

## An analysis of the emergence of adaptive governance for sustainable management of marine resources

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# An analysis of the emergence of adaptive governance for sustainable management of marine resources.

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A thesis presented for the degree of Doctor of Philosophy at the University of Aberdeen

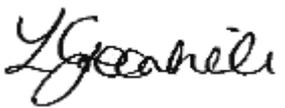
May 2020

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## Declaration

This thesis has been composed by the candidate and is a record of work that has been undertaken by that candidate. This has not been submitted in any application for another degree. All quotations are distinguished as such with quotation marks and the sources of information specifically acknowledged.

Signed: 

## Abstract

This thesis examined the emergence of adaptive governance in a national system of marine governance, with particular emphasis on the role of marine planning. Using a social-ecological systems framework, a model was constructed to enable analysis of Scotland's marine governance system, as a dynamic and interrelated mixture of institutional processes at multiple levels. Three intersecting case studies provide important insights into factors which constrain or promote adaptive governance and the capacity of governance to respond to change: 1) analysis of Scotland's new regional marine planning process and the extent to which it enables adaptive governance; 2) analysis of the feasibility of adaptive governance to support adaptation of the aquaculture industry to climate change-related ocean acidification; and 3) analysis of the developing management regime for the expansion of industrial seaweed harvesting from an adaptive governance perspective. An analytical framework was used based on four defining characteristics of adaptive governance: 1) polycentric and multi-layered institutions; 2) participation and collaboration; 3) learning and innovation; and 4) self-organisation / supporting activities. A critical realist approach was taken to acknowledge an objective reality as well as the socially constructed aspects of both scientific endeavour and the functioning of governance, and to be critical of both in making practical and theoretical contributions. The analysis was informed by semi-structured interviews, document analysis and a stakeholder workshop.

Results show that a dynamic and supportive policy context is leading to diversification of governance arrangements and new arenas of collective action at different scales, extending involvement of non-state actors in governance. New structural arrangements are providing opportunities for participation and collaboration at multiple levels of marine governance, including in partnership-led marine planning, devolution of marine asset management under the Scottish Crown Estate Act 2019, and legislative and policy change emphasising local control for islands. Scottish Government is also explicitly promoting *innovation* in marine governance, with a phased approach to marine planning and experimental management approaches based on 'pilot' projects, to allow flexibility in design and learning in different locations and settings. This suggests a shift towards adaptive governance, supported by new legislation and public policy on marine resource management, climate change and wider topics. Across the cases significant self-organisation is evident, with individual actors, networks, and organisations demonstrating capacity to be proactive and flexible at different levels of governance.

However, results also indicate important tensions to be addressed in the institutionalisation of adaptive governance in terms of influence on the management of human activities at sea. Firstly, the

legislative regime remains crucially important in defining what is possible, both enabling and constraining adaptive governance. It was shown to facilitate adaptive governance by providing the structural arrangements and legal legitimacy for innovative, partnership-led marine planning and in defining specific provisions for climate change adaptation, for example. But the legacy of existing legislation upon which new approaches are overlaid is problematic and the dominant regulatory regime was shown to ultimately constrain adaptive governance and management across the cases. Conservation legislation is of low adaptive capacity and a key challenge exists in ensuring adequate ecological protection while enabling learning-based adaptive management, including of novel and controversial industries such as kelp harvesting. A balance between stability and flexibility in governance is essential in order to be responsive yet legitimate but a level of reform might be necessary. Second, there are notably conflicting perceptions and attitudes to change among stakeholders which affects adaptive capacity and requires further study of institutional and cognitive barriers in adaptive governance. Third, while there is a proliferation of participatory arrangements, a lack of co-ordination between governance levels was identified, limiting transfer of the learning and benefits from local governance models into decision-making in other domains of the wider regime. Poor integration also contributes to stakeholder confusion and management inefficiencies, as shown in relation to marine planning, and better connections are needed between governance instruments and interventions, with robust feedback loops and mechanisms for learning across scales. To move beyond the limits of conventional planning and management, and transition to adaptive governance, an argument is therefore made for greater reflexivity in marine governance, in order to:

- Reflect on underlying values, continually re-negotiate normative goals, consider governance outcomes and key barriers;
- Enable transfer of learning and innovation between levels of governance;
- Enable rapid, innovative responses to social and ecological change, including crises;
- Reduce stakeholder confusion in proliferation of arrangements and ensure commitment; and
- Ensure efficient use of resources and reduce transaction costs of governance.

