making process... And then yeah, you can have simple ways of doing that, or you can have really myopically complicated and painful ways... I think we don't have to get hugely stuck in the detail of natural capital to make better decisions. But it is a good lens. And then if I'm honest, I think natural capital committee were probably thinking that this is a no brainer. There just needs to get up and do it and then that policy level we just kind of make it horribly complicated” (Marine Consultancy)

Two other participants agreed with this statement suggesting NC is a good conversation starter, to think about how different groups use the marine and coastal environment, indeed “just starting that conversation is maybe completely different from conversations that people have had before” (Marine Policy). It was said it is a good starting point to establish “what the choices are, so you know if you have plan one, how is natural capital going to perform under this choice” (Terrestrial Policy), which enabled discussions around project focus.

5.3.2.2. Establish focus

It was agreed by two participants that it is important to establish from the outset why a NCA is being used, what additionality it might add to stakeholders, and where differences or concerns may be:

“Why do it? Why use that natural capital approach? And I think that has to come across quite clearly to start with... Natural capital, it's a very economic, it's come from an economic origin, and so if you start to use that language, what does that then result in? And so that could result in in fear or people feeling like they're, you, know, commodification of nature rather than actually trying to save it” (Marine Policy)

“Is everyone wanting to use natural capital for the same reasons...I've sat in quite a few meetings where not everyone is on the same page and in the groups that I mean, we should all be on the same page about those terms so, I think [Marine Policy's] concern is really quite valuable” (Marine Planning)

Using NC, with its economic lineage, can mean different things to different groups. It was agreed by four IntdS participants, that the economic language and associated project applications can be concerning, as highlighted in the following quote:

“I'm instinctively nervous of natural capital, because reading something like the Dasgupta report, it seems to be associated with the view that you know if you can put the right pricing incentives on the world, what the state does is it walks away, and the private sector undertakes things. So that that's my overall concern about it... if it's intended as a kind of cover for saying, actually we don't really want the state to do any actions at all, we want just to create a playing field with the right incentives [for the private sector] and then we [the state] want to kind of leave the stage, that that's what worries me, because it after all, in some of these [environment] areas capital spending by the state is half of all capital spending, so it's very important what we collectively do in it” (Terrestrial Planning)

The above quote received nodding of heads throughout the group and is echoing the above Marine Policy quote regarding the commodification of nature. In these quotes there is concern that private organisations will be able to use NC terminology and approaches to buy and

manage the natural environment and that government will relinquish responsibility and accountability, which would not advance collaborative governance and decision-making. Significantly, NbS projects were mentioned by three participants where a NCA could be used as an effective collaborative tool: was in relation to NbS projects:

“Things like nature-based solutions, if you want to do a managed realignment, you could then pull together the evidence that really demonstrates that, so there is a wider range of benefits beyond creating a bit of habitat. Or you're having a more sustainable flood defence and things like that. And I think bringing that together can help stakeholders and it's more comprehensive in understanding all of the benefits that potentially might arise. It also helps identify the beneficiaries, and then then that might also help you tap up for a bit of funding, which can be good too” (Marine Consultancy)

Here, the economic framing is useful to increase project funding. Therefore, as one participant highlighted (though not in direct response to the above quote), it *“ultimately it depends on how these things were applied and that's the critical issue... A top-down application of natural capital would potentially end up selecting areas based on predefined policies within it, which could say well, you're no longer compatible with these policy objectives, so we're going to remove your livelihood... Alternatively, it could be a way of informing ways of working, it might be genuine issues, of course, which then leads to ways of collaborative work into, you know, promote stewardship” (Fishing Federation)*. This quote also highlights how inclusion of local stakeholder perspectives can promote positive behaviour change and co-benefits rather than the need for enforced removal of activities.

It was agreed by three participants, however, that using a NCA is resource intensive. It was said *“you can't just do your natural capital asset and risk register and say this is this is it; I've got my risk register. You then make an action, make a change and then monitor it to see whether it's you know it's actually led to your desired outcome” (Marine Policy)*. It was said *“it requires a significant investment of resources and people's time not only to be on the same*

page with regards to language, but to gather the data and to start making decisions in a different way... decision making mechanisms will be varied and they will happen at different scales” (Marine Planning). Therefore, to effectively advance collaborative governance and decision-making, there is a potential need for specific roles for people or organisations to assist with the work, to translate the information in order to be accessible.

5.3.3. Environmental connectors to assist collaborative working and further the use of ecosystem science to mainstream environmental priorities

In this section the concept of environmental connectors (ECs) was introduced to the participants. It was noteworthy that in the focus group itself some participants had already made suggestions regarding the need for such roles (as highlighted in section 5.3.1.3.). It was described to the participants that the previous one-to-one, semi-structured interview research in round one and two had indicated the need for greater horizontal and vertical connection between currently disintegrated sectors and organisations, this was also echoed in the feedback from the pre-survey questionnaire. Focus group participants were also informed that multiple participants in the interviews had alluded to the need for specific connecting roles.

The idea of ECs was described to the IntdS focus group participants, suggesting the overall meaning of ECs was that they are specified roles that aim to manage, build and nurture relationships within a governance and decision-making system, for better long term outcomes for the environmental and social system. The participants were shown a slide with bullet points appearing one after the other along the list (Figure 11). Participants were then asked for their thoughts and ideas.

Environmental Connectors

- Independent and specialised connecting roles.
 - Manage, build and nurture relationships within the governance system, for better outcomes for the environmental system.
 - Sit within government departments, government agencies, and local groups (vertical), and connect local groups in a geographic area (horizontal).
 - Specific function of joining up, understanding workstreams and policy goals, cross pollinating ideas, understanding evidence requirements and who has what data and knowledge.
- ❖ Initial thoughts
 - ❖ How could this person fit into your work? Support or hinder?
 - ❖ Should they be specialist in NCA or more broad?
 - ❖ Who would they work for: Civil service? Consultancy? Partnership? Cross-funded by All?
 - ❖ How often should they meet?
 - ❖ How many?
- 

Figure 11. Slide that was shown to focus group participants for information and discussion points.

The IntdS participants reaction was mixed, with suggestions ranging from where the ECs could sit within governance structures, to the importance of those already in roles connecting more, which, it was said, would be more possible within local nested plan areas. Variations of the role were offered, and also in this section the opportunity space of offshore wind was discussed.

5.3.3.1. *Support and be broad*

Initially two consecutive quotes from the Marine Planner and Marine Policy participants are highlighted, both of which could see the value of the role to support and increase capacity:

“It’s not a bad suggestion. I would always take extra support if someone was going to come in externally to help me, then yes, by all means, it will release the capacity for us to do other things so I don’t think it would be a hindrance...I think they’re particularly suited for those areas that have got very complex issues... in a more complex system that had more players involved that could really test some of these connector roles and how they work together... [projects or local plan areas] that are really stretched would benefit from this connector role more so than a very well-resourced organisation. Maybe that’s where this could add value” (Marine Planning)

“I think it would be good for this person to understand natural capital, but from a broad range of views... So, I think understanding Natural capital and how different people view natural capital would be really valuable” (Marine Policy)

The above quotes highlight that the role of an EC could help build connection and collaboration by being quite broad in approach. By working in a complex location with multiple opportunities and challenges, rather than just for a particular sector. Where there are currently gaps due to being under resourced or not understanding different points of view, the ECs could develop links. It was also said that the ECs could potentially use ESc as the language or connecting tool between groups, by developing dialogue and cross-over around how different groups use and experience shared NC. A variation of the role definition was offered by the Community Group representative:

“Like a learning partner role where there could be capturing of the learning that all the collaborators within the area have jointly made sense of and which can then help them reflect on practice and inform future practice locally, but also then escalate that information kind of to higher levels to the national or whatever. So yeah, more like a learning, a learning exercise or something like that” (Community Group)

Collecting and synthesising learning from multiple programme outcomes and disseminating this information could be useful and could advance collaboration through building shared knowledge and understanding, as well as shared failures in process and progress. Additionally, capturing learning could have real impact on monitoring and evaluation of organisations. While monitoring occurs for project impact, learning within an organisation or sector is often lost.

It was said *“they need to meet the relevant people at the relevant points of their business planning cycle, so every organisation will have its own business plan where it sets its objectives and its targets for the year”* (Marine Planning). This quote highlights the role would need to be systematic in its approach to engagement with groups and organisations, ensuring they are at the appropriate meetings and at significant times of the year to receive and be able to give useful information. To be able to provide bilateral knowledge exchange to have impact. However, the Fishing Federation perspective was that *“somebody could get very lost very quickly”*. Within the fisheries industry alone there are multiple groups and ever-changing parameters, the Fisheries Federation perspective was speaking from experience themselves of dealing with multiple groups, which would necessitate the need for boundaries and/or a specified EC framework. The Marine Planner agreed with the Fishing Federation perspective and furthered it:

“I do think it would be a really challenging role and it would be challenging because depending on where they sit in the governance structure will determine what influence they actually have to change things” (Marine Planning)

The role of the EC would be to move around the governance system, to build relationships horizontally and vertically; potentially it would be best placed in a middle-ground. However, the role would need to have sufficient authority to be privy to high-level strategic information and be appreciated enough to be listened to by other groups when relaying information. The following Terrestrial Planner quote concurs with the Marine Planner and furthers the idea to speak of a specific group of high-level people connecting:

“We proposed Green Growth boards to deal with this question... Green Growth Board would have an Executive Director level from a local authority covering one each of a number of different topic areas, one of those would be the environment and at the moment there's nothing comparable to that in local government at all... You need a big plan to get a seat at the top table. The Green Growth Board would be a non-statutory body that would act to ensure that plans within the territory were consistent with each other. You know we're not saying something different about transport than

we are about the environment. We need some way of making sure the MMO was involved because, probably, the local environment plan, because otherwise this wouldn't cope with the issue of the of marine environment” (Terrestrial Planning)

In this view there is not a need for an EC additionally appointed; rather it is important to develop responsibility and give time and space within current roles.

5.3.3.2. *Alignment with current structures and future possibilities*

Two participants agreed with the terrestrial planner comments above voicing that they do not feel there should be new designated roles; rather people in their current roles should be given a more explicit connecting role:

“I think I'm looking at all the environmental connectors. I think is a fundamental role of the people in the room as part of their job to be connectors. To me one of the problems in Adapt Town is there is no local system of marine planning, they're disenfranchised really. If it was a hierarchical process, if it is legitimate for them to have a local plan, then they [stakeholders of ACT] could engage in all of these issues... and then there would be that opportunity, wouldn't there, for information to feed up and down that hierarchy, but at the moment it cannot exist because there is no local planning process other than your local authorities or local reps trying to feed things into a much bigger regional plan which is at a larger regional scale and that's not really that sensitive to local issues... To me it's all the faces I'm looking at, that's their job to be part of this process, and it's not something that you bolt on” (Marine Consultant)

“I share the views of [Marine Consultant] looking at it just at this case study example in Adapt Coastal Town because some yeah, as [Marine Consultant] said certainly with respects the marine environment it's pretty disenfranchised that they were very there was very, very limited local level decisions taken... I agree with the objectives [of an EC] if you like. But how we get there is another matter, and you know just it can't just be about a deploying people. I think the various people that are already there, but structured in the right collaborations essentially” (Fishing Federation)

These quotes highlight that the participants feel strongly that local, nested plans would solve multiple challenges regarding connection and inclusion. The following quote also agreed with these two statements and highlighted an example or opportunity space for an EC role within a local area:

“You could trial one purely focused on nature-based solutions and natural capital techniques, and perhaps in the southwest. It's sort of best place for that, so there are obvious places to do this, it's just getting the push to be able to do it. You can really start teasing out some things that we just, they're just not possible at regional or national level. You can have a policy that is specific in a small local area. So yeah, there's definitely utility for this sort of role [EC's] in that space” (Marine Planning)

The participant highlights that development of ESc techniques would be easier at smaller scale, and the ECs could assist with this. Based on the *“it's just getting the push to be able to do it”* comment, a follow-on question was asked from the researcher/facilitator “where does the push come from; who is the decision-maker there?” The response has three key elements. Firstly, the high turnover of staff in Defra leading to decisions being made that do not necessarily make sense presently or serve to advance the system. Secondly, the participant suggests there needs to be political will and points out the approaching hook associated with offshore renewables. Thirdly, the quote highlights that when there is a link between a government main agenda, and an environmental impact, there is a large and fast roll-out, ergo, attaching environmental priorities to areas of ministerial interest is advantageous:

“I think one of the challenges we've had to date is that there's high turnover in Defra, particularly around marine policy, marine planning policy. And marine planning is complex, it doesn't have to be, but it takes a bit of explaining, you have questions, and someone goes yeah it's done like that because of something ten years ago and your like right, and no one looked at it again. OK, that doesn't make sense. So you've got a bit of getting people up to speed, but then you've got to have ministerial ambition and I actually think that the opportunity is coming very shortly with regards to offshore wind, and it's how we get our Defra ministers at the table in that conversation around offshore wind and the impact it has on the environment and on fisheries and that is in my view, the hook that will create more spatially specific marine plans will create more collaborative working and we'll probably see some trials at sort of more local level

maybe... The optimist wants to say we're doing this for climate change reasons, but the cynic in me says that this is about a wider government agenda and our current Prime Minister⁵⁹ likes big infrastructure projects that's his legacy. So, excuse me for not falling over and surprise that it's a big infrastructure project that's being suggested for our marine area and the push is real. There's a huge amount of push within government that this is the priority, so don't be surprised if you see more of this coming, a lot more in the next six months I'd say" (Marine Planning)

The comment above secured agreement from all the participants as confirmed with nodding of heads, and the discussion continued around the opportunity of offshore wind farms. The big data that will be provided through surveys and the local spatial planning possibilities, where the importance of joining-up across marine and terrestrial was highlighted:

"Deciding where it happens is not simply marine question, because you might find that ideal location for it, you know the right depths of sea the right wind speed, but then you might find that there's no way of getting the power on land because the communities on land say we don't want transformers and power cables and things crossing our, you know, arriving at our coastline then going in land from our coastline to a more you know place where they're actually going to use the power. So that's an example that works very difficult unless you treat their terrestrial and marine environments in a single process" (Terrestrial Planning)

This quote gives an example of the need for join-up in planning and delivery across marine and terrestrial spaces to discuss present and future opportunities and challenges.

⁵⁹ At the time of the focus group (September 2021) Boris Johnson was head of state

5.4. Conclusion

This chapter identified the results from the semi-structured interviews and focus group. The results highlighted key themes relating to the shared and connected nature of the environment, which was further illuminated through ESc concepts. Participants suggested ESc concepts have transformed the way the environment is viewed; from a constraint to an opportunity, albeit with some concerns over the monetary language and potential monetisation or commodification of natural assets if governed incorrectly. This was the main concern in both the interviews and focus group. The results show that ESc principles largely through NCA and NC perspectives help to mainstream the environment into non-environmental sectors. However, integrating data and increasing social values and skills proficiency would further include diverse perspectives that would lead to lasting outcomes. Indeed, the process of developing the shared evidence base through collaborative working itself, could illicit the most mainstreaming potential.

The results reveal the disconnect of governance across sectors hindering any ability to make joined-up decisions about the marine and coastal, and adjoining terrestrial environment. To improve governance and decision-making in the marine and coastal environment greater inclusion and engagement in knowledge building, and governance and decision-making at smaller local, nested scales, supported by the weight of government on larger challenges in a hierarchical structure, was generally agreed amongst participants from the interviews and focus group. Across the governance structure(s) connection and collaboration supported by connecting roles we promoted and deliberated. These results are now discussed with the wider literature.

6. Chapter Six: Discussion

6.1. Introduction

This chapter discusses the priority results from the semi-structured interviews and focus group alongside the wider literature. Key themes have emerged relating to the way previous and current governance frameworks hinder environmental mainstreaming, the economic priorities dominating policy and decision-making processes and the current siloed way in which knowledge is developed and exchanged. The use of ecosystem science (ESc) concepts arguably offers potential to address these problems, shaping more holistic intervention pathways both in policy and practice. However, fundamental challenges exist with the design and delivery of the concepts. Here, key notions of values, skills, inclusion, capacity, champions, and social learning became important drivers to aid deeper mainstreaming modes (Scott and Holtby et al., 2022), set within evolved marine planning and delivery arrangements.

6.2. Addressing the disintegrated governance challenge

The results from the interviews and focus group confirm unanimously that the current governance framework for marine decision-making is not suitable for present and future requirements. The results highlighted that sectors, industries, and organisations across the marine-coast-terrestrial interface were disconnected and misaligned in policy and practice, and that current governance structures have evolved over time, with layers of different geographical and political boundaries that do not match up on spatial or temporal scales. This “messy” picture resonates with similar findings by Scott et al. (2013) in the rural urban fringe

and Leach et al. (2017) in urban planning, reflecting a wider governance problem. At its heart lies the discrete identification of problems and interventions in separate sectors, which creates inefficiencies, duplication, gaps, and contradiction, as well as unhelpful conflict and competition between sectors for resources, space, power, and influence.

The majority of participants from both the local and policy stakeholder interviews described the policy landscape as complex. They also described the environmental challenges as complex, whereby a silo mentality tends not to take full account of the interactions of natural systems. In the focus group, there was an interesting point made regarding the intrinsic nature of complex systems: that they are inherently emergent. Therefore, we don't have to and potentially never will fully understand them. Rather, the ability to act, observe the impact on the system, and then, importantly, change and / or progress in adaptable and iterative ways to work towards a desired outcome is essential within complex systems.

In the interviews, local and policy stakeholders pointed out the inability to control drivers of change across the marine / terrestrial jurisdiction represented a challenge to the marine and coastal environment because land use decisions are made by organisations or sectors that do not have a marine focus. This is often combined with the consideration and management of issues across the marine-coastal-terrestrial space in isolation through separate government departments and a rigid regulatory system that is not easily adaptable. Rather than the sense and respond dynamic basis that Pahl-Wostl (2009), Boulton (2015), and French and Lowe (2018) argue is necessary in complex environments; the results suggest that the environment and operations taking place within the environment, are still governed by mechanistic, linear policies, with perceived predictable outcomes. These results are in line with Merchant (2006) who asserts, in a reflection on her own 1980 paper describing the mechanistic world view

developed during the scientific revolution, that these approaches lead both to the destruction of nature, and much of the issues with modern day dualistic decision-making.

It was said by participants that there are countless different plans and strategies that have different / competing objectives for the same space. Together, these attributes lead to conflicting policies with their own targets which, if mapped against one another could not all be feasible. Additionally, targets do not often take into account their effect on other sectoral targets. These results support Jentoft and Chuenpagdee (2009), who proclaim the marine and coastal environment is hampered by a wicked problem of conflicting, sectoral policies and a diverse architecture of authorities making their own rules and policies (Boyes and Elliott, 2014 and 2016).

The results found that there is not a standard procedure for working together across sectors, and no standard method or culture to apply for interdisciplinary funding within or across government agencies, where collective strategies to address cross-cutting issues are encumbered (Lowndes and Wilson 2003; Christensen and Laegreid, 2013; Scott, 2019; Scott and Holtby et al., 2022). Though academic institutes and partners are starting to work in inter / transdisciplinary ways, funded by UKRI⁶⁰, it is well documented that there remains a disconnect between academic research and actual integration into policy frameworks and subsequent decision-making (Laurans et al., 2013; Primmer et al., 2018; Barton et al., 2018).

Most participants believed there was a significant lack of joined-up thinking and decision-making between the many different sectors, industries, and organisations. The results highlighted gaps and missed opportunities, contradictions in different policy spheres, and

⁶⁰ United Kingdom Research and Innovation <https://www.ukri.org/> Examples of this new working can be seen in the SMMR projects <https://www.smmr.org.uk/funded-projects/>

confusion regarding where to get information or whom to speak to, leading to project inertia. The results also illuminated multiple documents for stakeholders or the public to address when formulating a project or making pro-environmental decisions, which, it was said, is confusing and off-putting, particularly at the coast where there is a cross-over of remit, agencies, and legislation. Within the environmental sector alone, there are many organisations, which makes it complicated in terms of who has responsibilities for what. These results confirm Boyes and Elliot's (2014 and 2016) work, that there is complex and patchwork marine legislation and administrative frameworks, and Nunan et al. (2020) that join-up across sectors that operate in the marine and coastal space are still insufficient.

Due to sectoral decision-making, there is minimal appreciation of external cumulative effects to the environment. One single project may negatively affect a relatively small ecosystem. However, multiple, multifarious projects over time have whittled away at the environment's resilience to external, anthropogenic influence. The results support Hodgson et al.'s (2019) argument that the cumulative impacts of siloed anthropogenic activities result in multiple ecological stressors. Furthermore, that decision-making frameworks currently impede the application of cumulative effects assessments at ecosystem levels. This is because, even though cumulative impacts are required through the regulatory process (i.e., Environmental Impact Assessments), this application necessitates reliance on professionals, paid by the project instigator, to demonstrate the level of environmental and social impact of that particular activity (Hodgson et al 2019).

Overall, the results confirm that current governance frameworks are designed with a separation mindset. Capra (1975 and 1996), and Ponting's (1991) argument is validated by the results that early Cartesian and Newtonian scientific movements led to a fragmented view of the world and that individual parts of the system are managed irrespective of how the

elements in the wider system interact. The example of trade negotiations from the results is instrumental in this regard. Remarks from a policy stakeholder that detailed negotiations show trade-based economic arrangements and interventions are designed independently from environmental discussions “*those decisions are looking at trade flows and making sure trade flows are working better... And then the next generation of questions that come after that will be much more to do with how we look after the environment*” (Deputy Director: p.164) The trade-before-environment discussions also underline that trade is prioritised over the environment. Moving away from this disintegration to more joined-up governance where trade is seen as an integral part of the natural environment requires significant culture and values change. The core of this issue lies within the fallacy of economic primacy, which was the concern of many interviewees who articulated that the environment is seen as secondary.

It was interesting to hear participants speak, often quite passionately, regarding the dominance of the current economic growth paradigm, which was believed to be “*completely mismatched*” (LS.S. Academia: p.163) with the environment. Mainstreaming environmental priorities is challenging because, in our neoliberal capitalist society, there is a predominance for economic growth (Moore, 2016; Carter, 2018). It seems that for any sector or organisation to operate in the current system, the necessity is to develop competitive practices which generate significant financial returns – whether that is for profit or non-profit processes. Growth imperatives present a barrier to environmental and social sustainability because there is a tension between the practices necessary to increase financial return (e.g., over-use of limited resources; short-term or quick fixes; and cost-cutting through reducing person-hours, cheap materials or equipment, and poor project design with prioritisation of low budget over quality), and increased resilience practices (e.g., resource and time for collaboration, inclusion, empowerment, restoration, and adaptability based on up to date evidence).

The results expose that current governance does not adequately address damaging activities and over-consumption of natural resources. Here, the results spoke to the alliance between big business and government due to a culture of obsession with economic growth. These results are in line with Schmelzer (2016), who states that growth statistics and Gross Domestic Product (GDP) drive political decisions; and Moore (2016 and 2014), and Carter (2018), who argue that the environmental costs of the predilection for economic growth, wrought by capitalist hegemony have become increasingly evident (Moore, 2016; Carter, 2018). In the collection of essays edited by Moore (2016) the overall summary asserts that there is no doubt that capitalism imposes a relentless pattern of violence on nature. Moore (2016: p.6) captures the modern world as the “*Age of Capital*” describing the current era as a world of capital accumulation and unfettered domination over the environment. The results support authors such as Juntti et al. (2009) and Jordan and Lenschow (2010) as participants believed that, despite abundant evidence of the decline of the marine and coastal environment, the economy and industry is still consistently prioritised over environmental and social outcomes. This prioritisation is a matter of incentive because the motivations for the government and current societal norms are financial.

To address these two key governance challenges – the disintegrated, sectoral characteristics of governance and decision-making; and the economy before environment imbalance – ESc offers significant potential. The results highlight that the ecosystem thinking elements of ESc (e.g., ecosystem-based management (EBM)) has aided perceptions of the environment as a more connected whole, and the monetary framing elements (e.g., natural capital (NC)) have transformed opinions of the environment from a constraint to an opportunity, in so doing, elevating the importance of the environment to society. It was mostly agreed amongst local and policy stakeholders that “*speaking to the economics, in a language that is tangible, is probably really important*” (LS.S. Academia: p.145) to highlight the value of nature to multiple groups and to bring the environment into equal weighting in discussions. However, despite

this support, both local and policy stakeholders highlighted that the word natural 'capital' is concerning because of the dangers of putting a perceived price on nature, with one participant stating to do so is an "*anthropogenic way of conceiving of things*" (LS.ND. Multi Partnership Agency: p.144). There was agreement on this point in the focus group, whereby the potential projects that may arise from monetary framing, or monetisation, was highlighted as concerning for some focus group members.

These results are compelling in a call to be cautious of financialising nature and the need to move beyond an economic quick fix, towards more integrated perspectives. Indeed, the results highlight that an advantage of NC is to illuminate nature as the foundation upon which everything else rests and highlight the ecosystem services (ES) that are essential for different people at different times. Therefore, if used appropriately / inclusively, a natural capital approach (NCA) could be the mechanism to fully incorporate impact into the planning, delivery, and accounting of all areas of society so that the true use and true costs to nature and society can be highlighted in any sector, thus leading to restrictions of damage and overuse. This suggestion supports the ideas of Raworth's (2017) Doughnut Economics model; that building and costing all aspects of society into the economic system is essential, and that nothing grows unchallenged forever. This concept is also explored in Gunderson and Holling's (2002) adaptive cycle of growth, consolidation, release, and renewal phases experienced in ecological, social-ecological, and social-economic systems. In a natural system, the growth phase would start with early pioneer species, there would be waves of colonisers and, as new species come along, the ecosystem adapts until a climax ecosystem in the consolidation phase. The closer to consolidation, the less able the ecosystem is to adapt; it becomes more resistant to change but also becomes more fragile. Gunderson and Holling likened this to social and economic systems, and this cycle can be seen with neoliberal-capitalism today; having grown rapidly since the industrial revolution, presenting in the consolidation phase. Currently, despite interminable evidence of the crisis points of climate and biodiversity, the

power structures that support neoliberal-capitalism, are very resistant to change. However, the system is very fragile as illustrated by the financial crash of 2008, and the cost-of-living crises of 2022/3. Each of those shocks (and others) should have tipped the system into the release phase, opened to new innovative thinking and renewal of more up-to-date and suitable social-ecological-economic systems that better incorporate fragility and frugality with natural resource. However, governments have become ever more entwined and connected with funding institutions with regulatory capture much in evidence (Scott et al., 2014), supported by powerful media interests. Resistance to change is fierce, although here it is noteworthy that the concept of natural 'capital' is gaining more traction within this current archetype than previous concepts within ESc.

That said, NC alone does not speak to the necessary deep systemic shift needed to solve the environmental crisis; rather, it pursues the incremental, shallow approach as the capital element aims to fit within the current paradigm rather than insight any deep system changes away from it (Scott and Holtby et al., 2022). However, where radical change away from a neoliberal, capitalist growth paradigm is not yet possible, environmental mainstreaming must [initially] find solutions under the current politically and socially accepted narrative (Adelman, 2018). As two participants in the focus group described, NC is a good conversation starter. The ability of NC terminology to appeal to a wider non-environmental audience, because of the use of monetary units that are widely understood, may mainstream the notion that nature has immense value for humans, and ES highlights irreplaceable service benefits for services to humans. How these concepts are applied through the NCA, and the inclusiveness of the data collection, incorporated values, and joined-up decision-making: indeed, whether a NCA is used within a wider social-ecological, ecosystem-based context, are key to the mainstream outcomes that will emerge.

Participants from each round of research felt the need for a joined-up approach was becoming recognised because ESc concepts (ecosystem thinking, ecosystem based, whole-site approach) now help to bring together currently separate policy areas. It was generally agreed that a NCA enables joined-up thinking and planning across organisations by promoting discussion around shared resources and establishing shared priorities. In the focus group, it was highlighted that the major advantage to collaborative governance and decision-making was through the process itself of integrating currently fragmented datasets from environmental, social, and economic spheres. It was said that developing an understanding of where strategies align is the key to building system-wide relationships that have longevity. Thus, the initial hard work pays off in the form of building more resilient networks that can adapt and discuss priority issues over time, forming effective collaborative networks. Significantly, no participant said that ESc made joined-up working more problematic.

These results confirm the importance of ESc in policy and decision-making processes as, through illuminating the ES that flow from NC assets, beneficiaries who rely on or influence a certain area or type of NC can be identified. Thence, NC values can be used to prioritise investment in environmental management and inform policy instruments and can also be used to demonstrate the effects of damaging activities. The research highlighted that ES/NC concepts could help to build an understanding of common dependencies and can facilitate dialogue around important beneficiaries and benefactors, which allows the discussion of common constraints. Rees et al. (2021) posit that if nature is valued broadly for the benefits to human well-being, this can highlight pathways for more sustainable outcomes, and it could be argued that economic valuation is not necessary. Instead, NC/ES can be used to instigate broad-scale policy change and management measures to map and ensure no net loss of assets and given the current precarious status of nature, improve the extent and condition of NC assets over time. One policy stakeholder interviewee, and a wider conversation in the

focus group discussed this concept in regard to using a NCA for nature-based solutions (NbS) and net gain (NG) projects; for restoration purposes.

It was infrequent that participants articulated the link between different ESc concepts. Moreover, the results highlighted that it is common practice to use the different related terms interchangeably, reflecting a limited understanding of the terms themselves and how they interrelate. Indeed, Bateman and Mace (2020) found that there are multiple different understandings of a NC 'approach'. This highlights a key weakness in the translation of terms in plans and policy documents thus far, where vagueness in policy wording can leave stakeholders feeling uncertain as to what is required. Although some local stakeholder participants said ESc concepts provided shared language for different groups to use to increase partnership working and strategic planning, others felt that the technocratic and confusing language of ESc was a barrier. This ties in with work of Scott et al. (2018) who identified the importance of identifying and co-developing hooks⁶¹ (H) and bridges as important mechanisms to gain initial traction.

Clearer definitions of ESc concepts and their interrelationships, as well as how to operationalise them in policy and practice, is urgently needed, building on recommendations from the UKNEAFO (2014) exercise and preliminary work from Scott et al. (2021), because *"people are running with the idea of natural capital in their in their various little silos"* (LS.ND. Multi Partnership Agency: p.147). The urgency is needed to prevent different organisations from framing and using ESc differently within their own sectors, which could lead to further diversification and disparity in language, values, and approaches; akin to the problems experienced over sustainable development (section 3.6.). Ultimately, this could lead to further

⁶¹ Hooks (H) as first showcased in the mainstreaming conceptual framework (Figure 2, section 2.4), are further highlighted in relation to ESc mainstreaming framework (Figure 11, section 6.4.)

disintegration and watering down of ESc in theory and practice if not effectively tackled, posing a significant risk to the positive potential for ESc identified within the results.

Policy stakeholders expressed the view that there was an appetite from local partnerships and some industries to start using ESc in their daily working practices. However, though there are champions of ESc, they are currently mismatched in terms of pace and ambition with some government gatekeepers. The results suggest that Defra and /or government are not currently ready to drive forward the use of ESc concepts across government departments or through a legal process. In this case, *“coastal partnerships, some of them, or indeed industry, are wanting to go at a much greater pace than Defra is able to facilitate at the moment”* (PS. Director: p.155). These results support Scott et al. (2013) and Jordan and Russel (2014) who identify barriers (B⁶²) to mainstreaming related to key gatekeepers who control the flow of acceptable knowledge based on their current values and how well new concepts fit in with their agendas and structures. Thus, the consequential PPPPs that emerge are often pragmatic and piecemeal (Turnberry et al., 2014; Scott and Holtby et al., 2022).

There is emerging evidence that ESc concepts are being supported internationally (e.g., CBD, TEEB, IUCN), and nationally (e.g., NCC); however, progress is not linear. For example, in England the (NCC supported, originally cross-governmental though later Defra-led) 25YEP committed to embedding the NCA in environmental and wider policymaking processes. Though subsequent legal frameworks such as The Environment Act 2023, and the first revision of the 25YEP plan, now titled the Environmental Improvement Plan (EIP23) make no mention of a NCA specifically, rather NC is mentioned as part of wider discussion. This is also evident in the National Planning Policy Framework (NPPF) revisions. The natural capital

⁶² Barriers (B) as first showcased in the mainstreaming conceptual framework (Figure 2, section 2.4), are further highlighted in relation to ESc mainstreaming framework (Figure 11, section 6.4.)

ecosystem assessment (NCEA) and marine NCEA (mNCEA) are highlighted in the EIP, which are emerging programmes developing traction through Defra and agencies, though are not, at the time of writing, applied through the regulatory system. At the time of the research, the EIP had not been released, therefore, participants were unsure about how NG would be implemented. The EIP details Biodiversity NG for the land-based built environment, but only alludes to applications in the marine, rather than a definitive function. Additionally, NbS are frequently mentioned in the EIP in relation to reaching net zero, climate mitigation and adaptation, reducing flood risk, and connecting people with nature. The narrative speaks to these essential actions going forward and, therefore, positively supports mainstreaming of environmental priorities in their description.

On the other hand, the marine licensing process, which utilises the mitigation hierarchy to discourage damaging behaviour, though it does not stop it, does not currently promote or easily enable positive restoration projects. Therefore, the promotion of NbS in newer policy documents is difficult to deliver in practice. The results highlight the current licensing system is debilitating for groups trying to make positive changes. This was a view expressed by both local stakeholders and policy stakeholders; all be it with different angles. The local stakeholders felt the current licensing process hinders them through lengthy and expensive procedures, whereas the policy stakeholder highlighted the current procedure is a negative way of framing decisions. These outcomes support McLeod et al. (2018) and Shumway et al. (2021) by suggesting that regulation can restrict positive impact projects for the environment, such as novel NbS restoration projects, where the current marine licence system can hinder progress.

Individual organisations are gradually applying different ESc principles, in particular, a NCA, NC accounting, and a small amount of NbS projects, but in piecemeal and unstandardised

ways. In part, this reflects the wider ownership and original thought leadership of ESc terms and methods through the environment-economic disciplinary interface. Other disciplines and professions are developing interest in ESc more recently or are not particularly interested (UKNEA, 2011; 2014), potentially due to a lack of their involvement in design from the outset, meaning that the language and methods do not resonate with wider sectors. Furthermore, those sectors have developed their own terms and approaches which suit them and thus, there is no incentive to change (Scott et al., 2018). This is where translation of the new policy idea into the language and priorities of different key sectors is needed to help build on the initial hooks (H), and in particular bridges for a shared language and approach.

This speaks to the necessity of interdisciplinary and transdisciplinary collaboration across sectors and organisations to address barriers (B) with the creation of a common language, agreed terms of reference, and shared understanding of issues and solutions (Scott et al., 2018; Scott and Holtby et al., 2022). However, ESc has, thus far, not been inter/transdisciplinary in design. Rather, it has been developed in environmental and economic contexts. Because there was not transdisciplinary work to develop ESc approaches, all sectors are not currently represented in the methods, values or data, and adoption is not intuitive. The results highlight that to increase uptake of ESc, in particular NCA as it currently presents, necessitates development of understanding, upskilling, and regulation and incentives to work well. Interestingly, it was mostly local stakeholders that further stipulated the need for government steer through regulation and enforcement as a key approach to mainstreaming. It was said *“it’s got to be some, somewhere legally binding”* (LS.S. Activist: p.158), because *“it has to have weight”* (LS.ND. Ports and Harbour: p.158) for widespread use. This is perhaps to ensure that all competing businesses or organisations in the local area are all complying with the same processes. Also, it is perhaps due to local residents wanting the best outcome for their local area and the nature that they value, necessitating wider industry to act in accordance with the law.

Another key factor for ESc concepts to help work towards joined-up governance and decision-making is the need to better understand different perceptions of value, across broad policy areas, to enable governance cohesion. To do so there is a need to include multiple and diverse perspectives and retrospectively add these into further iterations of ESc. This necessitates exploring social science perspectives *“and until that happens, I don't think it's very easy to get better cohesion with other policies”* (PS. Scientific Advisor: p.170). Development and promotion of ESc as interdisciplinary, requires interdisciplinary participants as well as interdisciplinary data. Here, utilising natural and social science, and arts perspectives, is essential to highlight shared benefits across strategies and enable collective planning and delivery. Indeed, Cosgrove (2020) finds visual tools are a likely requirement for managers seeking to deliver a NCA in partnership; using art and photography to better enable discussion about different value perspectives was proven highly successful as it circumvents both jargon and process.

The fundamental work necessitates building on values-based research by Everard et al. (2016) and Reed (2018), developing social values and social justice alongside environmental values and environmental justice. IPBES (2022) provides a typology of different types of values to use in policy and decision-making but asserts that in valuation studies on improving nature to date, only 4% focus on issues or values also relating to social justice. Each mention of social values in the results was of the importance of capturing social values alongside natural and economic values, but that NC and ES methodologies and values are not (yet) able to encapsulate and present the values to society in a way that fully represents their true significance. Therefore, for major advancement in ESc, as an effective connecting tool, there needs to be greater input to build on values-based work to-date, and enhance or indeed mainstream the social and cultural values into ESc, as building blocks for citizens and stakeholders to better understand the contested, individual and shared values.

This necessitates research to provide qualitative values, alongside natural science quantification of stocks of natural resource. It was said that the ability to better capture and incorporate social values alongside natural and economic values could increase policy cohesion. In doing so it would better highlight the true value of natural resources to societies. This suggestion is in line with Bennett (2019: p.1) who asserts “*we will be missing the boat*” if we fail to include social science in marine governance and decision-making. Highlighting greater social value may also lead to behaviour change and widespread mainstreaming of environmental priorities through deeper connection of NC to government’s health and well-being agendas as well as the economy. Hence, livelihoods become part of the solution and stimulate new pathways to sustainability. It was found throughout the focus group that while participants believe ESc is contributing to the advancement of environmental and social factors being considered together, there is still major development needed to enable ESc to be used as the effective collaborative tool it has the potential to be. Combined, these ideas suggest the need for championing inter and transdisciplinary working, including local diverse stakeholders and values in developing outcomes-based governance and decision-making (Cowling et al., 2008). Any new initiative will fail unless the fundamental governance structures are (re)considered. Most participants in the research agreed that ESc is about better decision-making, however, people and institutions, if unchanged, are still likely to proliferate failings even with a theoretically solid ESc framework in place (Cosgrove, 2020).

The results highlight a recognition amongst local and policy stakeholders that including a wider circle of people is necessary to create knowledge and problem-solve, this was further confirmed in the focus group. These findings are in accordance with multiple mainstreaming authors, such as Tress et al. (2005), Scott et al. (2013), Cowling et al. (2008), Fish and Saratsi (2015), and Scott and Holtby et al. (2022). In general, policy stakeholders and focus group participants see inclusive collaboration more as being their colleagues and peers (horizontal join-up), whereas local stakeholders highlighted the need for more inclusion of local

stakeholders and citizens (vertical inclusion). In all cases, diversity was emphasised; the word interdisciplinary was used more by policy stakeholders, and transdisciplinary work was highlighted in the focus group. IPBES (2022a) states that in only 2% of over 1,000 studies reviewed stakeholders were consulted on values, and only 1% included stakeholders in every step of the process. IPBES (2022a) asserts that there is no shortage of tools to make visible the value of nature; what is in short supply is the use of valuation methods to tackle power asymmetries among stakeholders and to transparently embed the diverse values of people and nature into policymaking.

6.3. The essential nature of inclusion and participation

The results strongly concluded that local stakeholder participation and knowledge should be an integral part of policy and decision-making processes. It was stated by local stakeholder participants, that local people will know the local area best. The results suggested that by highlighting the local environment's benefits to local people there is the possibility to reframe the role of local stakeholders or citizens to be stewards or champions of the environment. However, the results highlight the way that local stakeholders appear to have been marginalised in policy and decision-making practices thus far, generated feelings of incapacity and disconnection. These results support Cooke and Kothari's (2001) findings that often participatory processes angered and harmed those that were supposed to be empowered due to selective incorporation of challenges and concerns of those outside of the orthodoxy.

The results show that many local stakeholder participants believed the power is held centrally, which contradicted policy stakeholder participants from within government agencies who felt that engagement was effective through lobbying and consultation processes and that local

stakeholders had powerful voices. This disparity is of concern and suggests the need for more effective participation strategies involving partnership and coproduction activities, moving away from more traditional top-down consultation processes. Consultations were highlighted as largely ineffective by some participants from both local and policy perspectives. It was highlighted in the results that the outcome of consultations can be discarded if not supported by the government or government agencies. It was noted that consultations do not necessarily lead to transparent or inclusive decision-making. Indeed, one policy stakeholder advances this theme to state that consultations give a veneer of transparency that is not honoured. NG and marine protection consultations were described in the results, and for both it was felt the outcomes of the consultations were largely omitted. Consultations aim to gauge public views; there may be a policy intention to include multiple stakeholder viewpoints. However, it is questioned by local stakeholder participants, and confirmed by some policy stakeholders that results can be disregarded, leading to perceptions that consultations are simply a tick-box exercise. These results strongly support De Vente et al. (2016) interviews and case study analysis where respondents indicated ad hoc participation or lower levels of participation, like consultations, were much less preferred than more continuous participation in problem definition, identification, selection, implementation, and evaluation of solutions. Moving away from the traditional method of consultation is difficult but requires prioritisation and resource for early inclusion and trust building; both with long-term processes in mind (De Vente et al., 2016; Reed et al., 2018).

Of the participants in the results that spoke of consultations, the feeling was that local representatives need to be allowed to engage earlier in the process, but participants felt that developers or planners are worried their plans or ideas will be derailed with early inclusion. Local stakeholders wanted to be informed earlier in the policy development process, for full transparency. It was recognised that once a policy or plan has been made, it is difficult to engage with meaningful contributions through consultation. Multiple local stakeholder

participants repeated the importance of involving stakeholders and citizens because local stakeholders live the experience of wanting more involvement in decisions about their local area. Yet, they often felt that decisions were out of their control. Local stakeholder participants repeated that a diverse group of well-informed citizens and stakeholders should be involved in local decision-making, working alongside locally based agency members and skilled organisations to enable more holistic solutions to societal challenges. Some policy stakeholder results claimed there is a limit to what is realistic; there are issues of capacity, which make wider engagement more difficult, and is perhaps why the current consultation method is preferred. However, a local stakeholder highlighted the need to involve stakeholders and citizens from the beginning of PPPs to ensure the output is relevant and useful to people or the environment in that area. It was said the outcomes tend to be more wholesome and could save time in the long run due to the robustness of a more acceptable PPP, thus early inclusion and collaboration is in line with Arnstein (1969) in her seminal work on citizen participation. Arnstein's 'Ladder of Citizen Participation' highlights consultations as tokenism, whereas genuine partnerships and delegated power as equitable participation, where citizens have meaningful access to and influence on a planning process that affects their day-to-day lives, thus leading to longevity. Though Arnstein's work influenced how top-down agencies think about participation, Morf et al. (2019) suggest it is extremely rare to reach the top of the ladder in marine, with most common forms of public participation remaining at the consultation phase.

Early engagement helps mainstreaming processes as there is a level of acceptance and ownership in outcomes through investment of time and knowledge (De Vente et al, 2016). As Cowling et al. (2008) and Fish and Saratsi (2015) posit, effective collaboration and stakeholder engagement is a necessary component in successful mainstreaming processes and can assist knowledge generation and transfer, and social learning (Blackstock et al., 2007), enabling new concepts to be better adopted, ultimately enhancing the rate of diffusion (e.g.,

Rogers, 2003 and Scott et al., 2018; Scott, 2020). The knowledge exchange aspect of co-developing data to use in a NCA is important: in developing data and values with stakeholders, the process also informs and shares knowledge. For example, Burden et al. (2019) used participatory mapping with local stakeholders, based on their knowledge of the visually mapped local area to help generate new insights, which were then shared amongst the wider stakeholder group.

Indeed, local people have a wealth of knowledge about their area and often see their local area in a particular way, where change can cause anxiety. Not all residents in a given area want to, or have the time or knowledge to, engage, but some citizens would like to inform local decisions. These stakeholders have the time, understand the local area, and often understand the legal processes, and could be a valuable resource for planning and monitoring. For representative inclusion, however, there is the more difficult issue of proactively seeking out the unusual suspects and securing voices that are often not heard. Though it was said by a local stakeholder that there is a need to make environmental priorities relatable to the wider public, a further local stakeholder participant added that some people are unconcerned unless they are directly affected, therefore, highlighting the *“linkage and the value that natural capital brings”* (LS.S. Conservation Charity: p.154) would lead to a greater sense of involvement and ownership. Nylen (2002) argues that problems of disconnection diminish when citizens become directly involved in public policymaking processes through citizen assemblies at the local or grassroots level, where such processes seem more relevant to people's day-to-day lives. This empowerment can be furthered to include citizen involvement at the budgetary planning level. Citizens are encouraged to attend neighbourhood meetings to propose, discuss, and vote on budgetary priorities for the local area, which may have higher upfront facilitation costs, but increases confidence in planning, reduces corruption, and increases the efficiency of public money, so long as the design of the processes is in line with democracy and social justice principles, and all necessary information is given (Arnstein, 1969; Nylen,

2002). As a local stakeholder said, “*people need to be able to make their decisions based on more honest information*” (LS. S. Planning Officer: p.173).

These results align with Bennett et al. (2018) in their work on coastal stakeholders and indigenous community access to marine environments and resources. Here, they highlight the essential need to make data accessible and include communities in decision-making and, also that decision-making structures should evolve to include local knowledge. Further, in Bennett’s (2019) paper, he asserts that much of the world’s oceans and coasts are peopled seascapes and, therefore, decisions and actions taken in the marine and coastal environment can have profound impacts on the people who depend on the sea for livelihoods, for sustenance, for well-being and for cultural survival. Future ocean science efforts to promote environmental sustainability would thus benefit from considering these human dimensions.

Indeed, the results highlight the importance of effective two-way communication and knowledge exchange with stakeholders and translating knowledge to stakeholders and citizens so that people are empowered to make meaningful contributions. It was thought that connection should be based on bilateral communication (meaningful contribution based on a combination of local knowledge and shared specialist knowledge) where different stakeholder and citizen perspectives from different geographical areas can inform ongoing debate, particularly for their own local areas. This is in line with McKinley et al. (2023), who recommends expanding previously recognised dimensions to ensure that ocean literacy encompasses diverse knowledge, values, and experiences in participatory processes. In that sense, the concept of ocean literacy reflects both public understanding, connection to, and behaviour towards the marine environment. By highlighting this connection, improved ocean literacy has the potential to catalyse the behaviour changes needed for achieving a sustainable future (Kelly et al., 2021).

The results reveal a strong consensus for a greater connection between decisions being made in central government and how these impact at the local scale, particularly in delivery. To address this, the concept of connectors was a highly significant finding within this research. These transdisciplinary “connectors” could act as bridges working across different groups to build capacity, capability, and knowledge. The results strongly support the need for connecting roles to manage the relationships *within* local areas, whilst also managing the relationships *between* areas; to create a system that can promptly act and react locally whilst providing the links to be guided by and feed back into a larger national system for knowledge exchange and social learning. Participants expressed the need for these roles to provide horizontal linkages among stakeholders and organisations in a given place, and vertical linkages between different levels of government, increasing flows of knowledge and resource, performing brokerage functions in a network to resolve cross-cutting, complex social-ecological problems. It was also suggested that a connecting role is needed to integrate government agencies and better enable their joint working, and help promote methods for interdisciplinary working, funding, and strategic action plans.

The notion of connecting roles, as described by the participants, support Angst et al. (2018) who stipulate connecting roles can overcome fragmentation of governance by encouraging and facilitating interactions between individual actors and organisations. Bridging and bonding (Newman and Dale, 2005), brokering (Bodin et al., 2006), and managing knowledge exchange and engagement (Scott et al., 2013; Angst et al., 2018; Ison et al., 2021) were all further elements highlighted for a connecting role. Interestingly the results found that local stakeholders repeatedly mentioned connecting roles for individuals. Whereas with policy stakeholders, the more dominant opinion was that of an umbrella organisation: a hub in the middle, as one policy stakeholder put it. This suggests that local stakeholders prefer a single person or point of contact to engage with, while policy practitioners view decision-making at more strategic levels and see the need for a larger entity. In all instances, connecting roles

were mentioned as either people or organisations that can see and work within the bigger picture, identify strategic goals, and facilitate other people or organisations' involvement in PPPP design and/or delivery.

Effective connecting roles would help identify shared values and issues of concern and build trusting relationships. It was said the connectors have to translate and understand different language styles to talk to different groups at local and national levels, and across different sectors. All types of knowledge (from traditional to commissioned), in cycles of generation and uptake, shape power dynamics and management action where multi-level interactions, or Panarchy (see Chaffin and Gunderson, 2015), provide the dynamic links between administrative layers, with learning and feedback loops between these social layers and biophysical components. In this way, governance continues to evolve and diverse actors, from policymaking to delivery levels, provide and use data relative to non-linear, oscillating periods of stability and instability. Here, Carlisle and Gruby (2019) suggest scientists and non-government organisations hold critical support and facilitation roles; this research builds on this notion of support and facilitation, to suggest the connector could check for alignment to a shared goal and establish where there is crossover and compliments from one strategy to the next.

Currently, organisations such as (but not exclusively) Coastal Partnerships and Local Nature Partnerships perform connecting roles such as these, bringing diverse groups together in a given place. There is a need for these roles, or similar, to be uniformly positioned all around the coast in a coherent network that has further reach into the marine environment and the terrestrial side. There are also designated Marine Management Organisation (MMO) marine officer roles with a marine planning function, and newly appointed regional fisheries group officers that, amongst other roles, could be expanded in remit to evolve into the described

connecting roles. Adequate and consistent funding from the state would enable these organisations and roles to grow and build on the work that they already carry out; with developed formal links to give and receive information as well as inform policy outcomes; from both citizens, stakeholders, government agencies, and organisations alike – they are already a notable, prominent start to connecting the system.

Knowing whom to collaborate with, understanding how to collaborate effectively, and having time to collaborate is not typically found within job roles. This is an important gap in agencies' work structures and does need addressing as partnerships can be vulnerable if not securely funded, and engagement can be lost if not managed effectively ensuring stakeholder time is well spent. Scott (2012) highlights that early partnerships entailed a small number of partners where the nature of the process and outcomes of projects and funding opportunities were readily identifiable and understandable by all participants. Whereas contemporary partnership arrangements have much wider spatial and temporal complexities, leading to convoluted partnership networks and ever-expanding institutional requirements and bureaucratic funding regimes. Therefore, dedicated roles in facilitating as well as managing collaboration, even across partnerships themselves, are important. The concept of an Environmental Connector (EC) was further developed in the focus group, where there was a mixed view apparent. Some participants envisaged an advantage of people or groups with specific connecting roles, whilst other participants believed people in their current roles should have a more connecting function.

Those participants who thought the role of an EC could help aid capacity issues, suggested projects or local plan areas *"in a more complex system that had more players involved... that are really stretched would benefit from this connector role"* (Marine Planning: p.205) by working to build connection and collaboration across diverse policy areas. Hence, the ECs

should be broad in approach by working as a complex systems thinker in a complex location with multiple opportunities and challenges, rather than a specialist in a particular sector. The role could also capture institutional learning between different sectors and groups, which could help with data and knowledge sharing, where the ECs could potentially manage a central data repository. It was said that ESc language, data and methods could be used by the EC, and they would need to understand and translate how NC and ES relate to different groups. This could also help to increase skills proficiency in ESc concepts across multi-level, multi-sectoral governance as the ECs should also specialise in inclusive methods of ESc application.

Additionally, it was said the role would need to be at a high enough level of seniority to have enough authority to be privy to strategic conversations and influence workstreams with the cross-pollination of ideas in their planning phases. This suggestion is in agreement with Angst et al. (2018) who also identified higher level actors as promising candidates for such a task. Conversely, some focus group participants stated that an EC would “*get very lost very quickly*” (Fishing Federation: p.207), and that people already in post should collaborate more as part of their job roles. However, as previously highlighted, collaboration and connection is frequently touted as essential, though ironically not currently prioritised or funded. Another member of the focus group suggested there ought to be a board of players that are directors in their own sectors that come together frequently to plan for an area, taking all sectors strategically into consideration. However, this does not necessarily speak to the local stakeholder inclusion that many interview participants stated as essential going forward.

6.4. Planning and delivery at different scales

The results detailed the importance and evolution of marine planning in England and the key delivery role of the MMO, as well as wider departments and local stakeholders. The MMO has various marine-related functions; however, as one focus group policy professional highlighted, the MMO, as an arms-length body of Defra, does not currently have enough power concerning other government departments. However, another policy stakeholder interviewee suggested that a lot more could be achieved with the MMO regarding joined-up planning and delivery going forward. The results highlight that governance in the marine, coastal and adjoining terrestrial area, at present, is not achieving the desired level of collaborative governance. However, the participants of this research had various suggestions for how marine planning should evolve, which largely centred around power relations, nested plans, and improved spatial prescription.

These results support Spijkerboer et al. (2020) and Trouillet (2020), who found that MSP more broadly is a strategic planning tool to complement existing initiatives rather than a fundamental change in governance. The intention for marine planning⁶³ in England and the resources and funding it receives are interlinked features in its ability to make meaningful changes to wider governance arrangements and, indeed, how much it can prioritise local environmental factors over and above the interests of industry. Marine planning in England is intended to “*encourage sustainable development while considering the environment, economy and society*” (MMO, 2014 and 2021). However, as previously alluded to, the results highlight that the economy is consistently put ahead of environmental and social factors limiting any sustainable development outcomes, even if they are policy goals. This was confirmed in the focus group regarding a discussion around using ESc to mainstream the environment into marine planning.

⁶³ As detailed in section 3.2, marine planning in England does not include the spatial element of MSP.

It was said that “*marine planning delivers cross-governmental policy priorities... the environment does not tend to be that bigger hitter in government* (Marine Planning: p.201). This supports Young (2015), Jones et al. (2016) and Flannery and McAteer’s (2020) statements that current marine planning aims to deliver aspirations that align with enabling development and promotion of the blue economy.

The results also illuminated concerns that marine planning in England is not currently spatially prescriptive. Planning and fishing-based participants in the focus group agreed with Smith et al. (2011), that zoning does not account well for maritime sectors, such as pelagic fishing or shipping. However, the majority view was that an increased spatial element was necessary, which Stojanovic and Gee (2020) pointed out aims to minimise conflicts whilst maximising the benefits of defined sea areas. Stojanovic and Gee assert that achieving spatial zoning relies on the characterisation of the biophysical environment and subsequent analysis of human uses in a marine area and is usually coupled with a regulatory approach that guides spatial development, necessitating data and evidence. However, the results highlighted that data is lacking in availability and join-up. Consequently, most participants commented on the need for better organised or more integrated data; here data was seen as siloed, reflecting its neoliberalist capture that renders it as a commodity rather than a public good. The results also emphasised the need for data in a comparable format and the need for open-access, shared datasets in a central repository to enable improved collaborative planning and delivery. Currently, practitioners need to account for the differences in data between different groups and need to apply for and pay for environmental data or the latest academic knowledge through journal paywalls. As policy stakeholders noted, this takes time and costs are a big factor, which is off-putting and, therefore, the status quo continues. This restricted access to data or academic research is potentially a contributing factor limiting application of academic knowledge in practice.

The causal sequence siloed working has on producing disconnected datasets that are created, then used sectorally, further detours collaborative working because it is difficult to commune in decision-making. This is particularly so for data availability upon which to base ESc decisions with clarity, especially regarding trade-off decisions. It was said in the focus group that there needs to be better incorporation of future planning into marine planning, which necessitates data from multiple sources and sectors. Though it was also said that even if there is enough information, decisions are still hard to make because not all stakeholders will get their desired outcome. Going forward a policy stakeholder suggested having “*natural capital as a core data set*” (PS. Senior Advisor: p.157), which government departments, developers, and planners, as well as NGOs, conservation authorities and local stakeholders can use for joined-up planning and decisions, with the understanding that “*an order of magnitude might be enough*” (LS.ND. Regulator: p.158), because “*you can have simple ways of doing that, or you can have really myopically complicated and painful ways*” (Marine Consultancy: p.201). Indeed, Clarke and Flannery (2020) find that decisions about the marine environment are framed as problems arising from data discussed amongst technocrats, rather than allowing for and honouring public debate and experiences. They state technocratic managerialism aggrandises experts and data in decision-making so that they become the focus of policy interventions, often leaving pressing issues unaddressed when there is not the data to support making a change.

Spatial zoning arguably provides more clarity in busy seas. A policy stakeholder highlighted its importance in their call for development of a definitive policy hierarchy that would set a framework for all sectors to work within. Multiple participants said that marine planning should have different spatial scales with hierarchical governance and decision-making, to work on environmental challenges at different levels. Moving forward, nested plans were seen as critical for improved collaborative working and positioning local environmental priorities at the forefront of decision-making. Marine plans were spoken about regarding their iterative nature

and future possibilities, where there is the important cycle of plan-making, monitoring and review as part of the planning process. It was said there is opportunity to develop the linkages down to the local level over time, advancing planning hierarchically. There was a strong consensus that there should be a greater connection between government agencies, sectors, industries, and organisations that work within specific, nested geographical places to achieve nuanced, place-based common goals in a policy ecosystem, where diverse groups of people could come together to discuss priorities in that locality. Here, shared outcomes could be more visible to stakeholders, and spatial prioritisation could be more specific akin to that on land. These arguments have strong echoes with the debates around the development and delivery of more effective terrestrial spatial planning (Scott et al., 2013).

The different themes on marine [spatial] planning that emerged from the results support Gilliland and Laffoley's (2008) key points in multiple ways, in particular: developing MSP can draw on extensive experiences in terrestrial land use planning, and a nested approach with appropriate planning activity at different spatial scales. Additionally, ecosystem-based MSP has been presented as the best way to ensure both ecosystem conservation and the development of human activities (Gilliland and Laffoley, 2008; Crowder and Norse, 2008). Using a nested hierarchy of spatial patterns and conducting gap analyses will allow governance and management frameworks to evolve and, providing there is strong and effective leadership, will enable priorities to be set that reflect ecological, and human use patterns as well as the processes that underlie them in a given place (Crowder and Norse, 2008).