Critical insights are also presented to support future development of adaptive governance theory and its application to the study of marine governance. This includes approaches to understanding: 1) levels of institutionalisation of adaptive governance; 2) evaluating outcomes of adaptive governance; 3) the relationship between adaptive governance and transformative governance; and 4) definition and consistency in use of key terms including adaptive governance and adaptive management.

## Acknowledgements

This PhD journey began in 2014 and I am indebted to many people who I have engaged with over the years and who have provided inspiration and support. My supervisory team has been excellent – I am thankful to have known Professor Laurence Mee and appreciate his early encouragement when joining SAMS to stick with my conviction of the need to look at the ‘big picture’ even with the challenges this brings. Dr Timothy Stojanovic, who has been a consistent support and ‘critical friend’ throughout and is a valued colleague in the world of marine governance and planning. Dr Jasper Kenter who joined the supervisory team and lent his immense social science prowess to the endeavour. And finally, Professor Paul Tett who somehow always managed to know which bit of advice, whether deeply philosophical or succinctly pragmatic, was just what was needed at the time. Please accept my thanks for your time and encouragement over the years, your contributions have been constructive, complementary and inspiring.

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I am very lucky to have an incredible network of friends which I rely on more than they realise, and I look forward to sharing more laughs and adventures.

My twin brother Michael, who while I get to sit and contemplate abstract ideas and good grammar is policing the mean streets of London and of whom I am immensely proud.

My partner Richard who came into my life just as my time at SAMS came to an end and has supported me, especially when Project PhD really took hold.

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## List of acronyms

ACM	Adaptive co-management
AG	Adaptive governance
AM	Adaptive management
AMA	Aquaculture Management Area
AS	Action situation (in the SES framework)
CCAP	Climate Change Adaptation Programme
CES	Crown Estate Scotland
CMPP	Clyde Marine Planning Partnership
EA	Ecosystem approach
ECCLR	Environment, Climate Change and Land Reform (Committee)
EIA	Environmental Impact Assessment
ENGO	Environmental non-governmental organisation
EU	European Union
FAO	Fisheries and Agricultural Organization of the United Nations
OA	Ocean acidification
RMP	Regional Marine Planning / Plan
MCCIP	Marine Climate Change Impacts Partnership
MPP	Marine Planning Partnership
MSP	Marine Spatial Plan
MSFD	Marine Strategy Framework Directive
MS-LOT	Marine Scotland Licensing and Operations Team
NMP	(Scotland's) National Marine Plan
SDG	Sustainable Development Goals (of the UN's 2030 Agenda)
SEA	Strategic Environmental Assessment

SES	Social-ecological system
SIRMP	Shetland Islands Regional Marine Plan
SMR	Scottish Marine Region
SSMO	Shetland Shellfish Management Organisation
SSMEI	Scottish Sustainable Marine Environment Initiative
WFD	Water Framework Directive

# Chapter 1. Introduction

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## 1.1 Introduction

Traditional approaches to governance need to change in order to address the intractable challenges of sustainability faced by society (Jentoft & Chuenpagdee 2009; Berkes 2010). Societies face ‘wicked’ problems which place different demands on governance beyond traditional management, and which are difficult to define and delineate from other problems, cannot be determined scientifically and are perceived differently by different stakeholders (Jentoft & Chuenpagdee 2009). Further, social-ecological systems (SES) are complex, nested and dynamic with unexpected outcomes and are not effectively addressed through linear, fragmented, ‘command-and-control’ regulatory models (Holling & Meffe 1996; Meadowcroft 2002; Lebel et al. 2006). Failures of current approaches and the increasing vulnerability of SESs has led to calls for more adaptive governance that can deal with uncertainty and change (Dietz et al. 2003; Folke et al. 2005).

Policy and legislative drivers for new approaches to governance are numerous and increasing. There has been a trend over the last 20 years towards more integrated and holistic approaches to management to address the issues of piecemeal and fragmented approaches, including in the European Union (EU) through the EU Water Framework Directive<sup>1</sup>, the Marine Strategy Framework Directive<sup>2</sup> and the Maritime Spatial Planning Directive<sup>3</sup> (Boyes & Elliott 2014). Recently, global attention is growing on the governance needed to address the UN 2030 Agenda Sustainable Development Goals (SDGs), requiring transformative policy change, participation and collective action, policy coherence, reflexivity, adaptation and democratic institutions (Glass & Newig 2019).

Adaptive governance and fields including sustainability science, participatory governance, deliberative democracy and others, provide theoretical insights on emergent features of governance for ‘sustainability’, which is adaptive and resilient. These include: governance operating across multiple levels with sharing of decision-making power to enable attending to context-specific issues shaped by local conditions (Ostrom 2007; Hooghe et al. 2009); involving a wider range of stakeholders

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<sup>1</sup> Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060> (accessed 12 July 2018)

<sup>2</sup> Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056> (accessed 12 July 2018)

<sup>3</sup> Directive 2014/89/EU of the European parliament and of the council of 23 July 2014 establishing a framework for maritime spatial planning. [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2014.257.01.0135.01.ENG%20](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.257.01.0135.01.ENG%20) (accessed 12 July 2018)

through collaborative, deliberative and participatory approaches (Plummer et al. 2013); and being learning-based and adaptive to respond to changing circumstances and deal with inherent uncertainty (Folke et al. 2005). Adaptive governance is considered necessary to respond to increasingly unpredictable factors in marine management, including increasing interest in development of existing and new maritime sectors such as offshore wind farms, aquaculture, deep sea mining and climate change-related effects such as ocean acidification (Craig 2019).

Adaptive governance is an expanding body of literature and growing in its application, and recent reviews of empirical research in the field of adaptive governance find support for the contributing factors of: collaboration across actors and scales; coordination between stakeholders and levels; social capital; community empowerment and engagement; capacity development; linking knowledge and decision-making; leadership and exploiting or creating governance opportunities (Sharma-Wallace et al. 2018). However, although increasingly applied in research of natural resource governance, there remains a lack of progress in understanding adaptive governance in practice, with a need for more situated, contextualised analyses and empirical research (Chaffin 2014; Wyborn 2015; Sharma-Wallace et al. 2018).

While adaptive governance cannot be mandated, it can be facilitated by legal mechanisms which allow governance to respond to dynamic social and ecological challenges over time (Camacho and Glicksman 2016; Cosens et al. 2017; Craig et al. 2017). Changing institutional arrangements can also provide 'windows of opportunity' for institutional innovation and for adaptive governance practice to emerge (Olsson et al. 2006). Rapidly changing context can provide opportunity for transitions in governance (Gelcich et al. 2010) and might be steered towards adaptive governance (Folke et al. 2005). However, enabling adaptive governance within extant systems of predominantly 'top-down' hierarchical approaches is challenging, and a balance is needed between adaptive approaches with flexibility to respond to change, and preserving the key functions of governance, government and the rule of law (Craig et al. 2017). Combination of both community-based and managerial systems are necessary, with co-ordination between them (Dietz et al. 2003).

In Scotland, recent policy and legislative changes emphasise increasing local governance and community empowerment across activities of government, including the Planning (Scotland) Act 2019, the Community Empowerment (Scotland) Act 2015, the Islands (Scotland) Act 2018, and specifically in coastal and marine management through a system of marine planning under the Marine (Scotland) Act 2010. Scottish Government is also taking a proactive approach to the implementation

of the SDGs including through the National Performance Framework<sup>4</sup> which aims to embed these goals across the activities of government. Combined with the economic significance of coastal and marine resources to Scotland and ambitious policy for growth in aquaculture, offshore wind and seaweed production, alongside developing action to address climate change adaptation, this represents a dynamic context for coastal and marine governance in Scotland.

Taking an adaptive governance approach, this thesis presents a situated study of marine governance in Scotland through three intersecting case studies addressing governance responses to:

1. A new governance instrument (marine planning), intended to improve management of marine resource use within the context of social-ecological uncertainty and change (*Case Study 1*).
2. The effects of climate change on a particular industry, i.e. aquaculture, and the need to enable adaptation to support ambitious national policy for growth of the sector (*Case Study 2*).
3. A new industrial activity (seaweed harvesting) with highly uncertain social and ecological effects and for which there is no procedure or precedent (*Case Study 3*).