In smaller, nested areas, individuals from organisations can better work together on the connections within that particular geographical area and feed and receive information from centralised systems where necessary. The results, especially in the focus group, suggested

a way through the complexity is to build consensus on priority issues - collaboration can be improved by developing shared goals or priority outcomes and understanding the steps that need to be taken to arrive at that result. Within smaller, local, nested plans, detail can be generated and seen in higher resolution. Importantly, in light of changing species abundance, sea level rise, extreme weather, storm surges and other increasing stressors (IPCC, 2022; IPBES, 2022) direct action can be adaptable, faster and easier to achieve, because a smaller number of more diverse participants can contribute more frequently and act on a sense and response basis. Additionally, compared to the difficulty of data availability for current larger marine plan areas, the ability to carry out a NCA for a nested plan area is more feasible at the smaller scale, such as the North Devon Marine Natural Capital Plan (2020). It is argued that EBM has been difficult to apply to wider marine planning (Jones et al., 2016; Spijkerboer et al., 2020). Jones et al. (2016) argue the political expedience of European MSP blue growth initiatives overshadow ideological ecosystem-based MSP. They argue this highlights top-down MSP. Therein, the results suggestion of smaller nested plans could make marine [spatial] planning more bottom-up and more ecosystem-based due to the ecosystem size being more manageable and priorities being more local.

It was said in the focus group that it is possible to progress towards nested plans, and there is scope within the legislation. However, there are major resource implications, with the biggest challenge identified being funding. The Scottish marine planning system was offered as an example of the difference between what is desired at high-level and what is funded at local levels. Regarding local plans, there is an incentive from all participants, there is information, but there are major capacity issues. Having high-level objectives can make it seem like there are good intentions. However, they are aspirations rather than actions because delivery is only possible when it is properly resourced. Here, there is a further disconnect with funding being only given for the short term whereas the identified needs are for longer-term funding.

Further aspects of local governance were highlighted in relation to the importance of linking agency with location. It was said current layers of bureaucracy slow down progress because decision-makers are currently centralised, and those decision-makers have an extensive list of proposals in a backlog. For a more adaptive approach, it was suggested that resources should be deployed to local levels to increase decision-makers with place, enabling targets to be achieved in ways suitable to localities. There is also the key issue of those in local areas having enough power and agency to make decisions. As both local and policy stakeholders highlighted, there is a worry that government or centralised agencies are reluctant to delegate power. Thus, both local and policy stakeholders feel they are currently unable to make definitive decisions in local areas. A local stakeholder highlighted concern over political expediency and short-termism, where decisions relating to the environment can suffer because of conflict of interests from funders' agendas. In the wider literature, it is argued that through inherent characteristics of free market economies (Vlek, 2000), appropriation occurs because agendas are crafted to fit models which facilitate business and government activities (Bacchi and Everline, 2003). Thus, the consequential PPPs that emerge reflect short-term politically acceptable agendas (Turnpenny et al., 2014; Scott et al., 2018). Governments aim to win votes based on building the economy quickly and present the development or stabilisation of the economy as the main goal; whereas local decision-making was argued to have long-term, local sustainability as a priority for local people.

In nested areas uniformly positioned around the coast, with application of complex, but connected SES thinking across the local marine, coastal, and terrestrial system, it was said that the role of connectors would be able to facilitate collaboration and join-up of governance and decision-making within that local area, and could potentially use ESc as the language between groups. In the focus group especially, the participants felt strongly that local, nested plans would solve multiple challenges regarding connection and inclusion, and that development of ESc techniques would be easier at smaller scale.

6.5. Pioneering the mainstreaming framework to deliberate ESc environmental mainstreaming potential

Building on both the research results and the wider literature, the mainstreaming framework is now applied to ESc concepts to deliberate their potential to mainstream environmental priorities. Figure 12 shows the pathway undertaken in response to selected hooks (H) and barriers (B) (Scott and Holtby et al., 2022), within the UK which remains the core focus of this discussion. The hooks (H) and barriers (B) are used to depict upward or downward trends as indicated by the shape of the pathway and are justified by literature (Table 6). This list is not meant to be exhaustive as literature covering ESc concepts is extensive; rather it is illustrative of the pathway taken in the establishment, evolution, and development of ESc concepts, layering upon one another to become a combined discipline, with mainstreaming potential deliberated along the journey. Where there is confirmation of ideas or trends from the research, this is discussed in the narrative.

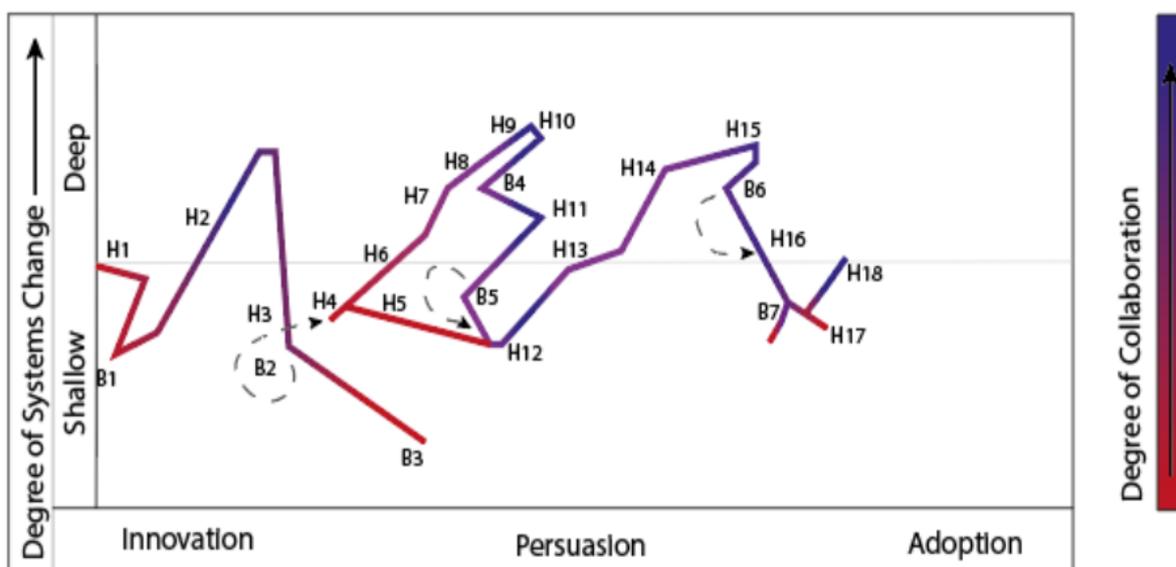


Figure 12. Mainstreaming framework applied to ESc concepts, charting illustrative historical movements (Hs and Bs) described in Table 6.

Table 6. Illustrative hooks (H) and barriers (B) of ESc concept development (Figure 12).

H/B	Description example	Reference justification
Innovation Phase		
H1	NC as a synonym for land alongside other forms of productive capital. Naturkapital used to refer to all natural resources and forces, such as water, light and air, which furnish productive services and artificial capital.	See Missimer, 2018, for history
B1	Industrial growth and technological development led to excessive use of resources. NC not a developed concept, limited supporting evidence towards its value for humans, other than as direct resource for use.	e.g., Mayumi, 1991
H2	In response to continued unsustainable use of natural resources and waste disposal, modern day environmentalist movement started to highlight human dependency. Collaborative projects, though heavily resisted and denied in wider political and industrial circles.	Carson, 1962; Meadows et al., 1972; Brundtland Commission, 1987
H3	Policy documents, frameworks and guidance to protect nature for intrinsic value from environmental/conservation sector.	
B2	However, often trumped by industry and public opposition grew as development and economy in conflict with environment, causing barriers.	
H4	Learning and feedback from barriers to reframe nature as essential services to reach wider audience and raise support for conservation, ES as a concept first described. Reintroduction of NC into modern economics	e.g., Ehrlich & Ehrlich, 1981; Pearce, 1988; Curry, 1993
H5	Development of EBM and ecosystem approaches to planning and management	e.g., Slocombe, 1993 and 1993a
B3 / H6	Difficulty to operationalise international initiatives, protected areas met with opposition and infringement's necessitating enforcement. Environment still declining. Timing of environmental challenges with essential need for environmental prioritisation galvanised ES and NC. Initially with ES dominance	e.g., Waylen, et al., 2014; Costanza et al., 1991
Persuasion Phase		
H7	Neoclassical economics critiqued for excluding value of nature. Monetary figures of ES and NC major impact in science and policy making	e.g., Costanza et al., 199
H8	Human dependency on ES, and role of biodiversity in human well-being highlighted. Development of ESF	MEA, 2003
H9	ES concept transcends academia to reach Governmental policy as well as non-profit, private and financial sectors. ES used increasingly in economic decision-making through PES and Market Based Instruments	e.g., Corbera et al., 2007; Reed, 2008
H10	National Ecosystem Assessments highlighted how ES were critical for human well-being, creation of shared vision and conceptual framework. Development of ESF. Natural Environment White Paper recognises value of NC in policymaking	UKNEA, 2011; HM Government, 2011

B4	Critics argue a move from original emphasis of ecosystem thinking and ES to raise public interest for conservation, towards increased emphasis on how to monetise ES as commodities in potential markets	e.g., Spash, 2008; Redford and Adams, 2009; Dempsey and Robertson, 2012; Norgaard, 2010
H11	Continued academic development of concepts	e.g., de Groot et al. 2012
B5	ES heavily critiqued in the academic and political realms. ESF difficult to apply. Classification systems in depth but confusing	e.g., Waylen et al., 2014; Bull et al., 2016
H12	Feedback from difficulties in applying ESF. EMB and ecosystem approach recommended for MSP, engrained into policy documents	e.g., Marine Policy Statement
H13	Cross-governmental Natural Capital Committee (NCC) established. Numerous methods and tools developed to aid the valuation of nature, and international endorsement to integrate NC and NC accounting more effectively into decision-making into business and the financial sector, raising awareness of constraints to business as usual	NCC, 2013' UKNEAFO, 2014
H14	NCC elevate concept of a NCA to the core of the UK's 25 Year Environment Plan (25YEP). Defra developed four 'Pioneer' projects to test delivery of the 25YEP. The Pioneers some of the first projects to test the use a NCA in a decision-making context, showing examples of good practice where interdisciplinary steering groups alongside stakeholder's integral to process	Defra, 2018
H15	NC now on the agenda for multiple departments and strategies. NC as a common and connecting language/method/tool across the different departments is significant, and recognised in National Planning Policy Framework. Emergence of NG with focus on terrestrial and built environment	e.g., NPPF, 2019
B6	NC met with continued barriers in relation public opinion who object to the concept because of possibility of neoliberal capitalist approach and fears the NC approach will reduce nature to a commodity. These barriers can significantly halt mainstreaming into adoption phases but rightly question motives	e.g., Sullivan, 2017
H16	Feedback from barriers such as B6 motivate researchers to develop non-monetary values. Emergence of NbS as international policy tool to solve societal challenges by enhancing nature. Though still limited wider engagement outside of academic/environmental realms	e.g., Reed 2018; Hooper et al., 2019; IUCN 2023

Adoption Phase

H17	Individual sectoral approaches to NC accounting such as water, energy and forests, however with limited collaboration or cross-sectoral approaches due to policy (mis)alignment. Adoption but without joining-up-governance.	e.g., Bass et al., 2017
B7	Though there is the emergence of policy drivers, there still remains institutional barriers in relation to the practicality of applying EBM to MSP, and limited method of applying NCA for the benefit of the environment AND society, and the necessity for change in status quo and governance arrangements in order to adopt the approach in a fair, inclusive and transparent manner. Combined with regulatory challenges for positive NbS project hindering progress.	NCC, 2020

H18 Small number of NC plans have been developed and adopted by diverse local groups and are feeding into local decision-making. NbS elevated internationally and nationally (though still experiencing B7). mNCEA programme in government. Recognition that for deep systemic change there needs to be collaboration around shared and diverse values, evolution of multiple ESc concepts in EIP (NC, ES, NbS, NG and interconnected ecosystem-based all mentioned), inter/transdisciplinary ways and complex systems approach recognised. e.g., Ingle and Stainthorp, 2020; EIP, 2023

In the innovation phase, the new concept or idea is introduced. Initially, the early framing of the environment as NC⁶⁴ (e.g., Missimer, 2018) was exceeded by the lack of science and prominence of industrial growth and technological development at that time (e.g., Mayumi, 1991). After the early stages of the environmental movement (e.g., Carson, 1962; Meadows et al., 1972), multiple national and international frameworks emerged to protect nature. However, these were often met with opposition from industry and landowners. Learning and feedback pursued the environmental science-led introduction of ecosystem thinking, and ES reframed the way the environment was valued (Ehrlich & Ehrlich, 1981; Curry, 1993). This was better received, though still in early developmental thought phases and with no involvement from wider sectors. NC was re-introduced, this time within environmental economics (e.g., Pearce, 1988), though again with limited reach outside of the environmental economics discipline. Thereafter, the development of EBM and relationship between ES and planning and management (e.g., Slocombe, 1993 and 1993a) involved a significant shift towards the connectedness of ecosystems. The EcA emerged as an international concept in 1995 (CBD, 2004) and was perceived, by conservation-type groups, to be a positive way to manage the environment. However, this was difficult to operationalise in policy and practice

⁶⁴ Early definitions of natural capital focused on land from a socialist perspective (Considerant, 1848., p20-21), hegemony of landed property and its consequences for social justice (Jones, 1849., p.6, 19, 20), and land and mines (Royal Statistical Society, 1904., p. 688). Additionally, early distinctions were made between natural capital as available material, and artificial capital as useful goods that derive from this (Walras, 1860; Johnson, 1909). The closest to present meaning was Schaffle (1861., p.43), an Austrian socialist and political economist who defined 'Naturkapital' as all natural resources and forces such as water, light, air etc., which furnish productive services (see Missimer, 2018).

due to the transformative nature of the changes involved concomitant with the inadequacies of governance frameworks to accept and deliver such change in practice. Therefore, it has remained stuck in the innovation phase trying to persuade wider groups to use and embed the 12 principles.

The persuasion stage involved designing and developing processes so that the concepts could become better accepted within other key policy sectors that were deemed crucial for successful delivery and impact. ES and NC expanded in the academic literature, initially with ES dominance, highlighting the value of global ES's to persuade others to take better care of environmental assets (e.g., Costanza et al., 1991). This instigated the reframing of the global significance of nature to economies. Indeed, neoclassical economics and government were critiqued for excluding the value of nature thus far. Methodological developments allowed ES and NC monetisation across habitats, landscapes, and species. Although the figures themselves were quite theoretical, they had a major impact in academia and environmental economics, and moved into environmental policy spheres (MA, 2003). Such change was challenged by some due to the fear of capitalising on nature, and also because the figures and values themselves were not, and never could be, correct (e.g., O'Neill, 2001; Spash, 2008). Additionally, it was argued that the emphasis on monetary figures would deflect away from the original emphasis on ecosystem thinking, the intrinsic value of nature, and the importance of nature to humanity.

Despite these concerns, the MA generated some traction due to key champions and supporting evidence on the continued degradation of the environment, heading towards crisis point under current management mechanisms. The legacy of the MA led to further international and national ecosystem assessments (e.g., TEEB, 2010; UKNEA, 2011), thus securing sufficient traction amongst key environmental scientists and government agencies.

In this phase, ES processes were largely incremental and shallow; though the idea of ES was becoming regularly used in narratives with its positive framing to highlight the importance of ecosystems. However, there was only limited adoption through market-based mechanisms on an ad-hoc project basis, such as PES schemes. Marine legislation started to move towards using EBM but with no enforcement. The degree of collaboration to develop methods or data was still relatively weak outside of the environment and economics sectors. Each attempt added more academic critique and social learning, generating feedback loops into the mainstreaming process and knowledge itself as opportunities and barriers to delivery emerged. Thus, achieving successful shallow outcomes, based on pragmatic assessment of what was politically acceptable at the time, provided the impetus for deeper efforts.

The chart shows significant fluctuation and bifurcation; there is an interesting tension between the theory of ES and NC pathways, which developed separately before converging. ES in the persuasion phase has been in existence from the early 1990s to the present day with selected examples and champions that have tried to mainstream, ES and EBM in the planning system (UKNEAFO, 2014; Scott et al., 2018). However, it waned significantly in the UK due to governmental resistance to the term itself, and also due to a lack of familiarity and understanding of what 'ecosystem' and 'services' meant across wider groups. In the research results, it was expressed that vagueness in policy wording can be confusing, which leaves stakeholders feeling uncertain as to what is required. Clear definitions and methods of use are important steps to move into adoption, which also should include co-design and delivery so as to have comparable data for monitoring and evaluation.

A separate pathway in NC has been evident since 2013 in the Natural Environment White Paper and the establishment of the cross-governmental Natural Capital Committee (NCC) (NCC, 2013), which, consequently, has captured more government traction. The

establishment of the Natural Capital Committee (NCC), seemingly, reduced the explicit currency of ES in popular usage, but elevated the idea that NC as a stock of nature that is finite, thus developing some urgency to preservation and restoration of NC. This highlights how one mainstreaming pathway may morph or feed into another concept pathway that is deemed more suitable or appealing to a wider audience, enabled through learning and feedback loops. In this case, NC takes over the dominant narrative whilst still including ES. NC and ES are now combined through the development of the NCA, with the monetary value of NC calculations derived from the market value of their services. However, there are renewed barriers with regard to potential for NC to commodify nature due to the shallow mainstreaming pathways being pursued. More recently, NbS and NG have emerged as international policy-shaping and delivery tools further linking ES and NC together. Arguably, NbS and NG may not have gained as much traction without the learning and advancement of the ES/NC pathways. However, despite these conceptual advances, there is evidence of NbS greenwashing, due in part to vested interests wanting to preserve the status quo, where the badge of support for NbS projects, often with monoculture non-native species, enables continued destructive behaviour. There is a need for systems approaches with coupled pressure reduction strategies alongside protection and restoration of biodiversity, and stronger and more transparent governance frameworks working for the longer term to mainstream the environment, rather than the current predilection for short-term profit margins.

The UK is currently at the persuasion/adoption interface. Moving further into the adoption phase is where ESc has gained enough traction and policy acceptance in the persuasion phase to become normalised in policy and decision-making. This is due to successful pilots and wider political support outside environmental interests, and also new legislation and policy instruments including the maturity of market-based mechanisms. There is, however, no final end point as it still can come under future challenge and, indeed, get deprioritised by a new policy paradigm or tipping point (Kuhn, 1962) resulting in reversals. Figure 12 highlights a

range of mainstreaming pathways and associated outcomes across a spectrum of shallow and deep system change. There is possibility for ESc to evolve down either path at present, depending on who is involved and whether the focus is on the short or long term.

The shallower pathway in the adoption phase (H17) revolves around the use of NC accounting in siloes, and the prevalence of market-based incentives/disincentives. Here, the policy has largely been built into existing systems incrementally, but with little overall system change, reflecting the limited capacity and capability of the governance framework to change. Two major challenges present themselves here whereby a NCA could be used to justify capitalist endeavours (e.g., monoculture designs for profit); and/or that wider groups will not know how to apply the concepts holistically because there are limited people with the skills and understanding of how to apply and deliver the concepts, which is a matter of information and capacity. Because there was no transdisciplinary work in the innovation phases, all sectors are not currently represented and adoption is not intuitive, leading to potential alienation and rejection given the extra work and resources needed for understanding and use. One common response here is to use regulation and incentives to help overcome these barriers, but both require effective engagement and consultation processes to work well. However, the results highlight that Defra and /or government are not ready to facilitate the wider mainstreaming process as there is currently not a strong enough legal framework to drive forward the use of ESc concepts across government departments. Ultimately this may lead to continued intensification of uptake and/or further development of knowledge within the existing environmental-economic sector, rather than through wider engagement and acceptance with new sectors or publics necessary for environmental mainstreaming.

The ideal outcome would involve transformational long-term change with alignment across multiple policy domains, set within entire ecosystems, with consequent changes in individuals',

organisations, and sectors values and behaviours towards supporting environmental priorities (H18). There are emerging 'good practice' pilot/pioneering projects, with key champions. Though there is the emergence of ESc in policy documents, there still remains institutional barriers in relation to the practicality of delivery for the benefit of the environment and society with the need for further inclusion of social values, and the necessity for change in governance frameworks in order to adopt the concepts in a fair, inclusive and transparent manner. Additionally, the current regulatory system is not set up for NbS projects, and NG does not yet have a direction of travel for marine planning, Therefore, major barriers still exist to delivery. The results support this as participants believed that despite abundant evidence of the decline of the marine and coastal environment, the economy and industry is still consistently prioritised over environmental and social outcomes. This is a matter of incentive, because the motivations for the government and society are currently financial.

Figure 12 shows that whilst there has been significant progress to date through the persuasion phase, the ability for individual ESc concepts to mainstream the environment is weak. However, collective ESc concepts could better mainstream environmental priorities if supported by the necessary systemic changes. One of the core problems with the ESc mainstreaming journey as depicted in Figure 12 has been its evolution and scientific advancement without sufficient collaboration outside the environment and economics policy sectors, resulting in ongoing difficulties in getting it understood and adopted in other sectors. Thus, the environmental "silo" may well be its own barrier to mainstreaming.

It seems plausible that the language of 'ecosystem services for humans', and then how this can be understood in the language of 'capital', received more buy-in in persuasion phases than the intrinsic value of nature. However, the language of capital has historically been shown to be negative for environmental priorities. Therefore, NC is unlikely to mainstream

environmental priorities alone. Here is where using ESc concepts as an integrated and linked up package could have real potential. Wider policy attention must ensure NC is used to enhance nature and ES through properly funded NbS projects – potentially through NG payments – which are governed and managed at ecosystem, EBM, whole-site levels.

Turning attention back to Figure 1, section 2.4., the ESc mainstreaming journey is largely proceeding along path 2 lines, but it is essential to consider urgently how to move on to a path 1 trajectory. As there was limited collaboration in the early innovation phases, ESc has grown from and grown into the environmental and economic sectors, so now there needs to be explicit social science engagement associated with shared values and behaviour change to bring in, retrospectively, all other sectors that operate in and effect the marine, coastal, and adjoining terrestrial space in order to shift to deeper systemic mainstreaming pathways. There need to be much stronger collaborative approaches championing interdisciplinary and transdisciplinary research endeavours and changing knowledge flows (Scott and Holtby et al., 2022) to understand how ESc could work for wider sectors. Therefore, feedback and learning from the barriers of being stuck in persuasion phases and shallow mainstreaming in adoption could, in a sense, move back to a new innovation phase to build a stronger foundation for the discipline of combined ESc with improved persuasion and adoption mechanisms for relevant sectors, stakeholders and citizens. This research highlighted data integration, values, and skills provision as key barriers to wider ESc mainstreaming. Therefore, social science endeavours could establish wider shared value systems with collaboration on learning packages that resonate. The use of connecting roles, as discussed in relation to the literature in section 6.3, could be crucial here.

7. Chapter Seven: Conclusion and Recommendations

7.1. Answering the research questions

1. What is mainstreaming, and why should environmental priorities be mainstreamed into marine and coastal governance and decision-making?

Emanating from this research, Scott and Holtby et al. (2022: p.213) compiled an important process-led definition to aid mainstreaming endeavours as an:

'Interdisciplinary and transdisciplinary process of transmorphing and normalising a concept, objective, policy or plan within the decision-making and routine activities of multiple policy domains necessary for effective delivery and impact; and in so doing building sufficient capacity and resilience to improve operational processes and outcomes enabling beneficial societal impacts for the long term'.

This definition has three components which provide important outcomes and additionality from this research. The first reflects the imperative for interdisciplinary and transdisciplinary working from the outset involving the active contribution of stakeholders who are needed to both design and deliver the desired change and associated integration. It was noteworthy that ESc originally did not do this, being the preserve of environment and economics disciplines, and has struggled with this deficit ever since, particularly with involving the built environment, planning, and industry professions. The second reflects the need to translate and adapt ESc core concepts so that they can be easily understood and delivered in the context of other sectors' priorities. This exposes the paucity of champions outside the environmental sector who actively translate ESc into the hooks and priorities of other sectors to improve mainstreaming pathways. Here, the concept of Environmental Connectors has been

advanced from this research as a crucial governance intervention to address this and to perhaps aid the development of a new innovation phase in ESc (as highlighted in the mainstreaming framework, Figure 12), leading to improved mainstreaming outcomes. The third part highlights the process component based on building resilience and societal benefit for the long term to prevent superficial changes. Such mainstreaming endeavours require effective leadership and governance to manage them, supported by value and behaviour changes away from neoliberal-capitalist fundamentalism. Furthermore, the results show that the current actions of environmental departments and organisations alone are ineffective against continued external pressure and, indeed, create the very siloes that urgently need breaking down. Currently, knowledge is developed and exchanged separately in sectors, leading to disintegrated decision-making. The marine environment is a complex ecosystem involving both marine, coastal and terrestrial components, and therefore, needs more joined-up decision-making. Thus, the process of mainstreaming environmental priorities into wider marine and coastal governance and decision-making is essential to work as a collaborative governance system.

2. What is ESc, and can ESc concepts mainstream environmental priorities into governance and decision-making?

This research has highlighted the developmental journeys and variable pathways of individual ESc concepts, and exposed shortfalls in their understanding and their interlinkages, building on Scott et al. (2018 and 2020) in the development of ESc as a discipline. Here, the natural capital approach (NCA) features prominently as a key mechanism in ESc, capturing the stocks of NC and flows of ES. The role of NbS and NG were also found to be important here as strategically and spatially planned, proactive actions that increase and improve NC and flows of ES benefits through environmental restoration, adaptation measures, and habitat creation.

This research has exposed problems in the language and values of ESc, particularly that NC may confuse and worry some participants due to the historical and continued damage of neoliberal-capitalist regimes. However, several participants highlighted certain ESc principles are perceived to emphasise the shared and connected nature of the environment, namely 'ecosystem thinking' and a 'whole-site approach', which largely define EBM. Other principles, such as NC, ES, NbS and NG, have also transformed the way the environment is viewed; from a constraint to an opportunity because they reframe the environment to highlight the multiple benefits received and provided for by natural resources, thus encouraging conservation, restoration, and investment in nature. Therefore, bringing these core concepts of NC, ES, NG and NbS, and applying them through EBM, has real potential to mainstream the environment into marine and coastal governance, with inclusive social science processes to further develop social and environmental justice values, supported by policy and regulatory guidance.

This research confirms that combining ESc concepts collectively and proactively, can help with policy formation and decision-making to highlight the value of nature and to integrate nature further into decision-making and governance structures. This is achieved by assisting strategic planning, and by facilitating a shared language that emphasises the shared and connected nature and multiple benefits of the environment itself. Participants throughout this research agreed that ESc can help to build an understanding of common dependencies, and can facilitate dialogue around important beneficiaries and benefactors, which makes way for discussion of common constraints or necessary trade-offs. Rather than simply 'monetising nature', ESc must be translated and framed as a positive and collaborative tool, to bring people together and bridge differences; for diverse parties to discuss restoration and enhancement of natural elements collectively. If ESc is used as a connecting tool, it may have the potential to facilitate a more connected systems approach to governing these cross-cutting challenges now and into the future.

The research and the mainstreaming framework highlighted that currently disconnected sectoral governance and decision-making significantly hinders ESc's ability to mainstream environmental priorities. Connecting roles were identified by participants as potential fibres that bring and hold the system together to allow each specialism to maintain its essential function. If we are going to restore and enhance the natural environment, indeed, the planet on which we all live, we need to work together more effectively and, in that regard, we do not currently have the resilient governance or organisational structures in place. Rather than agencies competing for individual funding projects at national, regional, or local levels over the short term with negative impacts on each other, Environmental Connectors could have the power and influence to cross-pollinate knowledge and ideas to allow and encourage citizens, stakeholders, organisations and government agencies to work together more efficiently within local nested, ESc areas. The connectors could also facilitate action from the national system, and feed learning back from the faster moving, nested local areas into the slower moving, centralised national system. However, this can only really work if the connectors are appointed in senior leadership roles in existing organisations.

Consequently, the distinctive characteristics of ESc can, moreover, be realised with these connector roles helping to secure acceptance across multiple audiences and across multiple scales so that it becomes normalised within routine operations. Thus, mainstreaming ESc in this way, would help to mainstream the environment, as well as increase social justice outcomes.

7.2. Recommendations for policy and practice

The following recommendations arise from the preceding discussion and conclusions:

1. It will be important to frame ESc as a collective body of interlinking concepts and as a collective science moving away from its current fix on environment and economics. Here, NC, ES, NbS, NG and EBM need further attention focussed on their interrelationships and definitional clarity in policy, delivery and evaluation. ESc should be seen and presented as a connecting discipline/tool that requires and encourages participation from different perspectives/professions and disciplines with inclusion of diverse values across different levels of societal governance in promotion of local environmental, social and economic sustainability.
2. Policy should be built on stronger inter and transdisciplinary agendas and associated funding programmes to help innovate and rejuvenate the ESc discipline. Here, there is a need for improved translation of ESc, identifying bridging concepts and shared priorities that can unite the currently disparate audiences. This also involves further research on whole-societal and shared values incorporating more social science and humanities' perspectives. The development of improved delivery focused guidance packages for relevant bodies is important in building collaborative adoption.
3. Marine planning and licensing processes should be more focussed on promoting and delivering positive restoration projects, using ESc. Therefore, the promotion of NbS in newer policy documents (i.e., the EIP23) is then able to be delivered in practice. Develop roles as dedicated restoration officers within the MMO that utilise a different approach to the mitigation hierarchy for licence granting, as an enabler for local groups to make positive impact. ESc as a discipline could aid this approach through identification of areas of NC that need improved ES; and NG payments to support NbS projects to increase NC / ES through whole-site EBM.
4. Develop an improved, integrated, open access data repository to enable ESc decision-making, with up-to-date and (working towards) standardised data enabling join-up of data sources with vertical and horizontal collaboration. This should be a collective endeavour between policy and research communities funded by UKRI over the long term. Such a data repository ought to be used by both government agencies (e.g., the

restoration officers), Environmental Connectors (see below), and wider stakeholders. It also ought to draw together extant data with a view to fill the gaps and continually develop. This requires a longer-term funding package, to develop the design and repository infrastructure. There is also a need for multiple types of data entry (e.g., data can be inputted by and categorised as academic, fisher person, citizen science, etc.), and open data viewing to improve the transparency of decision-making.