Through these interrelated case studies, the focus is on the extent to which the system of marine governance is, or might become, adaptive, and to provide insights into the emergence of adaptive governance within a highly regulated system of marine governance. The rationale for selection of the case studies and how they relate within a system of marine governance is further explained in Section 1.2.

## 1.2 Rationale and research questions

The aim of this thesis is to support the understanding of the functioning of marine governance and its capacity to change and adapt to address key challenges it faces. The three case studies presented focus on marine governance in Scotland and serve to inform the overarching research questions of:

1. How can adaptive governance emerge in marine governance in Scotland?
2. How does regional marine planning influence adaptive governance of coastal and marine resources in Scotland?
3. What factors constrain or promote the emergence of adaptive governance in a system of marine governance?

Addressing these questions from different perspectives through the case studies provides insights into the governance system and supports understanding patterns of emergence of adaptive

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<sup>4</sup> <https://nationalperformance.gov.scot/>

governance for management of marine resources. Particular attention is placed on understanding the social processes and institutions that influence opportunities for adaptive governance in complex and uncertain contexts. This thesis aims to contribute theoretically by critically reflecting on the adaptive governance theoretical framework through its application to marine planning and marine governance in Scotland. It provides a situated, empirical analysis, and takes a national 'regime-wide' approach, recognising that effort is needed to understand how adaptive capacity is developed and adaptive governance enabled across complex, overlapping governance arrangements addressing natural resource management. It is the first attempt to analyse marine governance in Scotland from an adaptive governance perspective. The research also seeks to make practical recommendations to support progress towards more effective coastal and marine governance, in Scotland and elsewhere.

The cases are related in addressing the research questions by providing focus on overlapping institutions in the same system of marine governance. Policy development and implementation flows through the cases: regional marine planning, the focus of Case Study 1, represents a new governance instrument which addresses marine development via regional policy making on marine activities within their jurisdiction. This regional policy articulated in the Regional Marine Plans, must reflect national priorities set out in Scottish Government policy, which addresses aquaculture and climate change adaptation (the topic of Case Study 2) and the implementation of new policy or development such as seaweed harvesting (Case Study 3). These enable insights across the governance regime which would not be addressed through the individual case studies.

The research questions that are posed in each case provide complementary perspectives on the overarching questions, as below:

- Case Study 1. To what extent the regional marine planning process in Scotland enables features of adaptive governance to emerge; and what are apparent conditions or constraints?
- Case Study 2. How do policy, planning and management arrangements constrain or enable adaptation responses to ocean acidification, including the role of marine planning?
- Case Study 3. How is adaptive governance emerging in response to the management of wild kelp harvesting in Scotland? How is this supported or hindered in the developing regime?

### 1.3 Thesis structure

This thesis is structured as follows: Chapter 2 describes the development of a theoretical framework for the research, including: adaptive governance and related literature; description of the Social Ecological System (SES) framework which is used to construct a model of marine governance in Scotland and frame the case studies; and an introduction to marine planning including situating the concept in relation to governance theory. Chapter 3 details the methodological approach used in the research including the different methods applied in each case study. The subsequent chapters (4, 5 and 6) present Case Studies 1, 2 and 3, addressing regional marine planning in Scotland, adaptation of aquaculture to ocean acidification and governance of kelp harvesting, respectively. Each case study chapter contains a short introduction and summary of methods (referring to earlier chapters), followed by detailed results and discussion relevant to the specific case study. These are brought together in Chapter 7 which presents a ‘grand’ discussion based on findings from across the studies in light of the overarching research questions and describes adaptive governance in Scotland’s system of marine governance. The final chapter (Chapter 8) presents the conclusions and research findings, critical reflections on theory and methodological approach and outlines practical recommendations and avenues for further research. An overview of the three case studies is presented below.

#### 1.3.1 Case Study 1: The role of regional marine planning in enabling adaptive governance

As a new governance arrangement being implemented in Scotland, Case Study 1 (Chapter 4) evaluated the extent to which the partnership-led approach to marine planning enables the benefits of an adaptive governance approach. Marine planning presents a new opportunity for considering governance of marine resources and is intended to support achievement of sustainable development; this research aimed to elucidate whether this is the case. Adaptive governance is used as a broad framework describing ‘ideal’ governance and marine planning is analysed in this context, to understand whether marine planning enables progress towards adaptive governance of marine systems. The rationale is further justified by the observation that the devolved marine planning arrangements of the two-tier system being implemented in Scotland, and the partnership-led process this creates, may present opportunity for adaptive governance in nested, polycentric arrangements. The marine planning partnerships represent new social and institutional spaces to influence governance of marine resource use and in-depth analysis of the regional marine planning process explores to what extent marine planning in Scotland enables features of adaptive governance to emerge, and apparent conditions or constraints. While focussing in detail on a marine planning process in Scotland, this has relevance to the implementation of marine planning in other contexts

and contributes to understanding the role that marine planning plays in governance, in addition to advancing theory development and analysis of marine planning.

Through the analysis tensions were identified which reflect the tensions of institutionalising adaptive governance, and included: a) the challenges of prevailing legislation, and the need to explore in more detail the legal adaptive capacity of overlapping governance systems / regimes addressing marine and coastal use, and; b) that the value and implications of marine planning to adaptive governance is contingent on other mechanisms, in responding to social change (such as new activities) and changing ecological conditions (such as climate change-related effects). This informed the approach to the subsequent case studies including focus on the rule of law as an important precursor to adaptive governance and which was investigated in more depth in Case Studies 2 and 3.

### 1.3.2 Case Study 2: The development of adaptive governance of the aquaculture industry in response to climate-change related OA in Scotland

In Case Study 2, the aim was to advance understanding of how to facilitate adaptive governance in response to the complex management challenge of ocean acidification (OA). This addresses increasing concern regarding OA and the threat to food security of human populations, and the limited progress in advancing adaptation of the aquaculture sector. Building on recent work by (Craig 2019) and others, an adaptive governance perspective was applied to the adaptation of aquaculture in Scotland, where there is increasing evidence of the potential detrimental effects of OA combined with a dynamic policy context. This includes recent and rapid progress in climate change adaptation policy, concurrent implementation of marine planning and other legislative developments affecting coastal and marine governance. Through a two-step approach of a workshop followed by policy and legislative analysis which focussed on legal adaptive capacity (as a key outcome of Case Study 1), this study considered potential adaptation responses in Scotland and the extent to which policy, planning and management arrangements constrain or enable adaptation responses to OA, including the role of marine planning.

### 1.3.3 Case Study 3: Adaptive governance for commercial seaweed harvesting

As an expanding sector globally, large-scale mechanical harvesting of wild seaweed poses challenges for governance in a number of countries, as it challenges existing regimes and requires a fundamentally adaptive approach. This case study analysed how opportunities for adaptive governance are supported or hindered in the emerging arrangements; i.e. how is adaptive governance emerging in response to the management of wild kelp harvesting in Scotland? The analysis focussed on two parallel processes addressing the development of management for kelp harvesting which were identified at different levels of governance, including the development of

legislation through parliamentary debate and the development of management in response to a specific proposal through the licensing process. These resulted in different outcomes and present different perspectives on adaptive governance, including the feasibility of specific tools including adaptive management.

#### 1.4 Related research activities

I began the PhD at SAMS in November 2014 on a part-time basis and it was developed alongside a full-time researcher position until March 2017 meaning that the research process was undertaken alongside other commitments, including supporting applications for funding and undertaking research projects. Case Studies 2 and 3 were supported through two funded research projects (detailed below) through which I was able to develop and complete research which contributed to the study on adaptive governance in marine management in Scotland. This was advantageous as through examining marine planning it became clear that it plays a somewhat limited role in marine governance and understanding the system more broadly, including the interacting regulatory and policy processes, became important in understanding adaptive governance across the wider regime. Details of the funded research included within this thesis are provided in Table 1.1.