5. Develop geographically defined, nested plan areas that span marine-coastal-terrestrial environments, that are small enough to allow for direct democratic participation (for example two or three nested areas within a marine plan area), where citizen assemblies can connect and work collaboratively with organisations and government agencies that have specialised knowledge of the particular nested area (facilitated by Environmental Connectors, see below). ESc concepts could be used as a boundary language (as defined correctly, inclusively, and officially, as above), which everyone can be familiar with and use to aid decision-making and increase environmental and social outcomes. The data repository, as described above, could evidence local decision-making, with monitoring and evaluation outcomes captured in the repository for feedback and learning across the governance system.
6. Develop, test and evaluate designated job roles as Environmental Connectors within pilot nested areas, as described above, to:
 - Manage the relationships *within* the nested plan areas, whilst also managing the relationships *between* the nested areas – to create a system that is able to promptly act and react locally, whilst being guided by and feeding back into a larger national system for bilateral communication and information sharing.
 - Connect government agencies, which have necessarily specialist functions, to improve joined-up working, cross-pollinate knowledge and ideas, and seek to establish methods to apply for interdisciplinary working and funding, in order to act on emerging inter and transdisciplinary research outcomes (e.g., from UKRI and university settings), thus increasing the flow of knowledge between academia, policy and practice.

Given that local stakeholders from the Marine Pioneer locations spoke about and developed the idea of connecting roles, pilot ESc projects could re-visit these areas with designated Environmental Connector roles, to build on the NCAs developed and the structures in place from the legacy of the Marine Pioneer, to establish the potential impact and/or complexities of the EC role. Alternatively, pilot nested plans could be trialled in a new area, at harbour levels.

7.3. Recommendations for future research

1. Research is needed to bolster the status of ESc as an inter and transdisciplinary science moving away from its current environmental and economic primacy. Here, there is a role for joint research council endeavours. The ideas of ecosystem complexity, trade-offs, shared priorities, and new governance frameworks that incorporate marine, coastal and adjoining terrestrial aspects all need attention to maximise mainstreaming potential.
2. There is a need for better more long-term funding packages to improve the integration of data for the marine and coastal zones. Building on policy recommendation 4 there needs to be an open access database to better inform understanding, policy interventions, and decision-making at delivery levels. Crucially the data must span marine, coastal and adjoining terrestrial areas in order to deal with the complex interrelationships in the system. Therefore, multidisciplinary research to build the platform and data layers is essential. Equally, establishing permissions for data viewing and data entry requires collaborative research to understand what works best for different groups.
3. The mainstreaming framework developed for this research with its different pathways, together with the revised mainstreaming definition, offers significant potential for advancing the understanding of mainstreaming as a process and outcome. More research could usefully assess the viability of using the pathways model to improve both the theory and practice of mainstreaming and policy integration.
4. Research is needed to develop the open and transparent governance and decision-making arrangement for NG contributions to fund NbS delivery in the marine and coastal environment. These emerging payments are poorly understood and are likely to suffer abuse if not defined and governed correctly. Hence, research can help identify the key characteristics for robust systems of design, monitoring and enforcement.
5. Social science and humanities outreach ought to include broader voices in the development of improved values for the next iteration of ESc as a discipline. Here, truly

interdisciplinary research is needed to include qualitative alongside quantitative values for different sectors, organisations and individuals.

6. Research is needed into the viability and deliverability of connector roles. The pilot project as described could be a test bed for all of these joined academic and policy research endeavours.

8. Appendix

Appendix 1: Round one interview presentation

Understanding Better Routes to Delivery

Making decisions about local natural capital resources

Rachel Holtby
PhD Researcher
Northumbria University



Aim

- Understand better routes to delivery
- To enable the right decisions to be made by the right people about natural capital, going forward into the future
- Create lasting legacy for the Marine Pioneer Projects



Stage 1: Interviews

1. Highlight values and beliefs in relation to local natural capital resources
2. Show experiences and effects of current decision-making processes
3. Establish what governance and decision-making process is wanted and needed to make fair decisions about local natural capital



Stage 1: Interviews

- 1 hour and answers will be confidential
- Convenient place and time



Research Outcomes



Enable the right people, to make the right decisions about your local natural capital



Informed Consent Form

North Devon/Suffolk Marine Pioneer

Stakeholder Interviews

In relation to the above described research conducted by Rachel Holtby, I, the undersigned confirm (please tick):

- I have read the information sheet provided
- I have been given the opportunity to ask any questions about the study
- I understand that taking part in this study will include being interviewed and audio recorded
- I understand that my name and employer will be detached from the interview data, and replaced with a sector type
- I understand that my words may be quoted in publications, reports, and other research outputs but that my name will not be used
- I understand that all data collected during the study may be looked at for monitoring and auditing purposes only by authorised individuals from the University of Northumbria, and only where it is relevant. I give permission for these individuals to have access to this data
- I understand that all project data will be held for at least 6 years and all research data for at least 10 years in accordance with University policy and that my personal data is

held and processed in the strictest confidence, and in accordance with the (UK) Data Protection Act (1998)

- I understand that I can withdraw from the study at any time and I will not be asked any questions about why I no longer want to take part

Name (BLOCK
CAPITALS).....
.....

Signature.....
.....

Date.....



Appendix 3: Round one interview framework

1. Do you think current marine and coastal legislation, regulations and/or policy⁶⁵ allow for effective decisions about the marine and coastal environment?
2. Do you feel restricted or unrestricted in the decisions you make, or would like to make, about the marine and coastal environment?
 - a. *Further* - Can you give an example of how the current system has affected a decision that you or your organisation wanted to make, be that in a positive or negative way?
 - i. How did this make you feel?
3. Is there any marine or coastal natural capital⁶⁶ here in Suffolk/North Devon that your organisation or sector particularly values? (Based on the ecosystem services it delivers)
 - a. *Further* - Have you seen any changes to this since you started working in this sector?
 - i. How? Why do you think that was?
 - ii. Do you think this is based on any particular decisions, sectors, or policy?
4. Is there anything that could work better for your sector, to improve decision-making relating to the marine and coastal environment?
 - a. *Prompt* - Different legislation, regulations, policy; Or, a different level of agency and accountability?

⁶⁵ Noting these interviews were before the Fisheries Act (2020) and Environment Act (2021)

⁶⁶ Participants had interaction with the Marine Pioneer and an understanding of the 25 Year Environment Plan (2018), so were aware of natural capital terminology but were also asked if they required any clarification.

5. Do you think the natural capital approach can help with decision-making in the marine and coastal environment?
 - a. *Further* - How/why?

6. Do you think the current governance and decision-making structure(s) in the marine and coastal environment are adequate to use a natural capital approach?
 - a. *Prompt* – e.g., to make decisions about nature-based solutions/restoration ideas, net gain/enhancement or investment opportunities, flood risk options, or development proposals.

7. What would be the best governance structure⁶⁷ when it comes to making decisions about marine and coastal natural capital?

8. Do you think ‘this’ (governance structure) and/or a NCA would enable decision-making in non-environmental sectors to be more inclusive of the environment going forward?

9. If you were to start from scratch (where there is no legislation or regulations, no history and no governance in place that makes decisions about the marine environment) what do you think would be an ideal way of distributing authority and accountability to ensure fair and effective decision-making about marine and coastal natural capital, in an unpredictable future?
 - a. What would be needed to make this reality?

⁶⁷ Governance was further discussed with participants where needed, stating that governance is “*the structures and processes by which people in societies make decisions and share power*” (Falke et al., 2005: p.444).

Information Sheet

Thank you very much for taking part in this study. This document briefly outlines the purpose of the research, the interview structure, your involvement in the study and the data output.

Purpose of the Research

The purpose of this research is to facilitate knowledge exchange and establish themes and possibilities for improving policy and decision-making in the marine and coastal area around England. Also, to explore possible mechanisms to improve joined up working, using a more systematic approach to deal with the complexity of the marine and coastal social-ecological system.

The interview will initially focus on current marine and coastal decision-making processes (current challenges and opportunities) and thereafter, enquire about views and options for ecosystem science (ecosystem-based, ecosystem approach, natural capital, ecosystem service, net gain, nature-based) solutions.

Participation

Participation is voluntary; you can discontinue participation in the study at any time without explanation and request that data already collected from you be withdrawn.

The researcher has made effort to make sure that the interview questions are understandable. However, please feel free to ask for further explanation of any terminology.

On your verbal consent (at the beginning of the interview), the interview will be audio recorded to allow the researcher to give you their full attention during the interview. Once the interview has been transcribed the recording will be deleted. Your personal details and the organisation that you are associated with will be confidential. The interview data will be represented by the sector within which you work. The interview will be further coded and thematically analysed alongside other interview outputs.

Data

The data from the interviews will be used for the researcher (Rachel Holtby, Northumbria University – Environment and Engineering Dept.) PhD thesis, and will contribute to Marine Pioneer legacy work. The research findings may also be disseminated through publications and conferences.

If you have any concerns about any aspect of the research or way you have been treated during this study, in the first instance, you could contact Rachel Holtby at Rachel.holtby@northumbria.ac.uk or the project supervisor Alister Scott BA PhD MRTPI Alister.scott@northumbria.ac.uk



Appendix 5: Round two interview framework

I would like to set the scene with a brief thought experiment. Feel free to close your eyes. Imagine, if you will, 25 years into the future. What kind of a country do we live in? What is the sea surrounding England like?

If they answer with an optimistic answer:

1. What were the key drivers for this outcome? Were there any changes from the current status quo that enabled this future vision?

Or,

1. What is needed between now and then to stop that happening, to change that trajectory?
2. The 25 Year environment plan sets a vision to leave the environment in a better state that we found it and pass it on in a way that is enhanced. What decisions are being made now in the marine and coastal area that are in the interest of the next generation?
3. What observations would you make about the current governance and decision-making structure of the marine and coastal environment?
 - a. In nature, everything is connected – what are your observations on the cohesion of different policy areas that operate within the marine and coastal environment?
 - i. What is the impact of this?
4. Are there any particular areas that you have experience in, or can see from an outside perspective, that are in need of greater integrated (more joined-up planning and delivery on cross-cutting issues) decision-making?

- a. What barriers or opportunities to integration (e.g. particular policy areas, technology, political will) do you see or experience?
 - b. What would the outcome be of more integration for your department?
- 5. Are there any particular areas that you have experience in, or can see from an outside perspective, that are in need of greater inclusive (including different perspectives from different types of organisations or people) decision-making?
 - a. What barriers or opportunities to including a wider group of people do you see or experience?
 - b. What would the outcome be of more inclusion?
- 6. Interdisciplinary research (research that draws from two or more disciplines in order to gain a more well-developed perspective) is occurring evermore within the academic and research space (e.g. research councils). Should, or how can government agencies also work in interdisciplinary ways in order to act on emerging research or test practical implementation?
 - a. What opportunities or challenges are there for greater collaboration and integration across policy areas that affect the marine and coastal environment?
 - i. How can these challenges be overcome / opportunities be amplified – what are the practical steps that can be acted on in the next month, or in the next year?
- 7. To what extent can employees within your organisation work towards change? Does it have to be a Government steer, or can employees actively work towards a more integrated and inclusive approach in their daily working practices?
 - i. Do people have information, capacity, incentive?
- 8. Questions relating to ecosystem science principles (explain): how do you understand or experience these approaches?
 - a. What are the opportunities or challenges for embedding ecosystem science principles in policy and daily working practices?

- i. Do you think it would enable more or less inclusion of different perspectives?
 - ii. More or less connection across policy areas?
 - iii. More or less collaboration amongst teams and organisations?
 - b. What actions are happening, or can, or should be taken now to further this in your team, across your organisation?
 - i. OR (if negative response to Esc principles) are there alternative approaches that would enable more inclusion, connection, collaboration?
- 9. Do you feel you have enough information, capacity?

Conceptual framework

Information (do participants have the information they need to act on emerging science/ideas)

Capacity (do participants have the capacity – time, mechanisms - to act)

Incentive (do participants have the incentive – desire, reason, meaning – to act)

Informed Consent Form

Research Participation – Focus Group

In relation to the Focus Group research conducted by Rachel Holtby, I understand that taking part in this study will include being recorded for transcription purposes only. I understand that my name and employer will be detached from the data and replaced with a sector description. I understand that my words may be quoted in research outputs but only the sector descriptor will be used.

I understand that all data collected during the study may be looked at for monitoring and auditing purposes only by authorised individuals from the University of Northumbria, and only where it is relevant. I understand that all project data will be held for at least 6 years and all research data for at least 10 years in accordance with university policy and that my personal data is held and processed in the strictest confidence, and in accordance with the (UK) Data Protection Act (1998).

I understand that I can withdraw from the study at any time, and I will not be asked any questions about why I no longer want to take part.

By typing my name below and emailing this form back to the researcher, I consent to taking part in the research.

Name

.....

.....

Date.....



Appendix 7: Pre focus group questionnaire

Focus Group Survey Questions

The following questions are intended to help structure and inform the design and delivery of the focus group. The questions and your answers will highlight your priority areas of interest so that the focus group can be guided towards these interest areas across all participants, meaning each participant is able to contribute from the beginning. Please add your answers below the questions. There are no right or wrong answers and can be as long or short as you like. They are completely confidential, and your name will not be attached to the data. If you do not want or do not feel able to answer any of the questions you can leave them blank. Please send back to the researcher by 27th August.

- 1) To codesign the hypothetical coastal town where the focus group will take place, please state (approximately) three key issues that you feel have the most impact on coastal towns now and into the future.
- 2) What observations would you make about the current marine and coastal governance and decision-making structures affecting your work?
- 3) In your own work, have you ever tried to break down the organisational siloes to work collaboratively with other professions? If yes, what are the lessons from your experience?
- 4) What would help your organisation and/or sector to make better policy and/or decisions about the marine and coastal area going into the future? Do you have experience working with natural capital and/or ecosystem services and/or net gain concepts and/or nature-based solutions? If yes, what are the lessons from your experience?



9. References

- Abson, D. J., Fischer, J., Leventon, J., Newig, J., Schomerus, T., Vilsmaier, U., ... & Lang, D. J. (2017). Leverage points for sustainability transformation. *Ambio*, 46(1), 30-39.
- Acosta, A. (2013). Extractivism and neoextractivism: two sides of the same curse. *Beyond development: alternative visions from Latin America*, 1, 61-86.
- Adams, W. M., Aveling, R., Brockington, D., Dickson, B., Elliott, J., Hutton, J., ... & Wolmer, W. (2004). Biodiversity conservation and the eradication of poverty. *science*, 306(5699), 1146-1149.
- Adelman, S. (2018). The sustainable development goals, anthropocentrism and neoliberalism. In *Sustainable development goals* (pp. 15-40). Edward Elgar Publishing.
- Ader, C. R. (1995). A longitudinal study of agenda setting for the issue of environmental pollution. *Journalism & Mass Communication Quarterly*, 72(2), 300-311.
- Adger, W. N., Hughes, T. P., Folke, C., Carpenter, S. R., & Rockström, J. (2005). Social-ecological resilience to coastal disasters. *Science*, 309(5737), 1036-1039.
- Agar, M. (1996). Schon Wieder? Science in linguistic anthropology. *Anthropology Newsletter*, 37 (1), 13
- Agardy, T., Bridgewater, P., Crosby, M. P., Day, J., Dayton, P. K., Kenchington, R., ... & Peau, L. (2003). Dangerous targets? Unresolved issues and ideological clashes around marine protected areas. *Aquatic conservation: marine and freshwater ecosystems*, 13(4), 353-367.
- Agardy, T. (2010). *Ocean zoning: making marine management more effective*. Earthscan.
- Agardy, T., Di Sciara, G. N., & Christie, P. (2011). Mind the gap: addressing the shortcomings of marine protected areas through large scale marine spatial planning. *Marine Policy*, 35(2), 226-232.
- Agnew, J., & Crobridge, S. (2002). *Mastering space: hegemony, territory and international political economy*. Routledge.
- Allison, G.W., Lubchenco, J., Carr, M.H., (1998). Marine reserves are necessary but not sufficient for marine conservation. *Ecological Applications* 8, S79–S92
- Amabile, T. M. (1993). Motivational synergy: Toward new conceptualizations of intrinsic and extrinsic motivation in the workplace. *Human resource management review*, 3(3), 185-201.
- Amin, S. (2014). *Capitalism in the age of globalization: The management of contemporary society*. Bloomsbury Publishing.
- An, L. (2012). Modeling human decisions in coupled human and natural systems: Review of agent-based models. *Ecological modelling*, 229, 25-36.
- Anderson, G. R. V., Ehrlich, A. H., Ehrlich, P. R., Roughgarden, J. D., Russell, B. C., & Talbot, F. H. (1981). The community structure of coral reef fishes. *The American Naturalist*, 117(4), 476-495.
- Andersson, T. (1991). Government failure—the cause of global environmental mismanagement. *Ecological economics*, 4(3), 215-236.

- Angst, M., Widmer, A., Fischer, M., & Ingold, K. (2018). Connectors and coordinators in natural resource governance. *Ecology and Society*, 23(2).
- Amundsen, H., Berglund, F., & Westskog, H. (2010). Overcoming barriers to climate change adaptation—a question of multilevel governance?. *Environment and Planning C: Government and Policy*, 28(2), 276-289.
- Acheson, J. M. (2003). *Capturing the commons: devising institutions to manage the Maine lobster industry*. Upne.
- Acheson, J. M. (2006). Institutional failure in resource management. *Annu. Rev. Anthropol.*, 35, 117-134.
- Altheide, D., Johnson, J., Denzin, N., & Lincoln, Y. (1998). Collecting and interpreting qualitative materials.
- Arkema, K. K., Abramson, S. C., & Dewsbury, B. M. (2006). Marine ecosystem-based management: from characterization to implementation. *Frontiers in Ecology and the Environment*, 4(10), 525-532.
- Armitage, D. (2005). Adaptive capacity and community-based natural resource management. *Environmental management*, 35, 703-715.
- Armitage, D. R., Plummer, R., Berkes, F., Arthur, R. I., Charles, A. T., Davidson-Hunt, I. J., ... & Wollenberg, E. K. (2009). Adaptive co-management for social-ecological complexity. *Frontiers in Ecology and the Environment*, 7(2), 95-102.
- Armitage, D., Béné, C., Charles, A. T., Johnson, D., & Allison, E. H. (2012). The interplay of well-being and resilience in applying a social-ecological perspective. *Ecology and Society*, 17(4).
- Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of planners*, 35(4), 216-224.
- Arnstein, S. R. (2019). A ladder of citizen participation. *Journal of the American planning association*, 85(1), 24-34.
- Asara, V., Profumi, E., & Kallis, G. (2013). Degrowth, democracy and autonomy. *Environmental Values*, 22(2), 217-239.
- Atkins, J. P., Gregory, A. J., Burdon, D., & Elliott, M. (2011). Managing the marine environment: is the DPSIR framework holistic enough?. *Systems Research and Behavioral Science*, 28(5), 497-508.
- Atkinson, J. M., & Heritage, J. (Eds.). (1984). *Structures of social action*. Cambridge University Press.
- Bacchi, C., & Eveline, J. (2010). *Mainstreaming politics: Gendering practices and feminist theory* (p. 368). University of Adelaide Press.
- Baland, J. M., & Platteau, J. P. (1998). Division of the commons: a partial assessment of the new institutional economics of land rights. *American journal of agricultural economics*, 80(3), 644-650.
- Balmford, A., Rodrigues, A., Walpole, M., Ten Brink, P., Kettunen, M., Braat, L., & De Groot, R. (2008). Review on the economics of biodiversity loss: scoping the science. European Commission, Cambridge, UK.
- Barange, M., O'Boyle, R., Cochrane, K. L., Fogarty, M. J., Jarre, A., Kell, L. T., ... & Yatsu, A. (2010). Marine resources management in the face of change: from ecosystem science to

ecosystem-based management. *Global Change and Marine Ecosystems*. Oxford University Press, Oxford, 253-283.

Barbier, E. B., & Burgess, J. C. (2017). The Sustainable Development Goals and the systems approach to sustainability. *Economics*, 11(1).

Barot, S., Yé, L., Abbadie, L., Blouin, M., & Frascaria-Lacoste, N. (2017). Ecosystem services must tackle anthropized ecosystems and ecological engineering. *Ecological Engineering*, 99, 486-495.

Bar-Yam, Y. (1997). *About complex systems*. Reading, Addison-Wesley.

Bateman, I. J., Harwood, A. R., Mace, G. M., Watson, R. T., Abson, D. J., Andrews, B., ... & Termansen, M. (2013). Bringing ecosystem services into economic decision-making: land use in the United Kingdom. *science*, 341(6141), 45-50.

Bateman, I. J., & Wheeler, B. W. (2018). *Bringing Health and the Environment into Decision-Making: The Natural Capital Approach*.

Bateman, I. J., & Mace, G. M. (2020). The natural capital framework for sustainably efficient and equitable decision making. *Nature Sustainability*, 3(10), 776-783.

Bavington, D. (2010). From hunting fish to managing populations: fisheries science and the destruction of Newfoundland cod fisheries. *Science as Culture*, 19(4), 509-528.

BBC British Broadcasting Company (2017). *Blue planet 2*

Beaumont, N. J., Austen, M. C., Atkins, J. P., Burdon, D., Degraer, S., Dentinho, T. P., ... & Zarzycki, T. (2007). Identification, definition and quantification of goods and services provided by marine biodiversity: implications for the ecosystem approach. *Marine pollution bulletin*, 54(3), 253-265.

Beaumont, L. J., Hughes, L., & Pitman, A. J. (2008). Why is the choice of future climate scenarios for species distribution modelling important?. *Ecology letters*, 11(11), 1135-1146.

Beaumont, N. J., Aanesen, M., Austen, M. C., Börger, T., Clark, J. R., Cole, M., ... & Wyles, K. J. (2019). Global ecological, social and economic impacts of marine plastic. *Marine pollution bulletin*, 142, 189-195.

Beierle, T. C., & Konisky, D. M. (2001). What are we gaining from stakeholder involvement? Observations from environmental planning in the Great Lakes. *Environment and planning C: Government and Policy*, 19(4), 515-527.

Benjaminsen, T. A., & Bryceson, I. (2012). Conservation, green/blue grabbing and accumulation by dispossession in Tanzania. *Journal of Peasant Studies*, 39(2), 335-355.

Bell, S., & Hindmoor, A. (2009). *Rethinking governance: The centrality of the state in modern society*. Cambridge University Press.

Bennett, N. J., & Dearden, P. (2014). From measuring outcomes to providing inputs: Governance, management, and local development for more effective marine protected areas. *Marine Policy*, 50, 96-110.

Bennett, N. J. (2018). Navigating a just and inclusive path towards sustainable oceans. *Marine Policy*, 97, 139-146.

Bennett, N. J., Kaplan-Hallam, M., Augustine, G., Ban, N., Belhabib, D., Brueckner-Irwin, I., ... & Bailey, M. (2018). Coastal and Indigenous community access to marine resources and the ocean: A policy imperative for Canada. *Marine Policy*, 87, 186-193.

- Bennett, N. J. (2019). Marine social science for the peopled seas. *Coastal Management*, 47(2), 244-252.
- Bennett, N. J., Blythe, J., White, C. S., & Campero, C. (2021). Blue growth and blue justice: Ten risks and solutions for the ocean economy. *Marine Policy*, 125, 104387.
- Benson, E., Forbes, A., Korkeakoski, M., Latif, R., & Lham, D. (2014). Environment and climate mainstreaming: challenges and successes. *Development in Practice*, 24(4), 605-614
- Berg, B. L., & Lune, H. (2007). *Qualitative research methods for the social sciences* 6th edition. Pearson;
- Berg, M., & Lidskog, R. (2018). Deliberative democracy meets democratised science: a deliberative systems approach to global environmental governance. *Environmental Politics*, 27(1), 1-20.
- Berkes, F. (2006). From community-based resource management to complex systems: the scale issue and marine commons. *Ecology and Society*, 11(1).
- Berkes, F., Colding, J., & Folke, C. (Eds.). (2008). *Navigating social-ecological systems: building resilience for complexity and change*. Cambridge university press.
- Berkes, F. (2015). *Coasts for people: interdisciplinary approaches to coastal and marine resource management*. Routledge.
- Berkes, F. (2017). Environmental governance for the anthropocene? Social-ecological systems, resilience, and collaborative learning. *Sustainability*, 9(7), 1232.
- Berkes, F., & Folke, C. (1998). Linking social and ecological systems for resilience and sustainability. *Linking social and ecological systems: management practices and social mechanisms for building resilience*, 1(4), 4.
- Berkes, F., & Folke, C. (1992). *A systems perspective on the interrelations between natural, human-made and cultural capital*. Beijer International Institute of Ecological Economics, the Royal Swedish Academy of Sciences.
- Bernauer, W. (2022). Commercial fishing, Inuit rights, and internal colonialism in Nunavut. *Polar Record*, 58.
- Berthe, A., & Elie, L. (2015). Mechanisms explaining the impact of economic inequality on environmental deterioration. *Ecological economics*, 116, 191-200.
- Biermann, F., Betsill, M. M., Gupta, J., Kanie, N., Lebel, L., Liverman, D., ... & Zondervan, R. (2010). Earth system governance: a research framework. *International environmental agreements: politics, law and economics*, 10, 277-298.
- Biesbroek, G. R., Termeer, C. J. A. M., Kabat, P., & Klostermann, J. E. M. (2009). Institutional governance barriers for the development and implementation of climate adaptation strategies.
- Blackstock, K. L., Kelly, G. J., & Horsey, B. L. (2007). Developing and applying a framework to evaluate participatory research for sustainability. *Ecological economics*, 60(4), 726-742.
- Bodin, Ö., Crona, B., & Ernstson, H. (2006). Social networks in natural resource management: what is there to learn from a structural perspective?. *Ecology and society*, 11(2).
- Boonstra, W. J., & Joosse, S. (2013). The social dynamics of degrowth. *Environmental Values*, 22(2), 171-189.
- Borgwardt, F., Robinson, L., Trauner, D., Teixeira, H., Nogueira, A. J., Lillebø, A. I., ... & Culhane, F. (2019). Exploring variability in environmental impact risk from human activities across aquatic ecosystems. *Science of the total environment*, 652, 1396-1408.

- Botero, C. A., Weissing, F. J., Wright, J., & Rubenstein, D. R. (2015). Evolutionary tipping points in the capacity to adapt to environmental change. *Proceedings of the National Academy of Sciences*, 112(1), 184-189.
- Bouwma, I., Schleyer, C., Primmer, E., Winkler, K. J., Berry, P., Young, J., ... & Vadineanu, A. (2018). Adoption of the ecosystem services concept in EU policies. *Ecosystem Services*, 29, 213-222.
- Bowe, C., Scott, A., Smith, A., Chamberlain, B., & Clavey, L. (2021). Embedding nature-based solutions in strategic spatial planning. *Nature-based solutions for climate change in the uk*, 135.
- Boyes, S. J., & Elliott, M. (2014). Marine legislation—The ultimate ‘horrendogram’: International law, European directives & national implementation. *Marine pollution bulletin*, 86(1-2), 39-47.
- Boyes, S. J., & Elliott, M. (2015). The excessive complexity of national marine governance systems—Has this decreased in England since the introduction of the Marine and Coastal Access Act 2009?. *Marine Policy*, 51, 57-65.
- Boyes, S. J., Elliott, M., Murillas-Maza, A., Papadopoulou, N., & Uyarra, M. C. (2016). Is existing legislation fit-for-purpose to achieve Good Environmental Status in European seas?. *Marine Pollution Bulletin*, 111(1-2), 18-32.
- Boulton, J. G., Allen, P. M., & Bowman, C. (2015). *Embracing complexity: Strategic perspectives for an age of turbulence*. OUP Oxford.
- Braat, L. C., Van der Ploeg, S. W. F., & Bouman, F. (1979). Functions of the natural environment: an economic-ecological analysis. *Functions of the natural environment: an economic-ecological analysis*.
- Bracken, L. J., & Oughton, E. A. (2006). ‘What do you mean?’ The importance of language in developing interdisciplinary research. *Transactions of the Institute of British Geographers*, 31(3), 371-382.
- Bradshaw, N., Earll, B., Barham, P., Pryor, A. & Everard, M. (2021). Case study: the coastal based approach.
- Brand, F. S., & Jax, K. (2007). Focusing the meaning (s) of resilience: resilience as a descriptive concept and a boundary object. *Ecology and society*, 12(1).
- Brand, U., & Görg, C. (2003). The state and the regulation of biodiversity: International biopolitics and the case of Mexico. *Geoforum*, 34(2), 221-233.
- Brandt, S., & Ding, N. (2008). Impact of property rights on labor contracts in commercial fisheries. *Ocean & Coastal Management*, 51(11), 740-748.
- Braudel, F. (1993). *The dynamics of capitalism*. *Smolensk: Polygram*.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
- Braun, V., & Clarke, V. (2014). What can “thematic analysis” offer health and wellbeing researchers?. *International journal of qualitative studies on health and well-being*, 9(1), 26152.
- Brechin, S. R., Wilshusen, P. R., Fortwangler, C. L., & West, P. C. (2002). Beyond the square wheel: toward a more comprehensive understanding of biodiversity conservation as social and political process. *Society & natural resources*, 15(1), 41-64.
- Brennan, R. E. (2018). The conservation “myths” we live by: Reimagining human–nature relationships within the Scottish marine policy context. *Area*, 50(2), 159-168.

- Briassoulis, H. (2017). *Policy integration for complex environmental problems: The example of Mediterranean desertification*. Routledge.
- Brinkerhoff, Jennifer M. "Government–nonprofit partnership: a defining framework." *Public Administration and Development: The International Journal of Management Research and Practice* 22.1 (2002): 19-30.
- Brockington, D. (2008). Powerful environmentalisms: conservation, celebrity and capitalism. *Media, culture & society*, 30(4), 551-568.
- Brondo, K. V., & Bown, N. (2011). Neoliberal conservation, Garifuna territorial rights and resource management in the Cayos Cochinos Marine Protected Area. *Conservation and Society*, 9(2), 91-105
- Browman, H. I., Stergiou, K. I., Cury, P. M., Hilborn, R., Jennings, S., Lotze, H. K., & Mace, P. M. (2004). Perspectives on ecosystem-based approaches to the management of marine resources. *MARINE ECOLOGY-PROGRESS SERIES-*, 274, 269-303.
- Brouwer, S., Rayner, T., & Huitema, D. (2013). Mainstreaming climate policy: the case of climate adaptation and the implementation of EU water policy. *Environment and Planning C: Government and Policy*, 31(1), 134-153.
- Brown, K. (2002). Innovations for conservation and development. *Geographical Journal*, 168(1), 6-17.
- Brown, G., & Fagerholm, N. (2015). Empirical PPGIS/PGIS mapping of ecosystem services: A review and evaluation. *Ecosystem services*, 13, 119-133.
- Brown, G., Weber, D., & De Bie, K. (2014). Assessing the value of public lands using public participation GIS (PPGIS) and social landscape metrics. *Applied Geography*, 53, 77-89.
- Bruckmeier, K. (2016). Social-ecological systems and ecosystem services. *Social-Ecological Transformation*, 183-234.
- Bruckmeier, K. (2016a). *Social-ecological transformation*. London. Palgrave Macmillan
- Brundtland, G. H. (1987). Our common future—Call for action. *Environmental conservation*, 14(4), 291-294.
- Buckland, S. T., Goudie, I. B. J., & Borchers, D. L. (2000). Wildlife population assessment: past developments and future directions. *Biometrics*, 56(1), 1-12.
- Buckley, J. W., Buckley, M. H., & Chiang, H. F. (1976). *Research methodology and business decisions*.
- Buhl-Mortensen, L., Galparsoro, I., Fernandez, T. V., Johnson, K., D'Anna, G., Badalamenti, F., ... & Doncheva, V. (2017). Maritime ecosystem-based management in practice: Lessons learned from the application of a generic spatial planning framework in Europe. *Marine Policy*, 75, 174-186.
- Bull, J. W., & Brownlie, S. (2017). The transition from no net loss to a net gain of biodiversity is far from trivial. *Oryx*, 51(1), 53-59.
- Bunders, J. F., Broerse, J. E., Keil, F., Pohl, C., Scholz, R. W., & Zweekhorst, M. B. (2010). How can transdisciplinary research contribute to knowledge democracy?. *Knowledge democracy: Consequences for science, politics, and media*, 125-152.
- Burden, N., Benstead, R., Benyon, K., Clook, M., Green, C., Handley, J., ... & Hutchinson, T. H. (2020). Key opportunities to replace, reduce, and refine regulatory fish acute toxicity tests. *Environmental Toxicology and Chemistry*, 39(10), 2076-2089.

- Burdon, D., Potts, T., McKinley, E., Lew, S., Shilland, R., Gormley, K., ... & Forster, R. (2019). Expanding the role of participatory mapping to assess ecosystem service provision in local coastal environments. *Ecosystem services*, 39, 101009.
- Burnard, P. (1991). A method of analysing interview transcripts in qualitative research. *Nurse education today*, 11(6), 461-466.
- Büscher, B., Sullivan, S., Neves, K., Igoe, J., & Brockington, D. (2012). Towards a synthesized critique of neoliberal biodiversity conservation. *Capitalism nature socialism*, 23(2), 4-30.
- Candel, J.J.L. (2019) The expediency of policy integration, *Policy Studies* DOI 10.1080/01442872.2019.1634191
- Capra, F. (1975). Modern physics and eastern mysticism. *Journal of Transpersonal Psychology*, 8(1).
- Capra, F. (1996). *The web of life: A new synthesis of mind and matter* (p. 336). London: Flamingo.
- Carlisle, K., & Gruby, R. L. (2019). Polycentric systems of governance: A theoretical model for the commons. *Policy Studies Journal*, 47(4), 927-952.
- Carson, R. (1962). *Silent Spring*. New Yorker, 23.
- Carlsson, B., & Stankiewicz, R. (1991). On the nature, function and composition of technological systems. *Journal of evolutionary economics*, 1, 93-118.
- Carlsson, L., & Berkes, F. (2005). Co-management: concepts and methodological implications. *Journal of environmental management*, 75(1), 65-76.
- Carothers, C., & Chambers, C. (2012). Fisheries privatization and the remaking of fishery systems. *Environment and Society*, 3(1), 39-59.
- Carter, N. (2018). *The politics of the environment: Ideas, activism, policy*. Cambridge University Press.
- Carter, P. (2018). *Decolonising Governance: Archipelagic Thinking*. Routledge.
- Casado-Asensio, J., & Steurer, R. (2014). Integrated strategies on sustainable development, climate change mitigation and adaptation in Western Europe: communication rather than coordination. *Journal of Public Policy*, 34(3), 437-473.
- Castree, N. (2009). Researching neoliberal environmental governance: a reply to Karen Bakker. *Environment and Planning A*, 41(8), 1788-1794.
- Castro, G. (2005). *Mainstreaming biodiversity in production landscapes*. The Role of Mainstreaming. Washington, DC: Global Environment Facility.
- CBD (2009) *Connecting biodiversity and climate change mitigation and adaptation: report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change*. Secretariat of the Convention on Biological Diversity.
- Chaffin, B. C., & Gunderson, L. H. (2016). Emergence, institutionalization and renewal: rhythms of adaptive governance in complex social-ecological systems. *Journal of Environmental Management*, 165, 81-87.
- Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. sage.

- Chan, K. M., Boyd, D. R., Gould, R. K., Jetzkowitz, J., Liu, J., Muraca, B., ... & Brondízio, E. S. (2020). Levers and leverage points for pathways to sustainability. *People and Nature*, 2(3), 693-717.
- Chen, Y. Y., Shek, D. T., & Bu, F. F. (2011). Applications of interpretive and constructionist research methods in adolescent research: philosophy, principles and examples. *International journal of adolescent medicine and health*, 23(2), 129-139.
- Charnley, S., Carothers, C., Satterfield, T., Levine, A., Poe, M. R., Norman, K., ... & Martin, K. S. (2017). Evaluating the best available social science for natural resource management decision-making. *Environmental Science & Policy*, 73, 80-88.
- Christensen, N. L., Bartuska, A. M., Brown, J. H., Carpenter, S., d'Antonio, C., Francis, R., ... & Woodmansee, R. G. (1996). The report of the Ecological Society of America committee on the scientific basis for ecosystem management. *Ecological applications*, 6(3), 665-691.
- Christensen, C. M., Wang, D., & Van Bever, D. (2013). Consulting on the Cusp of Disruption. *Harvard business review*, 91(10), 106-114. Clark, J. R. (Ed.). (2018). *Coastal zone management handbook*. CRC press.
- Christensen, T., & Lægreid, P. (2013). Contexts and administrative reforms: a transformative approach. In *Context in public policy and management* (pp. 131-156). Edward Elgar Publishing.
- Chuenpagdee, R., & Song, A. M. (2012). Institutional thinking in fisheries governance: broadening perspectives. *Current Opinion in Environmental Sustainability*, 4(3), 309-315.
- Ciancio, O., & Nocentini, S. (2011). Biodiversity conservation and systemic silviculture: concepts and applications. *Plant Biosystems-An International Journal Dealing with all Aspects of Plant Biology*, 145(2), 411-418.
- Cicin-Sain, B., VanderZwaag, D. L., & Balgos, M. C. (Eds.). (2015). *Routledge handbook of national and regional ocean policies*. Abingdon: Routledge.
- CIEEM (2016) Biodiversity Net Gain. Online: <https://cieem.net/i-am/current-projects/biodiversity-net-gain/> [Accessed January 2019]
- Clarke, J., & Flannery, W. (2020). The post-political nature of marine spatial planning and modalities for its re-politicisation. *Journal of Environmental Policy & Planning*, 22(2), 170-183.
- Cobb, R. W., & Elder, C. D. (1971). The politics of agenda-building: An alternative perspective for modern democratic theory. *The journal of politics*, 33(4), 892-915.
- Cohen, B. C. (1963). *The Press and Foreign Policy*. Institute of Governmental Studies University of California, Berkeley, Reprinted 1993.
- Cohen, D., & Crabtree, B. (2006). *Qualitative research guidelines project*.
- Cohen, B. J. (2018). *The geography of money*. In *The Geography of Money*. Cornell university press.
- Cohen-Shacham, E., Walters, G., Janzen, C., & Maginnis, S. (2016). *Nature-based solutions to address global societal challenges*. IUCN: Gland, Switzerland, 97, 2016-2036.
- Coffey, B. (2016) 'Unpacking the politics of natural capital and economic metaphors in environmental policy discourse', in *Environmental Politics*, 25(2) pp.203-222
- Connelly, S. (2007). Mapping sustainable development as a contested concept. *Local environment*, 12(3), 259-278.

- Conley, D. J., J. Carstensen, J. Aigars, P. Axe, E. Bonsdorff, T. Eremina, B.-M. Haahti, C. Humborg, P. Jonsson, J. Kotta, C. Lañnegren, U. Larsson, A. Maximov, M. R. Medina, E. Lysiak-Pastuszak, N. Remeikaite_-Nikiene_, J. Walve, S. Wilhelms, and L. Zille´n. (2011). Hypoxia is increasing in the coastal zone of the Baltic Sea. *Environmental Science and Technology* 45: 6777–83
- Cooke, B., & Kothari, U. (2001). *Participation: The new tyranny?*. Zed books.
- Cooper, N., Brady, E., Steen, H., & Bryce, R. (2016). Aesthetic and spiritual values of ecosystems: Recognising the ontological and axiological plurality of cultural ecosystem 'services'. *Ecosystem Services*, 21, 218-229.
- Corbera, E., Brown, K., & Adger, W. N. (2007). The equity and legitimacy of markets for ecosystem services. *Development and change*, 38(4), 587-613.
- Cork S, Shelton D, Binning C, Parry R. 2001. A framework for applying the concept of ecosystem services to natural resource management in Australia. In: Rutherford I, Sheldon F, Brierley G, Kenyon C, editors. Third Australian Stream Management Conference; Aug 27–29. Brisbane (QLD): Cooperative Research Centre for Catchment Hydrology. p. 157–162.
- Cormier, R., & Kannen, A. (2019). Managing risk through marine spatial planning. *Maritime Spatial Planning: past, present, future*, 353-373.
- Cosgrove, P. (2020). Suffolk Marine Pioneer: Lessons & recommendations for applying the natural capital approach in England, Suffolk Coast & Heaths Area of Outstanding Natural Beauty, Dock Lane, Melton 58pp.
- Costanza, R. (1991). Ecological economics: a research agenda. *Structural Change and Economic Dynamics*, 2(2), 335-357.
- Costanza, R. (1992). *Ecological economics: the science and management of sustainability*. Columbia University Press.
- Costanza, R., d'Arge, R., De Groot, R., Farber, S., Grasso, M., Hannon, B., ... & Van Den Belt, M. (1997). The value of the world's ecosystem services and natural capital. *nature*, 387(6630), 253-260.
- Costanza, R., Fisher, B., Mulder, K., Liu, S., & Christopher, T. (2007). Biodiversity and ecosystem services: A multi-scale empirical study of the relationship between species richness and net primary production. *Ecological economics*, 61(2-3), 478-491.
- Costanza, R., De Groot, R., Sutton, P., Van der Ploeg, S., Anderson, S. J., Kubiszewski, I., ... & Turner, R. K. (2014). Changes in the global value of ecosystem services. *Global environmental change*, 26, 152-158
- Cowen, R. (2016) *Common Ground*: London: Hutchinson
- Cowling, R.M., Egoh, B., Knight, A.T., O'Farrell, P.J., Reyers, B., Rouget, M., Roux, D.J., Welz, A. and Wilhelm Rechman, A. (2008). An operational model for mainstreaming ecosystem services for implementation. *PNAS*, 105, 9483–9488.
- Cowell, R., & Lennon, M. (2014). The utilisation of environmental knowledge in land-use planning: drawing lessons for an ecosystem services approach. *Environment and Planning C: Government and Policy*, 32(2), 263-282.
- Cox, M., Arnold, G., & Tomás, S. V. (2010). A review of design principles for community-based natural resource management. *Ecology and Society*, 15(4).
- Crocker, J. (2008). Natural materials. *Materials technology*, 23(3), 174-178.
- Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. SAGE Publications.

- Crowder, L. B., Osherenko, G., Young, O. R., Airamé, S., Norse, E. A., Baron, N., ... & Wilson, J. A. (2006). Resolving mismatches in US ocean governance. *Science*, 313(5787), 617-618.
- Crowder, L., & Norse, E. (2008). Essential ecological insights for marine ecosystem-based management and marine spatial planning. *Marine policy*, 32(5), 772-778.
- Curry, N.R. (1993). Countryside planning: a look back in anguish (unpublished inaugural lecture), Cheltenham, Cheltenham and Gloucester College of Higher Education.
- Dalal-Clayton, D. B., & Bass, S. (2009). *The challenges of environmental mainstreaming: Experience of integrating environment into development institutions and decisions* (No. 1). IleD.
- Daly, H. E. (1995). On Wilfred Beckerman's critique of sustainable development. *Environmental Values*, 4(1), 49-55.
- Dangelico, R. M., & Pujari, D. (2010). Mainstreaming green product innovation: Why and how companies integrate environmental sustainability. *Journal of business ethics*, 95, 471-486.
- Dassen, T., Kunseler, E., & van Kessenich, L. M. (2013). The sustainable city: an analytical–deliberative approach to assess policy in the context of sustainable urban development. *Sustainable Development*, 21(3), 193-205.
- Dalal-Clayton, D. B., & Bass, S. (2009). The challenges of environmental mainstreaming: Experience of integrating environment into development institutions and decisions (No. 1). IleD.
- Daily, G. C. (1997). Introduction: what are ecosystem services. Nature's services: Societal dependence on natural ecosystems, 1(1).
- Daly, M. (2005). Gender mainstreaming in theory and practice. *Social Politics: International Studies in Gender, State & Society*, 12(3), 433-450.
- Daniel, T. C., Muhar, A., Arnberger, A., Aznar, O., Boyd, J. W., Chan, K. M., ... & von der Dunk, A. (2012). Contributions of cultural services to the ecosystem services agenda. *Proceedings of the National Academy of Sciences*, 109(23), 8812-8819.
- Dasgupta, P. (2021), *The Economics of Biodiversity: The Dasgupta Review*. (London: HM Treasury)
- Dauvergne, P. (2018). Why is the global governance of plastic failing the oceans?. *Global Environmental Change*, 51, 22-31.
- Davis, A., & Walsh, C. (2017). Distinguishing financialization from neoliberalism. *Theory, Culture & Society*, 34(5-6), 27-51.
- Davies, C., & Laforteza, R. (2019). Transitional path to the adoption of nature-based solutions. *Land use policy*, 80, 406-409.
- de Coninck, S. (2009). *Mainstreaming poverty-environment linkages into development planning: A handbook for practitioners*. UNEP/Earthprint.
- De Groot, R. S. (1987). Environmental functions as a unifying concept for ecology and economics. *Environmentalist*, 7(2), 105-109.
- De Groot, R. S., Wilson, M. A., & Boumans, R. M. (2002). A typology for the classification, description and valuation of ecosystem functions, goods and services. *Ecological economics*, 41(3), 393-408.

- De Groot, R. S., Alkemade, R., Braat, L., Hein, L., & Willemen, L. (2010). Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. *Ecological complexity*, 7(3), 260-272.
- De Groot, R., Brander, L., Van Der Ploeg, S., Costanza, R., Bernard, F., Braat, L., ... & Van Beukering, P. (2012). Global estimates of the value of ecosystems and their services in monetary units. *Ecosystem services*, 1(1), 50-61.
- De Santo, E. M. (2013). Missing marine protected area (MPA) targets: how the push for quantity over quality undermines sustainability and social justice. *Journal of environmental management*, 124, 137-146.
- Defra (2011). The Natural Choice: securing the value of nature. Online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228842/8082.pdf [Accessed June 2018]
- Defra. (2018). The 25 Year Environment Plan. HM Government.
- Defra. (2019). Marine Strategy Part 1: UK updated assessment and good environmental status. Online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/921262/marine-strategy-part1-october19.pdf [Accessed January 2023]
- Della Porta, D., & Diani, M. (1999). Social movements. *The SAGE Handbook of*, 656.
- Demaria, F., Schneider, F., Sekulova, F., & Martinez-Alier, J. (2013). What is degrowth? From an activist slogan to a social movement. *Environmental values*, 22(2), 191-215.
- Dempsey, N., Bramley, G., Power, S., & Brown, C. (2011). The social dimension of sustainable development: Defining urban social sustainability. *Sustainable development*, 19(5), 289-300.
- Denzin, N., & Lincoln, Y. (1994). Biographical method. *The SAGE*.
- Denzin, N. K., & Lincoln, Y. S. (2008). Introduction: The discipline and practice of qualitative research.
- De Vente, J., Reed, M. S., Stringer, L. C., Valente, S., & Newig, J. (2016). How does the context and design of participatory decision making processes affect their outcomes? Evidence from sustainable land management in global drylands. *Ecology and society*, 21(2).
- Diaz, R. J., & Rosenberg, R. (2008). Spreading dead zones and consequences for marine ecosystems. *science*, 321(5891), 926-929.
- Díaz, S., Fargione, J., Chapin III, F. S., & Tilman, D. (2006). Biodiversity loss threatens human well-being. *PLoS biology*, 4(8), e277.
- Dicey, A. V. (1905). Paradox of the land law. *LQ Rev.*, 21, 221.
- DiCicco-Bloom, B., & Crabtree, B. F. (2006). The qualitative research interview. *Medical education*, 40(4), 314-321.
- Dickie, I. A., Bennett, B. M., Burrows, L. E., Nuñez, M. A., Peltzer, D. A., Porté, A., ... & Van Wilgen, B. W. (2014). Conflicting values: ecosystem services and invasive tree management. *Biological invasions*, 16, 705-719.
- Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., ... & Zlatanova, D. (2015). The IPBES Conceptual Framework—connecting nature and people. *Current opinion in environmental sustainability*, 14, 1-16.

- Dietz, J. S., & Bozeman, B. (2005). Academic careers, patents, and productivity: industry experience as scientific and technical human capital. *Research policy*, 34(3), 349-367.
- Dietz, T., Fitzgerald, A., & Shwom, R. (2005). Environmental values. *Annu. Rev. Environ. Resour.*, 30, 335-372.
- Dietz, T. (2013). Bringing values and deliberation to science communication. *Proceedings of the National Academy of Sciences*, 110(supplement_3), 14081-14087.
- Dolan, A. H., & Walker, I. J. (2006). Understanding vulnerability of coastal communities to climate change related risks. *Journal of Coastal research*, 1316-1323.
- Doney, S. C., Busch, D. S., Cooley, S. R., & Kroeker, K. J. (2020). The impacts of ocean acidification on marine ecosystems and reliant human communities. *Annual Review of Environment and Resources*, 45, 83-112.
- Dorst, H., Van der Jagt, A., Raven, R., & Runhaar, H. (2019). Urban greening through nature-based solutions—Key characteristics of an emerging concept. *Sustainable Cities and Society*, 49, 101620.
- Dorst, H., van der Jagt, A., Runhaar, H., & Raven, R. (2021). Structural conditions for the wider uptake of urban nature-based solutions—A conceptual framework. *Cities*, 116, 103283.
- Doyon, S., & Sabinot, C. (2014). A new 'conservation space'? protected areas, environmental economic activities and discourses in two Yucatán biosphere reserves in Mexico. *Conservation and Society*, 12(2), 133-146.
- Draycott, S., Sellar, B., Davey, T., Noble, D. R., Venugopal, V., & Ingram, D. M. (2019). Capture and simulation of the ocean environment for offshore renewable energy. *Renewable and Sustainable Energy Reviews*, 104, 15-29. *ments: Politics, Law and Economics*, 16(3), 397-413.
- Dressler, W., Büscher, B., Schoon, M., Brockington, D. A. N., Hayes, T., Kull, C. A., ... & Shrestha, K. (2010). From hope to crisis and back again? A critical history of the global CBNRM narrative. *Environmental conservation*, 37(1), 5-15.
- Dryzek, J. S. (2021). *Politics of the earth: Environmental discourses*. Oxford university press.
- Duit, A., Galaz, V., Eckerberg, K., & Ebbesson, J. (2010). Governance, complexity, and resilience. *Global environmental change*, 20(3), 363-368.
- Eckersley, R. (1992). *Environmentalism and political theory: Toward an ecocentric approach*. Suny Press.
- Eggermont, H., Balian, E., Azevedo, J. M. N., Beumer, V., Brodin, T., Claudet, J., ... & Le Roux, X. (2015). Nature-based solutions: new influence for environmental management and research in Europe. *GAIA-Ecological perspectives for science and society*, 24(4), 243-248.
- Ehler, C., & Douvere, F. (2007). Visions for a Sea change: Report of the First International Workshop on Marine Spatial Planning, Intergovernmental Oceanographic Commission and the Man and the Biosphere Programme UNESCO Headquarters. Paris, France. 8-10 November 2006.
- Ehler, C., & Douvere, F. (2009). Marine Spatial Planning: a step-by-step approach toward ecosystem-based management. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme.
- Ehler, C. N. (2018). Marine spatial planning: an idea whose time has come. In *Offshore energy and marine spatial planning* (pp. 6-17). Routledge.

- Elkington, J. (1994). Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *California management review*, 36(2), 90-100.
- Elliott, M., Borja, Á., & Cormier, R. (2020). Managing marine resources sustainably: A proposed integrated systems analysis approach. *Ocean & Coastal Management*, 197, 105315.
- Elsaid, K., Kamil, M., Sayed, E. T., Abdelkareem, M. A., Wilberforce, T., & Olabi, A. (2020). Environmental impact of desalination technologies: A review. *Science of the Total Environment*, 748, 141528.
- Emas, R. (2015). The concept of sustainable development: definition and defining principles. Brief for GSDR, 2015, 10-13140.
- Engelman, R. (2013). Beyond sustainability. *State of the world 2013: is sustainability still possible?*, 3-16.
- Ekstrom, J. A., & Young, O. R. (2009). Evaluating functional fit between a set of institutions and an ecosystem. *Ecology and Society*, 14(2).
- Evans, L. S. (2009). Understanding divergent perspectives in marine governance in Kenya. *Marine policy*, 33(5), 784-793.
- Evans, P. G. (2018). Habitat pressures. In *Encyclopedia of marine mammals* (pp. 441-446). Academic Press.
- Everard, M. (2009). *The business of biodiversity*. WIT Press.
- Everard, M., Jones, L., & Watts, B. (2010). Have we neglected the societal importance of sand dunes? An ecosystem services perspective. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 20(4), 476-487.
- Everard, M., Reed, M. S., & Kenter, J. O. (2016). The ripple effect: Institutionalising pro-environmental values to shift societal norms and behaviours. *Ecosystem services*, 21, 230-240.
- Fairbanks, L., Boucquey, N., Campbell, L. M., & Wise, S. (2019). Remaking oceans governance: Critical perspectives on marine spatial planning. *Environment and Society*, 10(1), 122-140.
- Fairhead, J., Leach, M., & Scoones, I. (2012). Green grabbing: a new appropriation of nature?. *Journal of peasant studies*, 39(2), 237-261.
- Fang, Q., Zhang, R., Zhang, L., & Hong, H. (2011). Marine functional zoning in China: experience and prospects. *Coastal Management*, 39(6), 656-667.
- FAO. (2020). The state of world fisheries and aquaculture 2020. Sustainability in action. Rome. doi: 10.4060/ca9229en
- Farley, J., & Costanza, R. (2010). Payments for ecosystem services: from local to global. *Ecological economics*, 69(11), 2060-2068.
- Femenías, P. (2004). *Demonstration projects for sustainable building: towards a strategy for sustainable development in the building sector based on Swedish and Dutch experience*. Chalmers Tekniska Hogskola (Sweden).
- Fernandes, J. P., & Guiomar, N. (2018). Nature-based solutions: The need to increase the knowledge on their potentialities and limits. *Land Degradation & Development*, 29(6), 1925-1939.

- Ferse, S. C., Costa, M. M., Manez, K. S., Adhuri, D. S., & Glaser, M. (2010). Allies, not aliens: increasing the role of local communities in marine protected area implementation. *Environmental Conservation*, 37(1), 23-34.
- Field, P. A., Morse, J., & Helm, C. (1985). *Nursing Research: The Application of Qualitative Approaches*.
- Finkbeiner, E. M., Bennett, N. J., Frawley, T. H., Mason, J. G., Briscoe, D. K., Brooks, C. M., ... & Crowder, L. B. (2017). Reconstructing overfishing: moving beyond Malthus for effective and equitable solutions. *Fish and Fisheries*, 18(6), 1180-1191.
- Fischhoff, B. (2013). The sciences of science communication. *Proceedings of the National Academy of Sciences*, 110(supplement_3), 14033-14039.
- Fish, R., Saratsi, E., Reed, M., & Keune, H. (2016). Stakeholder participation in ecosystem service decision-making. In *Routledge Handbook of Ecosystem Services* (pp. 256-270). Routledge.
- Fischer, E. (1990). Regularities, rules and consumer behavior: tangencies between positivist and interpretive approaches to research. *ACR North American Advances*.
- Fisher, B., Turner, R. K., & Morling, P. (2009). Defining and classifying ecosystem services for decision making. *Ecological economics*, 68(3), 643-653.
- Flannery, W., Ellis, G., Ellis, G., Flannery, W., Nursey-Bray, M., van Tatenhove, J. P., ... & O'Hagan, A. M. (2016). Exploring the winners and losers of marine environmental governance/Marine spatial planning: Cui bono?/"More than fishy business": epistemology, integration and conflict in marine spatial planning/Marine spatial planning: power and scaping/Surely not all planning is evil?/Marine spatial planning: a Canadian perspective/Maritime spatial planning—"ad utilitatem omnium"/Marine spatial planning:"it is better to be on the train than being hit by it"/Reflections from the perspective of recreational anglers *Planning Theory & Practice*, 17(1), 121-151.
- Flannery, W., & McAteer, B. (2020). Assessing marine spatial planning governmentality. *Maritime Studies*, 19(3), 269-284.
- Fletcher, S., McKinley, E., Buchan, K. C., Smith, N., & McHugh, K. (2013). Effective practice in marine spatial planning: A participatory evaluation of experience in Southern England. *Marine Policy*, 39, 341-348.
- Fletcher Jr, R. J., Didham, R. K., Banks-Leite, C., Barlow, J., Ewers, R. M., Rosindell, J., ... & Haddad, N. M. (2018). Is habitat fragmentation good for biodiversity?. *Biological conservation*, 226, 9-15.
- Foley, J. A., DeFries, R., Asner, G. P., Barford, C., Bonan, G., Carpenter, S. R., ... & Snyder, P. K. (2005). Global consequences of land use. *science*, 309(5734), 570-574.
- Folke, C., Colding, J., & Berkes, F. (2003). Synthesis: building resilience and adaptive capacity in social-ecological systems. *Navigating social-ecological systems: Building resilience for complexity and change*, 9(1), 352-387.
- Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annu. Rev. Environ. Resour.*, 30, 441-473.
- Folke, C. (2006). Resilience: The emergence of a perspective for social-ecological systems analyses. *Global environmental change*, 16(3), 253-267.
- Folke, C. (2016). Resilience (republished). *Ecology and society*, 21(4).
- Ford, L. (2015). Sustainable development goals: all you need to know. *The guardian*, 19.