*Table 1.1 Research projects related to the thesis*

Research Project	Relationship of research presented in this thesis to the project and the role of collaborators and co-authors on published research
Adapting Coastal Zone Management to Ocean Acidification (ACIDCOAST) (Jan 2016 – Dec 2018)	This project aimed to contribute to improved governance for addressing OA. For this project, I delivered a workshop to develop a Scottish case study which supported knowledge exchange between Scotland and Norway. This workshop provided the initial data for a research paper which was prepared with minor input from co-authors. Dr Jasper Kenter (supervisor) provided early input to the design of the workshop and is a named co-author on the paper. Dr Halvor Dannevig (project lead from the Western Norway Research Institute) provided input to the initial paper draft to support a comparison with Norway however this was subsequently removed based on reviewer comments. The initial article was amended significantly during the review process, to include the results of a subsequent document analysis of policy and legislation analysing how governance arrangements constrain or enable adaptation responses. The paper was published in March 2020 and is almost entirely my own work: Greenhill, L., Kenter, J.O. and Dannevig, H. 2020. <i>Adaptation to climate change–related ocean acidification: An adaptive governance approach</i> . <i>Ocean &amp; Coastal Management</i> 191 (2020): 105176.

<p>Opportunities and trade-offs in managing kelp forest in an era of blue growth (OPTIMAKELP) (Jan 2018 - Jan 2021)</p>	<p>I was invited to join this project by NIVA<sup>5</sup> based on my previous experience through contributing to the WILDWEED<sup>6</sup> project at SAMS, and specifically to develop a Scottish case study for a work package analysing the governance and management of kelp harvesting in Norway. Case Study 3 in this thesis constitutes the Scottish case which is designed and undertaken solely by me to align with the research questions. A comparative paper will subsequently be developed, titled: <i>Adaptive governance for commercial seaweed harvesting: a comparative study of emerging governance arrangements in Scotland and Norway.</i></p>
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Other publications relevant to the research include:

- A book chapter written in 2016 which supported the literature review for the PhD: Greenhill, L. (2018). *Challenges and opportunities for governance in marine spatial planning*. In *Offshore Energy and Marine Spatial Planning* (pp. 56-73). Routledge.
- Contribution to a published paper with ENGO colleagues: Brooker, E. E., Hopkins, C. R., Devenport, E., Greenhill, L., & Duncan, C. (2019). *Civil society participation in the Scottish marine planning process and the role of Environmental Non-Governmental Organisations*. *Journal of Environmental Planning and Management*, 62(12), 2101-2123.
- The research presented in Chapter 4 has been published with Dr Tim Stojanovic and Professor Paul Tett (supervisors) as co-authors and who provided supervisory support to the development of the research project in addition to editorial input to the paper while it was being developed. The paper is cited as: Greenhill, L., Stojanovic, T. A., & Tett, P. (2020). *Does marine planning enable progress towards adaptive governance in marine systems? Lessons from Scotland's regional marine planning process*. *Maritime Studies*, 1-17.
- The research presented in Chapter 5 has also been published, with Dr Jasper Kenter (supervisor) and Dr Halvor Dannevig: Greenhill, L., Kenter, J.O., Dannevig, H. (2020) *Adaptation to climate change – related ocean acidification: an adaptive governance approach*. *Ocean & Coastal Management*, 191, 105176. Jasper and Halvor were co-researchers on the project and supported the development of the workshop. The paper is my own work with minor editorial input from co-authors.
- Consultancy projects related to the topic area include contribution to the following reports: Phillips, P., Kenter, J., Orr, P., Ainscough, J., Greenhill, L., Cotton, I., Murtagh, E., Mellor, P., 2018. *Delivery of public dialogue process to aid the development of the Clyde Regional*

<sup>5</sup> Norwegian Institute for Water Research.

<sup>6</sup> Wild seaweed harvesting as a diversification opportunity for fishermen, consultancy project by SAMS Research Services Ltd (SRSL) for Highlands and Islands Enterprise, 2017 – 2018.

Marine Plan; and Burrows M.T., Fox, C.J., Moore, P., Smale, D., Sotheran, I., Benson, A., Greenhill, L., Martino, S., Parker, A., Thompson, E., Allen, C.J. (2018) Wild Seaweed Harvesting as a Diversification Opportunity for Fishermen. *A report by SRSL for HIE*, pp. 169