- Foster, J. B. (2011). Capitalism and degrowth-An impossibility theorem. *Monthly review*, 62(8), 26.
- Frantzeskaki, N., McPhearson, T., Collier, M. J., Kendal, D., Bulkeley, H., Dumitru, A., ... & Pintér, L. (2019). Nature-based solutions for urban climate change adaptation: linking science, policy, and practice communities for evidence-based decision-making. *BioScience*, 69(6), 455-466.
- Freeden, W. (1978). An application of a summation formula to numerical computation of integrals over the sphere. *Bulletin Géodésique*, 52, 165-175.
- Freeden, M. (1986). The new liberalism: an ideology of social reform.
- Fréon, P., Avadí, A., Soto, W. M., & Negrón, R. (2014). Environmentally extended comparison table of large-versus small-and medium-scale fisheries: the case of the Peruvian anchoveta fleet. *Canadian journal of fisheries and aquatic sciences*, 71(10), 1459-1474.
- French, M., & Lowe, T. (2018). The wickedness of public service outcomes: Why we need a new public management paradigm. In *Conference paper presented at the XXII IRSPM Annual Conference* (pp. 11-13).
- Frieden, J., & Rogowski, R. (2014). Modern capitalism: enthusiasts, opponents, and reformers.
- Fulton, E. A., Smith, A. D., & Johnson, C. R. (2003). Effect of complexity on marine ecosystem models. *Marine Ecology Progress Series*, 253, 1-16.
- Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational behavior*, 26(4), 331-362.
- Galaz, V., Crona, B., Österblom, H., Olsson, P., & Folke, C. (2012). Polycentric systems and interacting planetary boundaries—Emerging governance of climate change—ocean acidification—marine biodiversity. *Ecological Economics*, 81, 21-32.
- Gallopín, G. C., Funtowicz, S., O'Connor, M., & Ravetz, J. (2001). Science for the twenty-first century: from social contract to the scientific core. *International Social Science Journal*, 53(168), 219-229.
- Galletta, A. (2013). *Mastering the semi-structured interview and beyond: From research design to analysis and publication* (Vol. 18). NYU press.
- Garland-Thomson, R. (2015). Human biodiversity conservation: a consensual ethical principle. *The American Journal of Bioethics*, 15(6), 13-15.
- Giakoumi, S., McGowan, J., Mills, M., Beger, M., Bustamante, R. H., Charles, A., ... & Possingham, H. P. (2018). Revisiting “success” and “failure” of marine protected areas: a conservation scientist perspective. *Frontiers in Marine Science*, 223.
- Gamfeldt, L., Lefcheck, J. S., Byrnes, J. E., Cardinale, B. J., Duffy, J. E., & Griffin, J. N. (2015). Marine biodiversity and ecosystem functioning: what's known and what's next?. *Oikos*, 124(3), 252-265.
- Geels, F. W. (2007). Transformations of large technical systems: A multilevel analysis of the Dutch highway system (1950-2000). *Science, Technology, & Human Values*, 32(2), 123-149.
- Gell, F. R., & Roberts, C. M. (2003). Benefits beyond boundaries: the fishery effects of marine reserves. *Trends in ecology & evolution*, 18(9), 448-455.
- Georgescu-Roegen, N. (1986). The entropy law and the economic process in retrospect. *Eastern Economic Journal*, 12(1), 3-25.

- Giddens, A. (2013). *The third way and its critics*. John Wiley & Sons.
- Gill, P., Stewart, K., Treasure, E., & Chadwick, B. (2008). Methods of data collection in qualitative research: interviews and focus groups. *British dental journal*, 204(6), 291-295.
- Gilliland, P. M., & Laffoley, D. (2008). Key elements and steps in the process of developing ecosystem-based marine spatial planning. *Marine Policy*, 32(5), 787-796.
- Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory*. Aldine Publishing Company, Hawthorne, New York.
- Godfrey, D., & Brown, C. (2018). How effective is the research and development ecosystem for England's schools?. *London review of education*, 16(1), 137-153.
- Görg, C. (2007). Landscape governance: The "politics of scale" and the "natural" conditions of places. *Geoforum*, 38(5), 954-966.
- Gov.UK (online). Marine Planning in England. Online: <https://www.gov.uk/government/collections/marine-planning-in-england> [Accessed March 2022]
- Gramsci, A. (1971). The modern prince. *Selections from the prison notebooks*, 123-205.
- Griggs, D., Stafford-Smith, M., Gaffney, O., Rockström, J., Öhman, M. C., Shyamsundar, P., ... & Noble, I. (2013). Sustainable development goals for people and planet. *Nature*, 495(7441), 305-307.
- Grip, K., & Blomqvist, S. (2020). Marine nature conservation and conflicts with fisheries. *Ambio*, 49(7), 1328-1340.
- Gruening, G. (2001). Origin and theoretical basis of New Public Management. *International public management journal*, 4(1), 1-25.
- Grumbine, R. E. (1994). Wildness, wise use, and sustainable development. *Environmental ethics*, 16(3), 227-249.
- Guba, E. G. (Ed.). (1990). *The paradigm dialog*. Sage publications.
- Guba, E. G., & Lincoln, Y. S. (1981). *Effective evaluation: Improving the usefulness of evaluation results through responsive and naturalistic approaches*. Jossey-Bass.
- Guba, E. G., & Lincoln, Y. S. (1989). *Fourth generation evaluation*. Sage.
- Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research*, 2(163-194), 105.
- Guerry, A. D., Polasky, S., Lubchenco, J., Chaplin-Kramer, R., Daily, G. C., Griffin, R., ... & Vira, B. (2015). Natural capital and ecosystem services informing decisions: From promise to practice. *Proceedings of the National academy of Sciences*, 112(24), 7348-7355.
- Gunderson, L. H., & Holling, C. S. (Eds.). (2002). *Panarchy: understanding transformations in human and natural systems*. Island press.
- Gunderson, L. H., & Pritchard, L. (Eds.). (2012). *Resilience and the behavior of large-scale systems* (Vol. 60). Island Press.
- Gunningham, N. (2019). Averting climate catastrophe: Environmental activism, extinction rebellion and coalitions of influence. *King's Law Journal*, 30(2), 194-202.
- Gustavsson, M., & Riley, M. (2018). Women, capitals and fishing lives: exploring gendered dynamics in the Llŷn Peninsula small-scale fishery (Wales, UK). *Maritime Studies*, 17(2), 223-231.

- Hadorn, G. H., Hoffmann-Riem, H., Biber-Klemm, S., Grossenbacher-Mansuy, W., Joye, D., Pohl, C., ... & Zemp, E. (Eds.). (2008). *Handbook of transdisciplinary research* (Vol. 10, pp. 978-1). Dordrecht: Springer.
- Haines-Young, R., & Potschin, M. (2010). The links between biodiversity, ecosystem services and human well-being. *Ecosystem Ecology: a new synthesis*, 1, 110-139.
- Haines-Young, R., & Potschin, M. (2011). Integrated coastal zone management and the ecosystem approach. *PEGASO Internal Deliverable ID2*.
- Haines-Young, R., & Potschin-Young, M. (2018). Revision of the common international classification for ecosystem services (CICES V5. 1): a policy brief. *One Ecosystem*, 3, e27108.
- Hagerman, S. M., & Pelai, R. (2016). "As far as possible and as appropriate": implementing the Aichi Biodiversity Targets. *Conservation Letters*, 9(6), 469-478.
- Hamilton, J. D. (2003). What is an oil shock?. *Journal of econometrics*, 113(2), 363-398.
- Halpern, B. S. (2003). The impact of marine reserves: do reserves work and does reserve size matter?. *Ecological applications*, 13(sp1), 117-137.
- Halpern, B. S., & Warner, R. R. (2003). Matching marine reserve design to reserve objectives. *Proceedings of the Royal Society of London. Series B: Biological Sciences*, 270(1527), 1871-1878.
- Hardin, G. (1968). The tragedy of the commons: the population problem has no technical solution; it requires a fundamental extension in morality. *science*, 162(3859), 1243-1248.
- Harrison, P. A., Dunford, R., Barton, D. N., Kelemen, E., Martín-López, B., Norton, L., ... & Zulian, G. (2018). Selecting methods for ecosystem service assessment: A decision tree approach. *Ecosystem services*, 29, 481-498.
- Hauer, M. E., Fussell, E., Mueller, V., Burkett, M., Call, M., Abel, K., ... & Wrathall, D. (2020). Sea-level rise and human migration. *Nature Reviews Earth & Environment*, 1(1), 28-39.
- Haughton, G., Allmendinger, P., & Oosterlynck, S. (2013). Spaces of neoliberal experimentation: soft spaces, postpolitics, and neoliberal governmentality. *Environment and Planning A*, 45(1), 217-234.
- Hawkins, E. R., Harcourt, R., Bejder, L., Brooks, L. O., Grech, A., Christiansen, F., ... & Harrison, P. L. (2017). Best practice framework and principles for monitoring the effect of coastal development on marine mammals. *Frontiers in Marine Science*, 4, 59.
- Hayek, F. A. (1976). *Socialism and Science*. New Studies in Philosophy, Politics, Economics, and the History of Ideas.
- Hein, L., Bagstad, K. J., Obst, C., Edens, B., Schenau, S., Castillo, G., ... & Caparrós, A. (2020). Progress in natural capital accounting for ecosystems. *Science*, 367(6477), 514-515.
- Heynen, N., & Robbins, P. (2005). The neoliberalization of nature: Governance, privatization, enclosure and valuation. *Capitalism Nature Socialism*, 16(1), 5-8.
- Hillman, J. (1975). *Re-visioning psychology*. Harper & Row.
- Hilborn, R., Orensanz, J. M., & Parma, A. M. (2005). Institutions, incentives and the future of fisheries. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 360(1453), 47-57.

- Hinson, C., O’Keeffe, J., Mijic, A., Bryden, J., Van Grootveld, J., & Collins, A. M. (2022). Using natural capital and ecosystem services to facilitate participatory environmental decision making: Results from a systematic map. *People and Nature*, 4(3), 652-668.
- Hislop, M., Scott, A. J., & Corbett, A. (2019). What does good green infrastructure planning policy look like? Developing and testing a policy assessment tool within Central Scotland UK. *Planning Theory & Practice*, 20(5), 633-655.
- Hodgson, E. E., Halpern, B. S., & Essington, T. E. (2019). Moving beyond silos in cumulative effects assessment. *Frontiers in Ecology and Evolution*, 7, 211.
- Hoegh-Guldberg, O., Jacob, D., Bindi, M., Brown, S., Camilloni, I., Diedhiou, A., ... & Zougmore, R. B. (2018). Impacts of 1.5 C global warming on natural and human systems. *Global warming of 1.5° C*.
- Holliday, A. (2007). *Doing & writing qualitative research*. Sage.
- Holland, D. S. (2004). Spatial fishery rights and marine zoning: a discussion with reference to management of marine resources in New England. *Marine Resource Economics*, 19(1), 21-40.
- Holling, C. S., & Meffe, G. K. (1996). Command and control and the pathology of natural resource management. *Conservation biology*, 10(2), 328-337.
- Holloway, I. M. M. Y. (2005). Qualitative writing. *Qualitative research in health care*, 270-286.
- Holmes, G., & Cavanagh, C. J. (2016). A review of the social impacts of neoliberal conservation: Formations, inequalities, contestations. *Geoforum*, 75, 199-209.
- Holtby, R. (2020) Marine Pioneer stakeholders: Governance Recommendations for a Marine Natural Capital Approach
- Hooper, T., Beaumont, N., Griffiths, C., Langmead, O., & Somerfield, P. J. (2017). Assessing the sensitivity of ecosystem services to changing pressures. *Ecosystem Services*, 24, 160-169.
- Hooper, T., Börger, T., Langmead, O., Marcone, O., Rees, S. E., Rendon, O., ... & Austen, M. (2019). Applying the natural capital approach to decision making for the marine environment. *Ecosystem Services*, 38, 100947.
- Hooper, T., Austen, M., & Lannin, A. (2021). Developing policy and practice for marine net gain. *Journal of Environmental Management*, 277, 111387.
- Hughes, T. P., Bellwood, D. R., Folke, C., Steneck, R. S., & Wilson, J. (2005). New paradigms for supporting the resilience of marine ecosystems. *Trends in ecology & evolution*, 20(7), 380-386.
- Humphries, R. (2015). Integrated health and social care in England—Progress and prospects. *Health policy*, 119(7), 856-859.
- Igoe, J., & Brockington, D. (2007). Neoliberal conservation. *Conservation and society*, 5(4), 432-449.
- Imperial College London (2022) The ever-growing climate movement. Presentation for the Grantham Institute. Online: https://www.imperial.ac.uk/news/241832/brian-eno-we-need-creative-industry/?mc_cid=c4082d4f22 [Accessed February 2023]
- Ingle, C. and Stainthorp, R. (2020). North Devon Marine Natural Capital Plan. North Devon UNESCO Biosphere Reserve. Available: https://www.northdevonbiosphere.org.uk/uploads/1/5/4/4/15448192/north_devon_marine_pl_an_final_version_approval_1_3.pdf [Accessed February, 2023]

IPBES. (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

IPBES (2022). Summary for policymakers of the methodological assessment of the diverse values and valuation of nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. In: Pascual U, Balvanera P, Christie M, Baptiste B, González-Jiménez D, Anderson CB, Athayde S, Chaplin-Kramer R, Jacobs S, Kelemen E, Kumar R, Lazos E, Martin A, Mwampamba TH, Nakangu B, O'Farrell P, Raymond CM, Subramanian SM, Termansen M, Van Noordwijk M, Vatn A (eds) IPBES secretariat, Bonn, Germany, p 37

IPBES (2022a) Media Release: IPBES Values Assessment – Decisions Based on Narrow Set of Market Values of Nature Underpin the Global Biodiversity Crisis. Available at: https://ipbes.net/media_release/Values_Assessment_Published [Accessed February 2023]

IPCC. (2019). IPCC special report on the ocean and cryosphere in a changing climate. Pörtner, H.-O., Roberts, D. C., Masson-Delmotte, V., Zhai, P., Tignor, M., et al., editors. Intergovernmental Panel on Climate Change. In press.

IPCC. (2022). Summary for Policymakers, Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, UK, 3-33

Ireland, G. E. A. (2022). Submission by Good Energies Alliance Ireland On Biodiversity Loss From Citizens Assembly.

Isaar, S. (2020). Listening to Black lives matter: Racial capitalism and the critique of neoliberalism 2020. *Contemporary Political Theory*, 20, 48–71.

Ison, S., Pecl, G., Hobday, A. J., Cvitanovic, C., & Van Putten, I. (2021). Stakeholder influence and relationships inform engagement strategies in marine conservation. *Ecosystems and People*, 17(1), 320-341.

Jack, B. K., Kousky, C., & Sims, K. R. (2008). Designing payments for ecosystem services: Lessons from previous experience with incentive-based mechanisms. *Proceedings of the national Academy of Sciences*, 105(28), 9465-9470.

Jahn, T., Bergmann, M., & Keil, F. (2012). Transdisciplinarity: Between mainstreaming and marginalization. *Ecological economics*, 79, 1-10.

Jamshed, S. (2014). Qualitative research method-interviewing and observation. *Journal of basic and clinical pharmacy*, 5(4), 87.

Jänicke, M., Schreurs, M., & Töpfer, K. (2015). The potential of multi-level global climate governance. *Institute for Advanced Sustainability Studies (IASS) Policy Brief*, 2, 2015.

Jänicke, M. (2017). The multi-level system of global climate governance—the model and its current state. *Environmental Policy and Governance*, 27(2), 108-121.

Jefferson, T., Costello, M. J., Zhao, Q., & Lundquist, C. J. (2021). Conserving threatened marine species and biodiversity requires 40% ocean protection. *Biological Conservation*, 264, 109368.

Jenkins, L. D., Maxwell, S. M., & Fisher, E. (2012). Increasing conservation impact and policy relevance of research through embedded experiences. *Conservation Biology*, 26(4), 740-742.

Jessop, B. (2002). Liberalism, neoliberalism, and urban governance: A state-theoretical perspective. *Antipode*, 34(3), 452-472.

- Jevrejeva, S., Jackson, L. P., Riva, R. E., Grinsted, A., & Moore, J. C. (2016). Coastal sea level rise with warming above 2 C. *Proceedings of the National Academy of Sciences*, 113(47), 13342-13347.
- Jefferson, T. A., Hung, S. K., & Würsig, B. (2009). Protecting small cetaceans from coastal development: Impact assessment and mitigation experience in Hong Kong. *Marine Policy*, 33(2), 305-311.
- Jentoft, S., McCay, B. J., & Wilson, D. C. (1998). Social theory and fisheries co-management. *Marine policy*, 22(4-5), 423-436.
- Jentoft, S., & Chuenpagdee, R. (2009). Fisheries and coastal governance as a wicked problem. *Marine policy*, 33(4), 553-560.
- Jones, P. J. (2002). Marine protected area strategies: issues, divergences and the search for middle ground. *Reviews in fish biology and fisheries*, 11, 197-216.
- Jones, P. J., & Burgess, J. (2005). Building partnership capacity for the collaborative management of marine protected areas in the UK: a preliminary analysis. *Journal of environmental management*, 77(3), 227-243.
- Jones, N. A., Ross, H., Lynam, T., Perez, P., & Leitch, A. (2011). Mental models: an interdisciplinary synthesis of theory and methods. *Ecology and society*, 16(1).
- Jones, P. J. (2012). Marine protected areas in the UK: challenges in combining top-down and bottom-up approaches to governance. *Environmental Conservation*, 39(3), 248-258.
- Jones, P. J. (2014). *Governing marine protected areas: resilience through diversity*. Routledge.
- Jones, P. J., & De Santo, E. M. (2016). Viewpoint—Is the race for remote, very large marine protected areas (VLMPAs) taking us down the wrong track?. *Marine Policy*, 73, 231-234.
- Jones, P. J., Lieberknecht, L. M., & Qiu, W. (2016). Marine spatial planning in reality: Introduction to case studies and discussion of findings. *Marine Policy*, 71, 256-264.
- Jones, K. R., Klein, C. J., Halpern, B. S., Venter, O., Grantham, H., et al. (2018). The location and protection status of Earth's diminishing marine wilderness. *Current Biology* 28:2506-2512.e2503. doi: 10.1016/j.cub.2018.06.010
- Jones, L., A. (2021). *Professional Troublemaker: The Fear Fighter Manual*. Penguin Life, USA
- Jordan, A., & Lenschow, A. (2010). Environmental policy integration: a state of the art review. *Environmental policy and governance*, 20(3), 147-158.
- Jordan, A., & Schout, A. (2006). *The coordination of the European Union: Exploring the capacities of networked governance*. Oxford University Press.
- Juntti, M., Russel, D., & Turnpenny, J. (2009). Evidence, politics and power in public policy for the environment. *Environmental Science & Policy*, 12(3), 207-215.
- Kaplowitz, M. D., & Hoehn, J. P. (2001). Do focus groups and individual interviews reveal the same information for natural resource valuation?. *Ecological Economics*, 36(2), 237-247.
- Kanie, N., & Biermann, F. (Eds.). (2017). *Governing through goals: Sustainable development goals as governance innovation*. Mit Press.
- Karlsson-Vinkhuyzen, S., Kok, M. T., Visseren-Hamakers, I. J., & Termeer, C. J. (2017). Mainstreaming biodiversity in economic sectors: An analytical framework. *Biological Conservation*, 210, 145-156.

- Karpouzoglou, T., Dewulf, A., & Clark, J. (2016). Advancing adaptive governance of social-ecological systems through theoretical multiplicity. *Environmental Science & Policy*, 57, 1-9.
- Keith, H., Vardon, M., Stein, J. A., Stein, J. L., & Lindenmayer, D. (2017). Ecosystem accounts define explicit and spatial trade-offs for managing natural resources. *Nature Ecology & Evolution*, 1(11), 1683-1692.
- Kellert, S. R. (1984). Urban American perceptions of animals and the natural environment. *Urban ecology*, 8(3), 209-228.
- Kelly, R., Evans, K., Alexander, K., Bettiol, S., Corney, S., Cullen-Knox, C., ... & Pecl, G. T. (2021). Connecting to the oceans: supporting ocean literacy and public engagement. *Reviews in fish biology and fisheries*, 1-21.
- Kenter, J. O., Bryce, R., Christie, M., Cooper, N., Hockley, N., Irvine, K. N., ... & Watson, V. (2016). Shared values and deliberative valuation: Future directions. *Ecosystem services*, 21, 358-371.
- Kenter, J. O., & O'Connor, S. (2022). The Life Framework of Values and living as nature; towards a full recognition of holistic and relational ontologies. *Sustainability Science*, 17(6), 2529-2542.
- Kerschner, C. (2010). Economic de-growth vs. steady-state economy. *Journal of cleaner production*, 18(6), 544-551.
- Kienast, F., Bolliger, J., Potschin, M., De Groot, R. S., Verburg, P. H., Heller, I., ... & Haines-Young, R. (2009). Assessing landscape functions with broad-scale environmental data: insights gained from a prototype development for Europe. *Environmental management*, 44, 1099-1120.
- Kingdon, J. W., & Stano, E. (1984). *Agendas, alternatives, and public policies* (Vol. 45, pp. 165-169). Boston: Little, Brown.
- Kingston, C., & Caballero, G. (2009). Comparing theories of institutional change. *Journal of Institutional Economics*, 5(2), 151-180.
- Kooiman, J. (2003). *Governing as governance*. Sage.
- Kørnøv, L., & Thissen, W. A. (2000). Rationality in decision-and policy-making: implications for strategic environmental assessment. *Impact assessment and project appraisal*, 18(3), 191-200.
- Kosoy, N., Martinez-Tuna, M., Muradian, R., & Martinez-Alier, J. (2007). Payments for environmental services in watersheds: Insights from a comparative study of three cases in Central America. *Ecological economics*, 61(2-3), 446-455.
- Kosoy, N., & Corbera, E. (2010). Payments for ecosystem services as commodity fetishism. *Ecological economics*, 69(6), 1228-1236.
- Krznaric, R. (2020). *The good ancestor: How to think long term in a short-term world*. Random House.
- Kvale, S. (1996). The 1,000-page question. *Qualitative inquiry*, 2(3), 275-284.
- Kuhn, T. S. (1962). *The structure of scientific revolutions*. University of Chicago press.
- Kukla, A. (2013). *Social constructivism and the philosophy of science*. Routledge.
- Kurtz, C. F., & Snowden, D. J. (2003). The new dynamics of strategy: Sense-making in a complex and complicated world. *IBM systems journal*, 42(3), 462-483.

- Lafferty, W., & Hovden, E. (2003). Environmental policy integration: towards an analytical framework. *Environmental politics*, 12(3), 1-22.
- Lannin, A. (2021) Marine Pioneer Programme (2017 – 2020): Testing delivery of the 25 Year Environment Plan
- La Notte, A., Vallecillo, S., Polce, C., Zulian, G., & Maes, J. (2017). Implementing an EU system of accounting for ecosystems and their services. Initial proposals for the implementation of ecosystem services accounts, EUR, 28681, 1-124.
- Larsen, T. B., & Harrington Jr, J. (2021). A human–environment timeline. *Geographical Review*, 111(1), 95-117.
- Laurans, Y., Rankovic, A., Billé, R., Pirard, R., & Mermet, L. (2013). Use of ecosystem services economic valuation for decision making: questioning a literature blindspot. *Journal of environmental management*, 119, 208-219.
- Leach, J., Mulhall, R.A., Rogers, C.D.F and Bryson, J.R (2019). Reading cities: Developing an urban diagnostics approach for identifying integrated urban problems with application to the city of Birmingham, UK, *Cities* 86 136-144
- Leadley, P. W., Krug, C. B., Alkemade, R., Pereira, H. M., Sumaila, U. R., Walpole, M., ... & Mumby, P. J. (2014, January). Progress towards the Aichi Biodiversity Targets: An assessment of biodiversity trends, policy scenarios and key actions. Secretariat of the Convention on Biological Diversity.
- Lee, M. A. (1993). Mainstreaming human rights. *Peace Review*, 5(1), 71-82.
- Leenhardt, P., Cazalet, B., Salvat, B., Claudet, J., & Feral, F. (2013). The rise of large-scale marine protected areas: Conservation or geopolitics?. *Ocean & Coastal Management*, 85, 112-118.
- Leiss, W. (1974). Critical theory and its future. *Political Theory*, 2(3), 330-349.
- Lele, S. (2021). From wildlife-ism to ecosystem-service-ism to a broader environmentalism. *Environmental Conservation*, 48(1), 5-7.
- Leltz, E. (2022). Nature Based Solutions for Carbon Sequestration and Biodiversity Conservation: Is there a future for solutions that look beyond tree planting for forests and grassy biomes?.
- Leopold, A. (1949). *The Land Ethic: A Sand County Almanac, and Sketches Here and There* (pp. 108-121). Island Press/Center for Resource Economics.
- Lenton, T. M. (2013). Environmental tipping points. *Annual Review of Environment and Resources*, 38, 1-29.
- Le Tissier, M. (2020). Unravelling the relationship between ecosystem-based management, integrated coastal zone management and marine spatial planning. *Ecosystem-based management, ecosystem services and aquatic biodiversity: Theory, tools and applications*, 403-413.
- Lewis-Beck, M., Bryman, A. E., & Liao, T. F. (2003). *The Sage encyclopedia of social science research methods*. Sage Publications.
- Levin, L. A., Amon, D. J., & Lily, H. (2020). Challenges to the sustainability of deep-seabed mining. *Nature Sustainability*, 3(10), 784-794.
- Levy, P. (2003). A methodological framework for practice-based research in networked learning. *Instructional Science*, 31, 87-109.

Levi-Faur, D. (2014). The welfare state: A regulatory perspective. *Public Administration*, 92(3), 599-614.

Lewin, K. (1951). *Theory of Social Science*. New York: Harper and Row.

Lincoln, Y. S. (1995). Emerging criteria for quality in qualitative and interpretive research. *Qualitative inquiry*, 1(3), 275-289.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. sage.

Lindsay, G. (2007). Educational psychology and the effectiveness of inclusive education/mainstreaming. *British journal of educational psychology*, 77(1), 1-24.

Lippitt, W., & Watson, J. (1958). Westley. *The dynamics of planned change*.

Liverman, D. (2004). Who governs, at what scale and at what price? Geography, environmental governance, and the commodification of nature. *Annals of the Association of American Geographers*, 94(4), 734-738.

Lockie, S. (2016). Beyond resilience and systems theory: reclaiming justice in sustainability discourse. *Environmental Sociology*, 2(2), 115-117. Lomborg, B., & Rubin, O. (2002). Limits to growth. *Foreign Policy*, (133), 42-44.

Lovering, J. (2007). The relationship between urban regeneration and neoliberalism: Two presumptuous theories and a research agenda. *International Planning Studies*, 12(4), 343-366.

Lowndes, V., & Wilson, D. (2003). Balancing revisability and robustness? A new institutionalist perspective on local government modernization. *Public Administration*, 81(2), 275-298.

(MA) Millennium Ecosystem Assessment. *Millennium Ecosystem Assessment Synthesis Report*. Millennium Ecosystem Assessment; Island Press: Chicago, IL, USA, 2005

Mace, G. M., Hails, R. S., Cryle, P., Harlow, J., & Clarke, S. J. (2015). Towards a risk register for natural capital. *Journal of Applied Ecology*, 52(3), 641-653.

Madden, F., & McQuinn, B. (2015). Understanding social conflict and complexity in marine conservation. *Human-Wildlife Conflict: Complexity in the Marine Environment*, 3-16.

Madill, A., & Gough, B. (2008). Qualitative research and its place in psychological science. *Psychological methods*, 13(3), 254.

Magdoff, F., & Foster, J. B. (2011). *What every environmentalist needs to know about capitalism: A citizen's guide to capitalism and the environment*. NYU Press.

Maes, J., Teller, A., Erhard, M., Liqueste, C., Braat, L., Berry, P., ... & Bidoglio, G. (2013). Mapping and Assessment of Ecosystems and their Services. An analytical framework for ecosystem assessments under action, 5, 1-58.

Maher, S. M., Fenichel, E. P., Schmitz, O. J., & Adamowicz, W. L. (2020). The economics of conservation debt: a natural capital approach to revealed valuation of ecological dynamics. *Ecological Applications*, 30(6), e02132.

Maltby, E. (2009). The changing wetland paradigm. *The wetlands handbook*, 3-43.

Manfredo, M. J., Teel, T. L., Don Carlos, A. W., Sullivan, L., Bright, A. D., Dietsch, A. M., ... & Fulton, D. (2020). The changing sociocultural context of wildlife conservation. *Conservation Biology*, 34(6), 1549-1559.

- Mansfield, B. (2004). Rules of privatization: contradictions in neoliberal regulation of North Pacific fisheries. *Annals of the Association of American Geographers*, 94(3), 565-584.
- March, J. G. (1994). *Primer on decision making: How decisions happen*. Simon and Schuster.
- Maron, M., Brownlie, S., Bull, J. W., Evans, M. C., von Hase, A., Quétier, F., ... & Gordon, A. (2018). The many meanings of no net loss in environmental policy. *Nature Sustainability*, 1(1), 19-27.
- Martínez-Alier, J., Pascual, U., Vivien, F. D., & Zaccai, E. (2010). Sustainable de-growth: Mapping the context, criticisms and future prospects of an emergent paradigm. *Ecological economics*, 69(9), 1741-1747.
- Mason, P. B. (2019). *'UK Marine Protected Areas: Powerful legal protection or paper parks?'* (Doctoral dissertation, University of Essex).
- Maud, P. R., Irvine, K. N., Dallimer, M., Fish, R., Austen, G. E., & Davies, Z. G. (2020). Do ecosystem service frameworks represent people's values?. *Ecosystem Services*, 46, 101221.
- Mascia, M. B., Brosius, J. P., Dobson, T. A., Forbes, B. C., Horowitz, L., McKean, M. A., & Turner, N. J. (2003). Conservation and the social sciences. *Conservation biology*, 17(3), 649-650.
- Matthews, B., Narwani, A., Hausch, S., Nonaka, E., Peter, H., Yamamichi, M., ... & Turner, C. B. (2011). Toward an integration of evolutionary biology and ecosystem science. *Ecology letters*, 14(7), 690-701.
- Maud, P. R., Irvine, K. N., Dallimer, M., Fish, R., Austen, G. E., & Davies, Z. G. (2020). Do ecosystem service frameworks represent people's values?. *Ecosystem Services*, 46, 101221.
- Max-Neef, M. A. (2005). Foundations of transdisciplinarity. *Ecological economics*, 53(1), 5-16.
- Maxwell, J. (1992). Understanding and validity in qualitative research. *Harvard educational review*, 62(3), 279-301.
- Maxwell, S. M., et al. (2011). Using satellite tracking to optimize protection of long-lived marine species: olive ridley sea turtle conservation in Central Africa. Public Library of Science ONE 6 DOI: 10.1371/journal.pone.0019905
- Marx, K., & Engels, F. (1845). The ruling class and the ruling ideas. *Media and Cultural studies*, 9.
- McAfee, K. (1999). Selling nature to save it? Biodiversity and green developmentalism. *Environment and planning D: society and space*, 17(2), 133-154.
- McAreavey, R. (2006). Getting close to the action: the micro-politics of rural development. *Sociologia Ruralis*, 46(2), 85-103.
- McCarthy, J., & Prudham, S. (2004). Neoliberal nature and the nature of neoliberalism. *Geoforum*, 35(3), 275-283.
- McCauley, D. J. (2006). Selling out on nature. *Nature*, 443(7107), 27-28.
- McClanahan, T. R., & Mangi, S. (2000). Spillover of exploitable fishes from a marine park and its effect on the adjacent fishery. *Ecological applications*, 10(6), 1792-1805.
- McCombs, M. E. Shaw, D. (1972). The agenda-setting function of mass media. *Public Opinion Quarterly* 36 (2) 176–187.
- McCombs, M., & Valenzuela, S. (2020). *Setting the agenda: Mass media and public opinion*. John Wiley & Sons.

- McGinnis, M. D., & Ostrom, E. (2012). Reflections on Vincent Ostrom, public administration, and polycentricity. *Public Administration Review*, 72(1), 15-25.
- McGinity, R., & Salokangas, M. (2014). Introduction: 'embedded research' as an approach into academia for emerging researchers. *Management in Education*, 28(1), 3-5.
- McKenzie, E., Posner, S., Tillmann, P., Bernhardt, J. R., Howard, K., & Rosenthal, A. (2014). Understanding the use of ecosystem service knowledge in decision making: lessons from international experiences of spatial planning. *Environment and Planning C: Government and Policy*, 32(2), 320-340.
- McKinley, E., Aller-Rojas, O., Hattam, C., Germond-Duret, C., San Martín, I. V., Hopkins, C. R., ... & Potts, T. (2019). Charting the course for a blue economy in Peru: a research agenda. *Environment, Development and Sustainability*, 21, 2253-2275.
- McKinley, E., Acott, T., & Stojanovic, T. (2019). Socio-cultural dimensions of marine spatial planning. *Maritime Spatial Planning: past, present, future*, 151-174.
- McKinley, E., & Burdon, D. (2020). Understanding Ocean Literacy and Ocean Climate-Related Behaviour Change in the UK-Work Package 1: Evidence Synthesis. *Hull: Daryl Burdon Ltd. Available online at: <https://darylburdon.co.uk>*.
- McKinley, E., Burdon, D., & Shellock, R. J. (2023). The evolution of ocean literacy: A new framework for the United Nations Ocean Decade and beyond. *Marine Pollution Bulletin*, 186, 114467.
- McLellan, E., MacQueen, K. M., & Neidig, J. L. (2003). Beyond the qualitative interview: Data preparation and transcription. *Field methods*, 15(1), 63-84.
- McLeod, I. M., Purandare, J., Gillies, C., Smith, A., & Burrows, D. (2018). Symposium report: Inaugural Australian Coastal Restoration Symposium. *Ecological Management & Restoration*, 19(1), E1-E5.
- McMorran, Scott A.J and Price, M. (2014) Reconstructing sustainability; participant experiences of community land tenure in North West Scotland, *Journal of Rural Studies* 33 20-31
- McWilliam, W., Brown, R., Eagles, P., & Seasons, M. (2015). Evaluation of planning policy for protecting green infrastructure from loss and degradation due to residential encroachment. *Land Use Policy*, 47, 459-467.
- Meadowcroft, J. (2005). From welfare state to ecostate. *The state and the global ecological crisis*, 3-23.
- Meadows, D. H., Meadows, D. L., Randers, J., & Behrens III, W. W. (1972). The limits to growth-club of Rome.
- Meadows, D. H. (1982). Whole earth models and systems. *CoEvolution Quarterly*, 34, 98-108.
- Meadows, D. (2009). Leverage points: Places to intervene in a system. *Solutions*, 1(1), 41-49.
- Mebratu, D. (1998). Sustainability and sustainable development: historical and conceptual review. *Environmental impact assessment review*, 18(6), 493-520.
- Merchant, C. (1980). The death of nature: Women, ecology, and the scientific revolution.
- Merchant, C. (2006). The scientific revolution and the death of nature. *Isis*, 97(3), 513-533.

Mesarovic, M., & Pestel, E. (1974). *Menschheit am Wendepunkt* (p. 2). Bericht an d. Club of Rome z. Weltlage. Aus d. Amerikan. ubertr. von Hans Dieter Heck u. Walter Stegemann. Stuttgart: Deutsche Verlags-Anstalt.

Milcu, A. I., Hanspach, J., Abson, D., & Fischer, J. (2013). Cultural ecosystem services: a literature review and prospects for future research. *Ecology and society*, 18(3).

Milupi, I. D., Somers, M. J., & Ferguson, J. W. H. (2017). A review of community-based natural resource management.

MMOa (2020). South west inshore and South west offshore marine plan. Draft for consultation. January 2020

MMOb (2020). South west inshore and South west offshore marine plan Technical Annex. Draft for consultation. January 2020 (2020)

Moore, D. (2014). Coercion, consent, and the construction of capitalism in Africa: development studies, political economy, politics and the 'Dark Continent'. *Transformation: Critical Perspectives on Southern Africa*, 84(1), 106-131.

Moore, E. A., & Koontz, T. M. (2003). Research note a typology of collaborative watershed groups: Citizen-based, agency-based, and mixed partnerships. *Society & Natural Resources*, 16(5), 451-460.

Moore, J. K., Doney, S. C., Kleypas, J. A., Glover, D. M., & Fung, I. Y. (2001). An intermediate complexity marine ecosystem model for the global domain. *Deep Sea Research Part II: Topical Studies in Oceanography*, 49(1-3), 403-462

Moore, J. W. (Ed.). (2016). *Anthropocene or capitalocene?: Nature, history, and the crisis of capitalism*. Pm Press.

Morse, J. M., Barrett, M., Mayan, M., Olson, K., & Spiers, J. (2002). Verification strategies for establishing reliability and validity in qualitative research. *International journal of qualitative methods*, 1(2), 13-22.

Morf, A., Kull, M., Piwowarczyk, J., & Gee, K. (2019). Towards a ladder of marine/maritime spatial planning participation. *Maritime Spatial Planning: past, present, future*, 219-243.

Morgan, D. L. (1996). *Focus groups as qualitative research* (Vol. 16). Sage publications.

Morton, S., Berg, A., Levit, L., & Eden, J. (Eds.). (2011). Finding what works in health care: standards for systematic reviews.

Muir's J. book: *My First Summer in the Sierra* (Boston: Houghton Mifflin, 1911), on page 110 of the Sierra Club Books 1988 edition

Muller, H. J. (1971). *The Children of Frankenstein; A Primer on Mode Technology and Human Values*.

Mumford, L. (1956). *The transformations of man*. Routledge.

Muradian, R., Arsel, M., Pellegrini, L., Adaman, F., Aguilar, B., Agarwal, B., ... & Urama, K. (2013). Payments for ecosystem services and the fatal attraction of win-win solutions. *Conservation letters*, 6(4), 274-279.

Muradian, R., & Pascual, U. (2018). A typology of elementary forms of human-nature relations: a contribution to the valuation debate. *Current opinion in environmental sustainability*, 35, 8-14.

- Murray, C. C., Agbayani, S., & Ban, N. C. (2015). Cumulative effects of planned industrial development and climate change on marine ecosystems. *Global Ecology and Conservation*, 4, 110-116.
- Myers, N., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature*, 403(6772), 853-858.
- Næss, P. (2006). Unsustainable growth, unsustainable capitalism. *Journal of Critical Realism*, 5(2), 197-227.
- Naidoo, R., Balmford, A., Costanza, R., Fisher, B., Green, R. E., Lehner, B., ... & Ricketts, T. H. (2008). Global mapping of ecosystem services and conservation priorities. *Proceedings of the National Academy of Sciences*, 105(28), 9495-9500.
- NASA (2022). Sea Level Change. Understanding Sea Level. Available at: <https://sealevel.nasa.gov/understanding-sea-level/global-sea-level/ice-melt> [Accessed November 2022]
- Nasuchon, N., & Charles, A. (2010). Community involvement in fisheries management: experiences in the Gulf of Thailand countries. *Marine Policy*, 34(1), 163-169.
- NCC Natural Capital Committee. (2017). Improving natural capital: an assessment of progress.
- Nayak, P. K., & Berkes, F. (2010). Whose marginalisation? Politics around environmental injustices in India's Chilika lagoon. *Local environment*, 15(6), 553-567.
- NEF (2006) The [un]happy planet index: an index of human wellbeing and environmental impact. New Economics Foundation. Available at: https://neweconomics.org/uploads/files/54928c89090c07a78f_ywm6y59da.pdf [Accessed January 2023]
- New York Times. (2020). How public opinions has moved on black lives matter. <https://www.nytimes.com/interactive/2020/06/10/upshot/black-lives-matter-attitudes.html> [Accessed July, 2020]
- Newman, L., & Dale, A. (2005). Network structure, diversity, and proactive resilience building: a response to Tompkins and Adger. *Ecology and society*, 10(1).
- Nin, A. (1961). *Seduction of the Minotaur*. Denver, Swallow.
- Ngulube, P. (2015). Qualitative data analysis and interpretation: systematic search for meaning. *Addressing research challenges: making headway for developing researchers*, 131, 156.
- Noble, M. M., Harasti, D., Pittock, J., & Doran, B. (2019). Understanding the spatial diversity of social uses, dynamics, and conflicts in marine spatial planning. *Journal of environmental management*, 246, 929-940.
- Nordbeck, R., & Steurer, R. (2016). Multi-sectoral strategies as dead ends of policy integration: Lessons to be learned from sustainable development. *Environment and Planning C: Government and Policy*, 34(4), 737-755.
- Norse, E. A., & Crowder, L. B. (2005). Marine conservation biology: the science of maintaining the sea's biodiversity.
- Nøstbakken, L. (2008). Fisheries law enforcement—A survey of the economic literature. *Marine Policy*, 32(3), 293-300.

- Norton, L. R., Smart, S. M., Maskell, L. C., Henrys, P. A., Wood, C. M., Keith, A. M., ... & Rowland, C. S. (2018). Identifying effective approaches for monitoring national natural capital for policy use. *Ecosystem Services*, 30, 98-106.
- NPPF (2019). National Planning Policy Framework. *Policy*, 2019.
- Nunan, F., Campbell, A., & Foster, E. (2012). Environmental mainstreaming: the organisational challenges of policy integration. *Public Administration and Development*, 32(3), 262-277.
- Nunan, F., Omond, M. A., Nchimbi, A. Y., Mangora, M. M., Kairoe, J. G., Shalli, M. S., & Jiddawi, N. S. (2020). The silos of natural resource governance. *Conservation & Society*, 18(2), 148-160.
- Nylen, W. R. (2002). Testing the empowerment thesis: the participatory budget in Belo Horizonte and Betim, Brazil. *Comparative politics*, 127-145.
- Nyumba, O. T., Wilson, K., Derrick, C. J., & Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. *Methods in Ecology and evolution*, 9(1), 20-32.
- Odum, W. E., & Heald, E. J. (1972). Trophic analyses of an estuarine mangrove community. *Bulletin of Marine Science*, 22(3), 671-738.
- O'Grady, D., Byrne, W., Kelleher, P., O'Callaghan, H., Kenny, K., Heneghan, T., ... & Ryan, F. (2014). A comparative assessment of culture and serology in the diagnosis of brucellosis in dairy cattle. *The Veterinary Journal*, 199(3), 370-375.
- O'Hagan, A. M., Paterson, S., & Le Tissier, M. (2020). Addressing the tangled web of governance mechanisms for land-sea interactions: Assessing implementation challenges across scales. *Marine Policy*, 112, 103715.
- O'Keeffe, J., Pluchinotta, I., De Stercke, S., Hinson, C., Puchol-Salort, P., Mijic, A., ... & Collins, A. M. (2022). Evaluating natural capital performance of urban development through system dynamics: A case study from London. *Science of the Total Environment*, 824, 153673.
- Olsen, S., Tobey, J., & Kerr, M. (1997). A common framework for learning from ICM experience. *Ocean and Coastal Management*, 37(2), 155-174.
- Olson, J. (2011). Understanding and contextualizing social impacts from the privatization of fisheries: An overview. *Ocean & Coastal Management*, 54(5), 353-363.
- Olubunmi, O. A., Xia, P. B., & Skitmore, M. (2016). Green building incentives: A review. *Renewable and Sustainable Energy Reviews*, 59, 1611-1621.
- O'Neill, R. V., DeAngelis, D. L., Waide, J. B., Allen, T. F., & Allen, G. E. (1986). *A hierarchical concept of ecosystems* (No. 23). Princeton University Press.
- ONS (2023) office for National Statistics Natural Capital Accounts: 2021. Online: <https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/uknaturalcapitalaccounts/2021> [Accessed January 2023]
- Ortuño Crespo, G., and Dunn, D. C. (2017). A review of the impacts of fisheries on open-ocean ecosystems. *ICES Journal of Marine Science* 74:2283-2297. Doi: 10.1093/icesjms/fsx084
- Oshionebo, E. (2019). Community development agreements as tools for local participation in natural resource projects in Africa. *Human Rights in the Extractive Industries: Transparency, Participation, Resistance*, 77-109.

- Ostrom, V., Tiebout, C. M., & Warren, R. (1961). The organization of government in metropolitan areas: a theoretical inquiry. *American political science review*, 55(4), 831-842.
- Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge university press.
- Ostrom, E., & Janssen, M. A. (2004). Multi-level governance and resilience of social-ecological systems. In *Globalisation, poverty and conflict* (pp. 239-259). Springer, Dordrecht.
- Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science*, 325(5939), 419-422.
- Packer, Martin (1985), "Hermeneutic Inquiry in the Study of Human Conduct," *American*
- Pagiola, S. (2008). Payments for environmental services in Costa Rica. *Ecological economics*, 65(4), 712-724.
- Pahl-Wostl, C. (2009). A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global environmental change*, 19(3), 354-365.
- Palley, T. I. (2005). From Keynesianism to neoliberalism: Shifting paradigms in economics. *Neoliberalism: A critical reader*, 268.
- Palomo, I., Martín-López, B., Potschin, M., Haines-Young, R., & Montes, C. (2013). National Parks, buffer zones and surrounding lands: Mapping ecosystem service flows. *Ecosystem Services*, 4, 104-116.
- Panaïotov, T. (1994). *Economic instruments for environmental management and sustainable development* (pp. 1-72). Nairobi: UNEP.
- Parlee, C. E., & Wiber, M. G. (2014). Institutional innovation in fisheries governance: adaptive co-management in situations of legal pluralism. *Current Opinion in Environmental Sustainability*, 11, 48-54.
- Parr, A. (2014). *The wrath of capital: Neoliberalism and climate change politics*. Columbia University Press.
- Parsons, T. (1990). Prolegomena to a theory of social institutions. *American sociological review*, 55(3), 319-333.
- Pascual, U., Adams, W. M., Díaz, S., Lele, S., Mace, G. M., & Turnhout, E. (2021). Biodiversity and the challenge of pluralism. *Nature Sustainability*, 4(7), 567-572.
- Passmore, J. (1976). Man's responsibility for nature. *Philosophical Review*, 85(2).
- Patterson, J., Schulz, K., Vervoort, J., Van Der Hel, S., Widerberg, O., Adler, C., ... & Barau, A. (2017). Exploring the governance and politics of transformations towards sustainability. *Environmental Innovation and Societal Transitions*, 24, 1-16.
- Patton, M. Q. (2002). Two decades of developments in qualitative inquiry: A personal, experiential perspective. *Qualitative social work*, 1(3), 261-283.
- Pattberg, P. (2007). Conquest, domination and control: Europe's mastery of nature in historic perspective. *Journal of Political Ecology*, 14(1), 1-9.
- Pearce, D. (1989). *Internationalization of research and development by multinational enterprises*. Springer
- Pearce, D., & Moran, D. (2013). *The economic value of biodiversity*. Routledge.

- Peck, J. (2001). Neoliberalizing states: thin policies/hard outcomes. *Progress in human geography*, 25(3), 445-455.
- Peck, J., & Shu, S. B. (2009). The effect of mere touch on perceived ownership. *Journal of consumer Research*, 36(3), 434-447.
- Percival, R. V., Schroeder, C. H., Miller, A. S., & Leape, J. P. (2021). *Environmental regulation: Law, science, and policy [connected EBook with study center]*. Aspen Publishing.
- Pérez-Ramírez, M., Ponce-Díaz, G., & Lluch-Cota, S. (2012). The role of MSC certification in the empowerment of fishing cooperatives in Mexico: The case of red rock lobster co-managed fishery. *Ocean & coastal management*, 63, 24-29.
- Pérez, R., & Simon, A. (2017). *Heartwired: Human Behaviour, Strategic Opinion Research and the Audacious Pursuit of Social Change*.
- Persson, Å., & Klein, R. J. (2009). 11 Mainstreaming adaptation to climate change in official development assistance. *Climate change and foreign policy: Case studies from east to west*, 162.
- Peters, B. G., & Pierre, J. (1998). Governance without government? Rethinking public administration. *Journal of public administration research and theory*, 8(2), 223-243.
- Petersen, C., & Huntley, B. (2005). *Mainstreaming biodiversity in production landscapes*. Washington, DC: Global Environment Facility.
- Phillips, L., & Ilcan, S. (2004). Capacity-building: the neoliberal governance of development. *Canadian Journal of Development Studies/Revue canadienne d'études du développement*, 25(3), 393-409.
- Picciotto, R. (2002). The logic of mainstreaming: a development evaluation perspective. *Evaluation*, 8(3), 322-339.
- Pinkerton, E. (Ed.). (1989). *Co-operative management of local fisheries: new directions for improved management and community development*. UBC Press.
- Pinkerton, E., & Edwards, D. N. (2009). The elephant in the room: the hidden costs of leasing individual transferable fishing quotas. *Marine Policy*, 33(4), 707-713.
- Pinkerton, E., & Davis, R. (2015). Neoliberalism and the politics of enclosure in North American small-scale fisheries. *Marine Policy*, 61, 303-312.
- Pikitch, E. K., Santora, C., Babcock, E. A., Bakun, A., Bonfil, R., Conover, D. O., ... & Sainsbury, K. J. (2004). Ecosystem-based fishery management. *Science*, 305(5682), 346-347.
- Plamondon, K. M., Bottorff, J. L., & Cole, D. C. (2015). Analyzing data generated through deliberative dialogue: Bringing knowledge translation into qualitative analysis. *Qualitative Health Research*, 25(11), 1529-1539.
- Plamondon, K., & Caxaj, S. (2018). Toward Relational Practices for Enabling Knowledge-to-Action in Health Systems. *Advances in Nursing Science*, 41(1), 18-29.
- Plant, R., & Ryan, P. (2013). Ecosystem services as a practicable concept for natural resource management: some lessons from Australia. *International Journal of Biodiversity Science, Ecosystem Services & Management*, 9(1), 44-53.
- Plummer, R., & Armitage, D. (2010). *Integrating perspectives on adaptive capacity and environmental governance* (pp. 1-19). Springer Berlin Heidelberg.

- Poloczanska, E. S., Burrows, M. T., Brown, C. J., García Molinos, J., Halpern, B. S., Hoegh-Guldberg, O., ... & Sydeman, W. J. (2016). Responses of marine organisms to climate change across oceans. *Frontiers in Marine Science*, 62.
- Ponting, C. (1991). *A green history of the world* (pp. 1-7). London: Sinclair-Stevenson.
- Porritt, J. (2005) *Capitalism as if the world matters*, London: Earthscan.
- Porritt, J. (2012). *Capitalism as if the World Matters*. Routledge.
- Posner, S. M., McKenzie, E., & Ricketts, T. H. (2016). Policy impacts of ecosystem services knowledge. *Proceedings of the National Academy of Sciences*, 113(7), 1760-1765.
- Potschin, M., & Haines-Young, R. (2013). Landscapes, sustainability and the place-based analysis of ecosystem services. *Landscape Ecology*, 28, 1053-1065.
- Potts, J., Lynch, M., Wilkings, A., Huppé, G. A., Cunningham, M., & Voora, V. (2014). The state of sustainability initiatives review 2014: Standards and the green economy.
- Potts, T., Pita, C., O'Higgins, T., & Mee, L. (2016). Who cares? European attitudes towards marine and coastal environments. *Marine Policy*, 72, 59-66.
- Prager, K., & Freese, J. (2009). Stakeholder involvement in agri-environmental policy making—learning from a local-and a state-level approach in Germany. *Journal of environmental management*, 90(2), 1154-1167.
- Priestley, M., & Roulstone, A. (2009). Targeting and mainstreaming disability in the 2008-2010 National Reform Programmes for Growth and Jobs. *Academic Network of European Disability Experts, University of Leeds*, 4-5
- Queirós, A., Faria, D., & Almeida, F. (2017). Strengths and limitations of qualitative and quantitative research methods. *European journal of education studies*.
- Raffaelli, D., & White, P. C. (2013). Ecosystems and their services in a changing world: an ecological perspective. In *Advances in ecological research* (Vol. 48, pp. 1-70). Academic Press.
- Ram-Bidesi, V. (2015). Recognizing the role of women in supporting marine stewardship in the Pacific Islands. *Marine Policy*, 59, 1-8.
- Rand, A., Branden, N., Greenspan, A., & Hessen, R. (1986). *Capitalism: The unknown ideal*. Penguin.
- Rangel, A., Camerer, C., & Montague, P. R. (2008). A framework for studying the neurobiology of value-based decision making. *Nature reviews neuroscience*, 9(7), 545-556.
- Raworth, K. (2017). *Doughnut economics: seven ways to think like a 21st-century economist*. Chelsea Green Publishing.
- Raudsepp-Hearne, C., Peterson, G. D., & Bennett, E. M. (2010). Ecosystem service bundles for analyzing tradeoffs in diverse landscapes. *Proceedings of the National Academy of Sciences*, 107(11), 5242-5247.
- Raworth, K. (2017). *Doughnut economics: seven ways to think like a 21st-century economist*. Chelsea Green Publishing.
- Rayner, J., & Howlett, M. (2009). Conclusion: Governance arrangements and policy capacity for policy integration. *Policy and Society*, 28(2), 165-172.
- Ray, C. (1970). Ecology, law, and the 'marine revolution'. *Biological Conservation*, 3(1), 7-17.

- Ray, R. D. (1998). Ocean self-attraction and loading in numerical tidal models. *Marine Geodesy*, 21(3), 181-192.
- Ray, G. C., & McCormick-Ray, J. (2013). *Marine conservation: science, policy, and management*. John Wiley & Sons.
- Raymond, C. M., Bryan, B. A., MacDonald, D. H., Cast, A., Strathearn, S., Grandgirard, A., & Kalivas, T. (2009). Mapping community values for natural capital and ecosystem services. *Ecological economics*, 68(5), 1301-1315.
- Reason, P. (1994). Three approaches to participative inquiry.
- Redford, K. H., & Adams, W. M. (2009). Payment for ecosystem services and the challenge of saving nature. *Conservation biology*, 23(4), 785-787.
- Rebellion, E. (2019). *This is not a drill: an extinction Rebellion handbook*. Penguin UK.
- Reed, M. S. (2008). Stakeholder participation for environmental management: a literature review. *Biological conservation*, 141(10), 2417-2431.
- Reed, M. S., Evely, A. C., Cundill, G., Fazey, I., Glass, J., Laing, A., ... & Stringer, L. C. (2010). What is social learning?. *Ecology and society*, 15(4).
- Reed, M. S., Kenter, J., Bonn, A., Broad, K., Burt, T. P., Fazey, I. R., ... & Ravera, F. (2013). Participatory scenario development for environmental management: A methodological framework illustrated with experience from the UK uplands. *Journal of environmental management*, 128, 345-362.
- Reed, M. S., Stringer, L. C., Dougill, A. J., Perkins, J. S., Atlhopheng, J. R., Mulale, K., & Favretto, N. (2015). Reorienting land degradation towards sustainable land management: Linking sustainable livelihoods with ecosystem services in rangeland systems. *Journal of environmental management*, 151, 472-485.
- Reed, M. S., Vella, S., Challies, E., De Vente, J., Frewer, L., Hohenwallner-Ries, D., ... & van Delden, H. (2018). A theory of participation: what makes stakeholder and public engagement in environmental management work?. *Restoration ecology*, 26, S7-S17.
- Rees, S. E., Rodwell, L. D., Searle, S., & Bell, A. (2013). Identifying the issues and options for managing the social impacts of Marine Protected Areas on a small fishing community. *Fisheries Research*, 146, 51-58.
- Rees, S., Ashley, M., & Cameron, A. (2019). North Devon Marine Pioneer 2: A Natural Capital Asset and Risk Register.
- Rees, S. E., Ashley, M., Cameron, A., Mullier, T., Ingle, C., Oates, J., ... & Attrill, M. J. (2022). A marine natural capital asset and risk register—Towards securing the benefits from marine systems and linked ecosystem services. *Journal of Applied Ecology*, 59(4), 1098-1109.
- Refsum Jensenius, A., (2012) Disciplinary's: intra, cross, multi, inter, trans. Online, Available: <http://www.arj.no/2012/03/12/disciplinaries-2/> [Accessed April 2018]
- Richards, C., Carter, C., & Sherlock, K. (2004). *Practical approaches to participation*. Aberdeen: Macaulay Institute.
- Richardson, C. A., & Rabiee, F. (2001). A question of access: an exploration of the factors that influence the health of young males aged 15 to 19 living in Corby and their use of health care services. *Health education journal*, 60(1), 3-16.
- Riisager-Simonsen, C., Fabi, G., van Hoof, L., Holmgren, N., Marino, G., & Lisbjerg, D. (2022). Marine nature-based solutions: Where societal challenges and ecosystem requirements meet the potential of our oceans. *Marine Policy*, 144, 105198.

- Robbins, S. P., & Judge, T. (2009). *Organizational behavior*. Pearson South Africa.
- Robert, K. W., Parris, T. M., & Leiserowitz, A. A. (2005). What is sustainable development? Goals, indicators, values, and practice. *Environment: science and policy for sustainable development*, 47(3), 8-21.
- Rochefort, D. A., & Cobb, R. W. (1993). Problem definition, agenda access, and policy choice. *Policy studies journal*, 21(1), 56-71.
- Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F. S., Lambin, E. F., ... & Foley, J. A. (2009). A safe operating space for humanity. *nature*, 461(7263), 472-475.
- Rodriguez, N. J. (2017). A comparative analysis of holistic marine management regimes and ecosystem approach in marine spatial planning in developed countries. *Ocean & coastal management*, 137, 185-197.
- Rogers, C. R. (1951). *Client-centered therapy: Its current practice, implications, and theory, with chapters*. Boston, MA: Houghton Mifflin.
- Rogers, E. M. (2003). *Diffusion of innovations*. Simon and Schuster.
- Rose, K. A., Allen, J. I., Artioli, Y., Barange, M., Blackford, J., Carlotti, F., ... & Zhou, M. (2010). End-to-end models for the analysis of marine ecosystems: challenges, issues, and next steps. *Marine and Coastal Fisheries*, 2(1), 115-130.
- Ross, K., & Mitchell, C. (2018). Transforming transdisciplinarity: an expansion of strong transdisciplinarity and its centrality in enabling effective collaboration. *Transdisciplinary theory, practice and education: the art of collaborative research and collective learning*, 39-56.
- Rotter, A., Barbier, M., Bertoni, F., Bones, A. M., Cancela, M. L., Carlsson, J., ... & Vasquez, M. I. (2021). The essentials of marine biotechnology. *Frontiers In marine science*, 8, 158.
- Rubin, H. J., & Rubin, I. S. (2011). *Qualitative interviewing: The art of hearing data*. sage.
- Ruckelshaus, M. H., Jackson, S. T., Mooney, H. A., Jacobs, K. L., Kassam, K. A. S., Arroyo, M. T., ... & Ouyang, Z. (2020). The IPBES global assessment: pathways to action. *Trends in Ecology & Evolution*, 35(5), 407-414.
- Ruddle, K., & Hickey, F. R. (2008). Accounting for the mismanagement of tropical nearshore fisheries. *Environment, Development and Sustainability*, 10, 565-589.
- Ruiz-Frau, A., Edwards-Jones, G., & Kaiser, M. J. (2011). Mapping stakeholder values for coastal zone management. *Marine Ecology Progress Series*, 434, 239-249.
- Runhaar, H., Driessen, P., Uittenbroek, C., (2014). Towards a systematic framework for the analysis of environmental policy integration. *Environmental Policy and Government*, 24 (4), 233–246
- Russell, J. E. (2010). *A study of the materials and techniques of Francis Bacon (1909–1992)*. University of Northumbria at Newcastle (United Kingdom).
- Russel, D. J., den Uyl, R. M., & De Vito, L. (2018). Understanding policy integration in the EU—Insights from a multi-level lens on climate adaptation and the EU's coastal and marine policy. *Environmental science & policy*, 82, 44-51.
- Russell, M., Rhodes, C., Van Houtven, G., Sinha, P., Warnell, K., & Harwell, M. C. (2020). Ecosystem-based management and natural capital accounting. *Ecosystem-based management, ecosystem services and aquatic biodiversity: Theory, tools and applications*, 149-163.

- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology*, 25(1), 54-67.
- Sagoff, M. (2011). The quantification and valuation of ecosystem services. *Ecological Economics*, 70(3), 497-502
- Sakai, Y., Yagi, N., & Sumaila, U. R. (2019). Fishery subsidies: the interaction between science and policy. *Fisheries science*, 85, 439-447.
- Sala, E., & Giakoumi, S. (2018). No-take marine reserves are the most effective protected areas in the ocean. *ICES Journal of Marine Science*, 75(3), 1166-1168.
- Sale, P. F., Agardy, T., Ainsworth, C. H., Feist, B. E., Bell, J. D., Christie, P., ... & Sheppard, C. R. (2014). Transforming management of tropical coastal seas to cope with challenges of the 21st century. *Marine Pollution Bulletin*, 85(1), 8-23.
- Salleh, A., & Ahmad, A. (2010). Human governance: Bringing the meaning of integrity in the life of professional accountants. *Articles of Merit E-book*, 30-39.
- Sand, P. H. (1992). UNCED and the development of international environmental law. *J. Nat. Resources & Env'tl. L.*, 8, 209.
- Sandbach, F. (1978). The rise and fall of the limits to growth debate. *Social Studies of Science*, 8(4), 495-520.
- Sandbrook, C., Adams, W. M., Büscher, B., & Vira, B. (2013). Social research and biodiversity conservation. *Conservation Biology*, 27(6), 1487-1490.
- Santos, I. R., Peterson, R. N., Eyre, B. D., & Burnett, W. C. (2010). Significant lateral inputs of fresh groundwater into a stratified tropical estuary: evidence from radon and radium isotopes. *Marine Chemistry*, 121(1-4), 37-48.
- Santos, R., SchrÖter-Schlaack, C., Antunes, P., Ring, I., & Clemente, P. (2015). Reviewing the role of habitat banking and tradable development rights in the conservation policy mix. *Environmental Conservation*, 42(4), 294-305.
- Santos, C. F., Ehler, C. N., Agardy, T., Andrade, F., Orbach, M. K., & Crowder, L. B. (2019). Marine spatial planning. In *World seas: An environmental evaluation* (pp. 571-592). Academic Press.
- Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students*. Pearson education.
- Saunders, M. E., & Luck, G. W. (2016). Limitations of the ecosystem services versus disservices dichotomy. *Conservation biology*, 30(6), 1363-1365.
- Scarff, G., Fitzsimmons, C., & Gray, T. (2015). The new mode of marine planning in the UK: Aspirations and challenges. *Marine Policy*, 51, 96-102.
- Scarlett, L., & McKinney, M. (2016). Connecting people and places: the emerging role of network governance in large landscape conservation. *Frontiers in Ecology and the Environment*, 14(3), 116-125.
- Schoijet, M. (1999). Limits to Growth and the Rise of Catastrophism. *Environmental History*, 4(4), 515-530.
- Schmelzer, M. (2016). *The hegemony of growth: the OECD and the making of the economic growth paradigm*. Cambridge University Press.

- Schmelzer, M. (2017). The growth paradigm: History, hegemony, and the contested making of economic growthmanship. In *Routledge Handbook of the History of Sustainability* (pp. 164-186). Routledge.
- Schneider, B., Ehrhart, M. G., & Macey, W. H. (2011). Organizational climate research. The handbook of organizational culture and climate, 29, 12169-012.
- Schultz, L., Folke, C., Österblom, H., & Olsson, P. (2015). Adaptive governance, ecosystem management, and natural capital. *Proceedings of the National Academy of Sciences*, 112(24), 7369-7374.
- Schumacher, E. F. (1973). *Small is beautiful: economics as if people mattered*. London: Blond & Briggs.
- Schumpeter, J.A. (1943), *Capitalism, Socialism and Democracy*, London: Allen and Unwin (originally published in the USA in 1942; reprinted by Routledge, London in 1994).
- Schwandt, T. A. (1994). Constructivist, interpretivist approaches to human inquiry. *Handbook of qualitative research*, 1, 118-137.
- Scott, A. J. (2012). Partnerships: Pandors box or pancea for rural development? Working paper. Series 11. Birmingham City University
- Scott, A. J., Carter, C., Reed, M. R., Larkham, P., Adams, D., Morton, N., ... & Forster, R. (2013). Disintegrated development at the rural–urban fringe: Re-connecting spatial planning theory and practice. *Progress in planning*, 83, 1-52.
- Scott, A.J., Carter, C., Hölzinger, O., Everard, M., Raffaelli, D., Hardman, M., Baker, J., Glass, J., Leach, K., Wakeford, R., Reed, M., Grace, M., Sunderland, T., Waters, R., Corstanje, R. Grayson, N., Harris, J, and Taft, A. (2014). Tools – Applications, Benefits and Linkages for Ecosystem Science (TABLES), *Final Report to the UNEPWMC Research Councils UK, Welsh Government and Defra*. June 2014, UNEP-WCMC, LWEC.
- Scott, A., Carter, C., Hardman, M., Grayson, N., & Slaney, T. (2018). Mainstreaming ecosystem science in spatial planning practice: Exploiting a hybrid opportunity space. *Land Use Policy*, 70, 232-246.
- Scott A.J. (2020). Mainstreaming the Environment in Planning Policy and Decision Making (in Davoudi, S. et al (2020) eds *Routledge Companion to Environmental Planning and Sustainability* Chapter 4.9 420-434
- Scott, A. J., & Hislop, M. (2020). How can we assess what good green infrastructure policy looks like? A case study of National Planning Guidance in England and Wales. Expert Policy Brief PERFECT project, TCPA. <https://www.interregeurope.eu/perfect/news/news-article/9015/what-does-good-gi-policy-look-like/>
- Scott, A.J., Sinnett, D., Smith, A., Baker, J., Berry, P., Wentworth, J., Girvan, M., Clubb, S., Butterworth, T., Rogers, C., Harris, J., Chisholm, A., Harris, J.A.C., Feith, J. and Shaffer, P. (2020) Understanding our growing environmental vocabulary in England: Connecting Green Infrastructure, Natural Capital, Ecosystem Services and Net Gain(s) within the English Planning System. <https://mainstreaminggreeninfrastructure.com/project-page.php?understanding-our-growing-environmental-vocabulary-in-england> [accessed 1 June 2021]
- Scott, A., Holtby, R., East, H., & Lannin, A. (2022). Mainstreaming the Environment: Exploring pathways and narratives to improve policy and decision-making. *People and Nature*, 4(1), 201-217.
- Schwartz, M. S., & Cragg, W. (2017). *Corporate social responsibility*. Routledge.

- Scoville-Simonds, M., Jamali, H., & Hufty, M. (2020). The hazards of mainstreaming: Climate change adaptation politics in three dimensions. *World Development*, 125, 104683.
- Scruggs, T. E., & Mastropieri, M. A. (1996). Teacher perceptions of mainstreaming/inclusion, 1958–1995: A research synthesis. *Exceptional children*, 63(1), 59-74.
- Schultz, L., Folke, C., Österblom, H., & Olsson, P. (2015). Adaptive governance, ecosystem management, and natural capital. *Proceedings of the National Academy of Sciences*, 112(24), 7369-7374.
- Segi, S. (2014). Protecting or pilfering? Neoliberal conservationist marine protected areas in the experience of coastal Granada, the Philippines. *Human ecology*, 42, 565-575.
- Seyfang, G., & Smith, A. (2007). Grassroots innovations for sustainable development: Towards a new research and policy agenda. *Environmental politics*, 16(4), 584-603.
- Sevinc, D., Scott A.J., Bryson, J., Leach J. and Hayhow, S. (2020). Playing around with Urban Placemakers: Exploring Board Games as Effective Participatory Tools for Diagnosing Urban Challenges *Regional Studies* (in press)
- Sherlock, K. L., Kirk, E. A., & Reeves, A. D. (2004). Just the usual suspects? Partnerships and environmental regulation. *Environment and Planning C: Government and Policy*, 22(5), 651-666.
- Sharma, S., & Chatterjee, S. (2017). Microplastic pollution, a threat to marine ecosystem and human health: a short review. *Environmental Science and Pollution Research*, 24(27), 21530-21547.
- Shucksmith, R., Stojanovic, T., Slater, A. M., Withouck, I., & Allan, K. (2020). Using marine planning to balance competing demands on the marine environment: International comparisons.
- Shipman, B., & Stojanovic, T. (2007). Facts, fictions, and failures of integrated coastal zone management in Europe. *Coastal management*, 35(2-3), 375-398.
- Schumacher, E. F. (1973). *Small is beautiful: economics as if people mattered*. London: Blond & Briggs.
- Shumway, N., Bell-James, J., Fitzsimons, J. A., Foster, R., Gillies, C., & Lovelock, C. E. (2021). Policy solutions to facilitate restoration in coastal marine environments. *Marine Policy*, 134, 104789.
- Smith, N. (2010). *Uneven development: Nature, capital, and the production of space*. University of Georgia Press
- Silver, J. J., Gray, N. J., Campbell, L. M., Fairbanks, L. W., & Gruby, R. L. (2015). Blue economy and competing discourses in international oceans governance. *The Journal of Environment & Development*, 24(2), 135-160.
- Singhal, G., Dibua, O., Murray, D., Culembourg, L., Erb, P., Wensel, E., & Makogon, T. (2019). Review of Technology Status and Challenges Associated with Ultra Deep Water Developments. In *Offshore Technology Conference*. OnePetro.
- Slater, A. M., & Claydon, J. (2020). Marine spatial planning in the UK: a review of the progress and effectiveness of the plans and their policies. *Environmental Law Review*, 22(2), 85-107.
- Slocumbe, D. S. (1993). Implementing ecosystem-based management. *BioScience*, 43(9), 612-622.
- Slocumbe, D. S. (1993a). Environmental planning, ecosystem science, and ecosystem approaches for integrating environment and development. *Environmental management*, 17, 289-303.

- Slocombe, D. S. (1998). Lessons from experience with ecosystem-based management. *Landscape and Urban Planning*, 40(1-3), 31-39.
- Smith, A. (1937). *The wealth of nations [1776]* (Vol. 11937). na.
- Smith, A., & Raven, R. (2012). What is protective space? Reconsidering niches in transitions to sustainability. *Research policy*, 41(6), 1025-1036.
- Smith, H. D., Maes, F., Stojanovic, T. A., & Ballinger, R. C. (2011). The integration of land and marine spatial planning. *Journal of Coastal Conservation*, 15, 291-303.
- Smoliner, C., Häberli, R., & Welti, M. (2001). Mainstreaming transdisciplinarity: A research-political campaign. *Transdisciplinarity: Joint Problem Solving among Science, Technology, and Society: An Effective Way for Managing Complexity*, 263-271.
- Smythe, T. C. (2017). Marine spatial planning as a tool for regional ocean governance?: An analysis of the New England ocean planning network. *Ocean & Coastal Management*, 135, 11-24.
- Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. (2007). Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Miller (eds.) Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Solow, R. M. (1974). The economics of resources or the resources of economics. In *Classic papers in natural resource economics* (pp. 257-276). Palgrave Macmillan, London.
- Soma, K., van Tatenhove, J., & van Leeuwen, J. (2015). Marine Governance in a European context: Regionalization, integration and cooperation for ecosystem-based management. *Ocean & Coastal Management*, 117, 4-13.
- Somers, M. J. (2001). Ethical codes of conduct and organizational context: A study of the relationship between codes of conduct, employee behavior and organizational values. *Journal of Business Ethics*, 30, 185-195.
- Sommerville, M. M., Jones, J. P., & Milner-Gulland, E. J. (2009). A revised conceptual framework for payments for environmental services. *Ecology and society*, 14(2).
- Song, J., Price, D. J., Guvenen, F., Bloom, N., & Von Wachter, T. (2019). Firming up inequality. *The Quarterly journal of economics*, 134(1), 1-50.
- Sorensen, J. (1997). National and international efforts at integrated coastal management: definitions, achievements, and lessons. *Coastal management*, 25(1), 3-41.
- Sorrell, S., & O'Malley, E. (2004). The economics of energy efficiency. *Books*.
- Spash, C. L. (2008). How much is that ecosystem in the window? The one with the bio-diverse trail. *Environmental values*, 17(2), 259-284.
- Spijkerboer, R. C., Zuidema, C., Busscher, T., & Arts, J. (2020). The performance of marine spatial planning in coordinating offshore wind energy with other sea-uses: The case of the Dutch North Sea. *Marine Policy*, 115, 103860.
- SRI (2022) Shark finning. Available at: <https://www.sharks.org/shark-finning>
- Stachowicz, J. J., Bruno, J. F., & Duffy, J. E. (2007). Understanding the effects of marine biodiversity on communities and ecosystems. *Annu. Rev. Ecol. Evol. Syst.*, 38, 739-766.
- Stavins, R. N. (2003). Experience with market-based environmental policy instruments. In *Handbook of environmental economics* (Vol. 1, pp. 355-435). Elsevier.

- Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., ... & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, 347(6223), 1259855.
- Stephenson, R. L., Hobday, A. J., Cvitanovic, C., Alexander, K. A., Begg, G. A., Bustamante, R. H., ... & Ward, T. M. (2019). A practical framework for implementing and evaluating integrated management of marine activities. *Ocean & Coastal Management*, 177, 127-138.
- Stember, M. (1991). Advancing the social sciences through the interdisciplinary enterprise. *The Social Science Journal*, 28(1), 1-14.
- Sterman, J. D. (1994). Learning in and about complex systems. *System dynamics review*, 10(2-3), 291-330.
- Stern, P. C. (2000). New environmental theories: toward a coherent theory of environmentally significant behavior. *Journal of social issues*, 56(3), 407-424.
- Steurer, R. (2013). Disentangling governance: a synoptic view of regulation by government, business and civil society. *Policy Sciences*, 46, 387-410.
- Stevens, C., & Kanie, N. (2016). The transformative potential of the sustainable development goals (SDGs). *International Environmental Agreements: Politics, Law and Economics*, 16, 393-396.
- Steynor, A., Lee, J., & Davison, A. (2020). Transdisciplinary co-production of climate services: a focus on process. *Social Dynamics*, 46(3), 414-433.
- Stoll-Kleemann, S. (2019). Feasible options for behavior change toward more effective ocean literacy: a systematic review. *Frontiers in Marine Science*, 6, 273.
- Stojanovic, T., Ballinger, R. C., & Lalwani, C. S. (2004). Successful integrated coastal management: measuring it with research and contributing to wise practice. *Ocean & Coastal Management*, 47(5-6), 273-298.
- Stojanovic, T., & Barker, N. (2008). Improving governance through local coastal partnerships in the UK. *Geographical Journal*, 174(4), 344-360.
- Sweezy, P. M. (1943). Professor Schumpeter's theory of innovation. *The review of economic statistics*, 93-96.
- Sumaila, U. R., & Pauly, D. (2007). All fishing nations must unite to cut subsidies. *Nature*, 450(7172), 945-945.
- Sullivan, L. M. (2020). *Wildlife Governance in an Era of Social Change: How Science, Politics, and Culture Influence Conservation Governance* (Doctoral dissertation, Colorado State University).
- Sumaila, U. R., Tai, T. C., Lam, V. W. Y., Cheung, W. W. L., Bailey, M., et al. (2019). Benefits of the Paris Agreement to ocean life, economies, and people. *Science Advances* 5:eaau3855. doi: 10.1126/sciadv.aau3855.
- Swyngedouw, E. (2007). The post-political city. *Urban politics now. Re-imagining democracy in the neo-liberal city*, 58-76.
- Tacon, A. G. (2020). Trends in global aquaculture and aquafeed production: 2000–2017. *Reviews in Fisheries Science & Aquaculture*, 28(1), 43-56.
- Taljaard, S., Slinger, J. H., Morant, P. D., Theron, A. K., Van Niekerk, L., & van der Merwe, J. (2012). Implementing integrated coastal management in a sector-based governance system. *Ocean & Coastal Management*, 67, 39-53.

- Taylor, N. (2010). What is this thing called spatial planning? An analysis of the British government's view. *The Town Planning Review*, 193-208.
- Thekaekara, T. (2020). Living with elephants: Indigenous world-views. In *The Routledge Handbook of Indigenous Environmental Knowledge* (pp. 266-274). Routledge.
- Thomas, L., MacMillan, J., McColl, E., Hale, C., & Bond, S. (1995). Comparison of focus group and individual interview methodology in examining patient satisfaction with nursing care. *Social Sciences in Health*, 1(4), 206-220.
- Thomson, R. E., & Emery, W. J. (2014). *Data analysis methods in physical oceanography*. Newnes
- Thorne-Miller, B. (1999). *The living ocean: understanding and protecting marine biodiversity*. Island Press.
- Toropova, C., Meliane, I., Laffoley, D., Matthews, E., & Spalding, M. (2010). Global ocean protection: present status and future possibilities. IUCN.
- Tosun, J., & Leininger, J. (2017). Governing the interlinkages between the sustainable development goals: Approaches to attain policy integration. *Global Challenges*, 1(9), 1700036.
- Trantas, N. (2021). Could "degrowth" have the same fate as "sustainable development"? A discussion on passive revolution in the Anthropocene age. *Journal of Political Ecology*, 28(1), 224-245.
- Treib, O., Bähr, H., & Falkner, G. (2007). Modes of governance: towards a conceptual clarification. *Journal of European public policy*, 14(1), 1-20.
- Tress, B., Tress, G., & Fry, G. (2005). Defining concepts and the process of knowledge production in integrative research. *From landscape research to landscape planning: Aspects of integration, education and application*, 12, 13-26.
- Treasury, H. M. (2018). *Tackling the Plastic Problem. Using the Tax System or Charges to Address Single-Use Plastic Waste*. HM Treasury, UK https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/690293/PU2154_Call_for_evidence_plastics_web.pdf.
- Trevino, L. K. (1986). Ethical decision making in organizations: A person-situation interactionist model. *Academy of management Review*, 11(3), 601-617.
- Trouillet, B. (2020). Reinventing marine spatial planning: a critical review of initiatives worldwide. *Journal of Environmental Policy & Planning*, 22(4), 441-459.
- Turner, R. S. (2008). *Neo-liberal ideology: History, concepts and policies*. Edinburgh University Press.
- Turner, R. K., & Daily, G. C. (2008). The ecosystem services framework and natural capital conservation. *Environmental and resource economics*, 39(1), 25-35.
- Turner, B., Devisscher, T., Chabaneix, N., Woroniecki, S., Messier, C., & Seddon, N. (2022). The role of nature-based solutions in supporting social-ecological resilience for climate change adaptation. *Annual Review of Environment and Resources*, 47, 123-148.
- Turnpenny, J., Nilsson, M., Russel, D., Jordan, A., Hertin, J., & Nykvist, B. (2008). Why is integrating policy assessment so hard? A comparative analysis of the institutional capacities and constraints. *Journal of Environmental Planning and management*, 51(6), 759-775.

- Turnpenny, J., Russel, D., & Jordan, A. (2014). The challenge of embedding an ecosystem services approach: patterns of knowledge utilisation in public policy appraisal. *Environment and Planning C: Government and Policy*, 32(2), 247-262.
- UKNEA (2011). The UK National Ecosystem Assessment: Synthesis of the Key Findings, UNEP-WCMC, Cambridge,
- Uittenbroek, C. J., Janssen-Jansen, L. B., Spit, T. J., Salet, W. G., & Runhaar, H. A. (2014). Political commitment in organising municipal responses to climate adaptation: the dedicated approach versus the mainstreaming approach. *Environmental Politics*, 23(6), 1043-1063.
- Uittenbroek, C. (2014). *How mainstream is mainstreaming?: The integration of climate adaptation into urban policy*. Utrecht University.
- van Rijn, T., & Wakefield, J. (2020). Post-Brexit: Untangling the fishing mesh. *Maastricht Journal of European and Comparative Law*, 27(5), 660-683.
- Van den Bergh, J. C. (2011). Environment versus growth—A criticism of “degrowth” and a plea for “a-growth”. *Ecological economics*, 70(5), 881-890.
- van der Jagt, A. P., Buijs, A., Dobbs, C., van Lierop, M., Pauleit, S., Randrup, T. B., & Wild, T. (2023). An action framework for the participatory assessment of nature-based solutions in cities. *Ambio*, 52(1), 54-67.
- Vakulchuk, R., Overland, I., & Scholten, D. (2020). Renewable energy and geopolitics: A review. *Renewable and sustainable energy reviews*, 122, 109547.
- Van Tatenhove, J. P. (2013). How to turn the tide: developing legitimate marine governance arrangements at the level of the regional seas. *Ocean & Coastal Management*, 71, 296-304.
- Van Dyke, F. (2008). *Conservation biology: foundations, concepts, applications*. Springer Science & Business Media.
- Vázquez-Rowe, I. (2020). A fine kettle of fish: the fishing industry and environmental impacts. *Current Opinion in Environmental Science & Health*, 13, 1-5.
- Veitayaki, J., Aalbersberg, B., Tawake, A., Rupeni, E., & Tabunakawai, K. (2003). Mainstreaming resource conservation: the Fiji Locally Managed Marine Areas network and national policy development. *Innovative governance: indigenous peoples, local communities, and protected areas*, 105-123.
- Veitch, L., Dulvy, N. K., Koldewey, H., Lieberman, S., Pauly, D., Roberts, C. M., ... & Baillie, J. E. (2012). Avoiding empty ocean commitments at Rio+ 20. *Science*, 336(6087), 1383-1385
- Veldman JW et al. (2015) Where tree planting and forest expansion are bad for biodiversity and ecosystem services. *BioScience* 65, 1011–1018. (doi:10.1093/biosci/biv118)
- Victor, P. A. (2012). Growth, degrowth and climate change: A scenario analysis. *Ecological economics*, 84, 206-212.
- Vierros, M. (2017). Global Marine Governance and Oceans Management for the Achievement of SDG 14. *UN Chronicle*, 54(1/2), 1.
- Vindrola-Padros, C., Pape, T., Utley, M., & Fulop, N. J. (2017). The role of embedded research in quality improvement: a narrative review. *BMJ Quality & Safety*, 26(1), 70-80.
- Wahyuni, D. (2012). The research design maze: Understanding paradigms, cases, methods and methodologies.

- Walby, S. (2005). Gender mainstreaming: Productive tensions in theory and practice. *Social Politics: International Studies in Gender, State & Society*, 12(3), 321-343.
- Wallerstein, I. M. (1986). *Africa and the modern world*. Africa World Press.
- Walsh, P. E. (2017). *Local governance and public policy: the dynamics of renewing disadvantaged neighbourhoods* (Doctoral dissertation, Queensland University of Technology).
- Wamsler, C., Wickenberg, B., Hanson, H., Olsson, J. A., Stålhammar, S., Björn, H., ... & Zelmanow, F. (2020). Environmental and climate policy integration: Targeted strategies for overcoming barriers to nature-based solutions and climate change adaptation. *Journal of Cleaner Production*, 247, 119154.
- Wanner, T. (2015). The new 'passive revolution' of the green economy and growth discourse: Maintaining the 'sustainable development' of neoliberal capitalism. *New Political Economy*, 20(1), 21-41.
- Waylen, K. A., Hastings, E. J., Banks, E. A., Holstead, K. L., Irvine, R. J., & Blackstock, K. L. (2014). The need to disentangle key concepts from ecosystem-approach jargon. *Conservation Biology*, 28(5), 1215-1224.
- Weathers, K. C., Strayer, D. L., & Likens, G. E. (Eds.). (2021). *Fundamentals of ecosystem science*. Academic Press.
- Weiss, H. M. (1990). Learning theory and industrial and organizational psychology.
- Weiss, K., Hamann, M., Kinney, M., & Marsh, H. (2012). Knowledge exchange and policy influence in a marine resource governance network. *Global Environmental Change*, 22(1), 178-188.
- West, P., Igoe, J., & Brockington, D. (2006). Parks and peoples: the social impact of protected areas. *Annu. Rev. Anthropol.*, 35, 251-277.
- Westman, W. E. (1977). How Much Are Nature's Services Worth? Measuring the social benefits of ecosystem functioning is both controversial and illuminating. *science*, 197(4307), 960-964.
- Wilson, E. O. (1988). The current state of biological diversity. *Biodiversity*, 521(1), 3-18.
- Wilshusen, P.R. (2014) 'Capitalizing Conservation/Development: Dissimulation, Misrecognition, and the Erasure of Power', in Büscher, B., Dressler, W., Fletcher, R. [eds.] (2014) *NatureTM Inc.*, University of Arizona Press, pp.127-157
- Wissenburg, M. L. J. (2006). Liberalism.
- While, A., Jonas, A. E., & Gibbs, D. (2010). From sustainable development to carbon control: eco-state restructuring and the politics of urban and regional development. *Transactions of the Institute of British Geographers*, 35(1), 76-93.
- Whitehead, M. (2013). Degrowth or regrowth?. *Environmental Values*, 22(2), 141-145.
- Whitehorn, P. R., Navarro, L. M., Schröter, M., Fernandez, M., Rotllan-Puig, X., & Marques, A. (2019). Mainstreaming biodiversity: A review of national strategies. *Biological conservation*, 235, 157-163.
- Wiber, M. G. (2000). Fishing rights as an example of the economic rhetoric of privatization: calling for an implicated economics. *Canadian Review of Sociology/Revue canadienne de sociologie*, 37(3), 267-288.

Wilflife and Countryside Link (2022). 2022 Progress Report on 30by30 in England. Online: https://www.wcl.org.uk/assets/uploads/img/files/WCL_2022_Progress_Report_on_30x30_in_England.pdf [Accessed February 2023]

Wissenburg, M. L. J. (2006). Liberalism.

Wilkinson, C., Briggs, J., Salt, K., Vines, J., & Flynn, E. (2019). In participatory budgeting we trust? Fairness, tactics and (in) accessibility in participatory governance. *Local Government Studies*, 45(6), 1001-1020.

Wilkinson, R. J., Porter, M., Woolcott, H., Longland, R., & Carragher, J. F. (2006). Effects of aquaculture related stressors and nutritional restriction on circulating growth factors (GH, IGF-I and IGF-II) in Atlantic salmon and rainbow trout. *Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology*, 145(2), 214-224.

Wills, B. (2020). *A case study of the Marine Pioneer, investigating local natural resource management and natural capital valuation* (Doctoral dissertation, University of Surrey).

Wilson, C. B. (2006). *Litigation and Embedded Legality: a Communicative Model of Polycentric Evolution for Business and Human Rights* (Master's thesis).

Wolfrum, R., & Matz, N. (2003). Conflicts in international environmental law (Vol. 164). Springer Science & Business Media.

Wood, L. J., Fish, L., Laughren, J., & Pauly, D. (2008). Assessing progress towards global marine protection targets: shortfalls in information and action. *Oryx*, 42(3), 340-351.

Wood, L., Hooper, P., Foster, S., & Bull, F. (2017). Public green spaces and positive mental health—investigating the relationship between access, quantity and types of parks and mental wellbeing. *Health & place*, 48, 63-71.

Worm, B., Barbier, E. B., Beaumont, N., Duffy, J. E., Folke, C., Halpern, B. S., ... & Watson, R. (2006). Impacts of biodiversity loss on ocean ecosystem services. *science*, 314(5800), 787-790.

Wright, S. L., & Kelly, F. J. (2017). Plastic and human health: a micro issue?. *Environmental science & technology*, 51(12), 6634-6647.

Wu, J. (2013). Landscape sustainability science: ecosystem services and human well-being in changing landscapes. *Landscape ecology*, 28, 999-1023.

Wunder, S., & Albán, M. (2008). Decentralized payments for environmental services: the cases of Pimampiro and PROFAFOR in Ecuador. *Ecological Economics*, 65(4), 685-698.

Wynne, B. (1992). Uncertainty and environmental learning: reconceiving science and policy in the preventive paradigm. *Global environmental change*, 2(2), 111-127.

Young, O. R., Osherenko, G., Ekstrom, J., Crowder, L. B., Ogden, J., Wilson, J. A., ... & Peach, R. (2007). Solving the crisis in ocean governance: place-based management of marine ecosystems. *Environment: science and policy for sustainable development*, 49(4), 20-32.

Young, M. (2015). Building the blue economy: the role of marine spatial planning in facilitating offshore renewable energy development. *The International Journal of Marine and Coastal Law*, 30(1), 148-174.

Young, S., Nelson, P., Oates, J, Davis, K.. 2019. The compass pilot report for North Devon compiled by WWF as part of the UK SEAS Project.

Yu, G., Piao, S., Zhang, Y., Liu, L., Peng, J., & Niu, S. (2021). Moving toward a new era of ecosystem science. *Geography and Sustainability*, 2(3), 151-162.

Zaucha, J., & Gee, K. (2019). *Maritime spatial planning: past, present, future* (p. 477). Springer Nature.

Zu Ermgassen, P. S., Bonačić, K., Boudry, P., Bromley, C. A., Cameron, T. C., Colsoul, B., ... & Sutherland, W. J. (2020). Forty questions of importance to the policy and practice of native oyster reef restoration in Europe. *Aquatic conservation: marine and freshwater ecosystems*, 30(11), 2038-2049.

Zucker, H. (1978). The variable nature of news media influence. *Annals of the International Communication Association*, 2(1), 225-240.

Zuniga-Teran, A. A., Staddon, C., de Vito, L., Gerlak, A. K., Ward, S., Schoeman, Y., ... & Booth, G. (2020). Challenges of mainstreaming green infrastructure in built environment professions. *Journal of Environmental Planning and Management*, 63(4), 710-732.