## Chapter 2. Theoretical Framework

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### 2.1 Introduction

This chapter presents an overview of the academic literature and theoretical basis for the analysis of adaptive governance of marine resources in Scotland. Adaptive governance is a broad and expanding literature and includes many concepts and definitions which vary in their application. The initial section (2.2.1) therefore defines key terms and concepts relevant to the study of governance and used in this thesis, based on reading of adaptive governance, governance theory and political theory more broadly. Section 2.2.2 presents the social-ecological system framework which was used to construct a model of marine governance to frame the case studies in subsequent chapters and supports interpreting them as interrelated cases within the same system. Adaptive governance is described in Section 2.3 with an overview of its key features which were used as an analytical framework in this thesis, along with explanation of two closely related concepts: adaptive co-management and adaptive management. A specific section (2.3.1) addresses the role of law in facilitating or hindering adaptive governance which is a relatively recent development in the literature and became a key focus in the latter case studies based on the results of Case Study 1 (Chapter 4). A summary of empirical approaches to adaptive governance research is presented in Section 2.3.3, including its application in the marine realm and key criticisms. As a primary focus of the research, an overview of marine planning and the developing field of marine planning literature is provided in Section 2.4 as a basis for the case studies, particularly Case Study 1 which specifically addresses the regional marine planning process in Scotland. Case Study 2 (Chapter 5) and Case Study 3 (Chapter 6) consider adaptive governance from the perspective of adaptation of aquaculture to OA (including the role of marine planning), and as a response to the emergence of commercial seaweed harvesting, respectively, and detailed introduction to these specific topics is presented in Chapters 5 and 6. Finally, based on the theoretical overview presented, the contribution of this thesis is summarised in Section 2.5.

### 2.2 Key theories and concepts

#### 2.2.1 Governance

‘Governance’ has no universally agreed definition and remains a contested concept (Glass & Newig 2019). It is used to refer to, variously, a structure, a process, a mechanism and a strategy (Levi-Faur 2012). Broadly, governance is concerned with goal-oriented, deliberative interventions in society (Kooiman 2003) and consists of the structures and processes by which people make decisions and share power (Folke et al. 2005). In this thesis, the focus is on ‘environmental’ governance (or ‘natural resource’ governance) i.e. the processes of steering or guiding human activity and mediating societal

interaction with environmental systems (Ostrom 1990; Folke et al. 2005)<sup>7</sup>. Two aspects of the concept of governance are particularly important: firstly, it shifts emphasis from the traditional view of government as a single, central decision-making body, to account for the roles of a wide range of actors<sup>8</sup> who co-determine policy processes and outcomes through collaboration, partnerships and networks<sup>9</sup> (Arts & Tatenhove 2004; Pierre & Peters 2005). Secondly, it increases analytical capacity for understanding governance as a *dynamic process* influenced by constant change, rather than a stable structure (Kooiman 2003). Governance therefore encompasses not only the concept of government, defined as political authority and state control, but the ‘totality of interactions’ and the evolving relationship between government and society, including the means through which private actors, markets and interest-based networks influence policy decisions and self-organise to mediate their own behaviour (Kooiman 2003; Folke et al. 2005; Huitema et al. 2009)<sup>10</sup>.

In practice, governance involves the formal and informal institutions that structure political, economic and social interaction, including laws, policies, regulations, discursive debates, negotiation, mediation, conflict resolution, elections, public consultations and other decision-making processes (Lebel et al. 2006). It can be formally institutionalised, expressed through subtle norms of interaction, or even more indirectly by influencing the agendas and shaping the contexts in which actors contest decisions and determine access to resources (Levi-Faur 2012). Governance is broader than *management* (or *governing*) which refers to the formal processes of decision making, coordination and resource deployment that occur within a given institutional setting (Jentoft & Chuenpagdee 2009). In management there is direct control over resources and the behaviour of agents, whereas governance reflects the influence or indirect control of one agent or group of agents over decisions or behaviour (Hatfield-Dodds et al. 2007). Management is therefore seen as a “technical issue” involving a set of tools that can be applied to solve a particular problem where the goal is clear and the outcome measurable, and is “something that professionals, experts, planners, engineers, scientists and bureaucrats do” (Jentoft & Chuenpagdee 2009, p.555). Governance is more expansive and considers the deliberation and determination of the goals of management, including the values, norms and principles underpinning them, and the formulation of these goals (including the role of the private sector and civil society) is considered part of governance itself (Ibid.). In addition to the inclusion of a wide range of institutions, actors and organisations in producing environmental policy and

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<sup>7</sup> ‘Governance’ is used in this thesis and refers to (marine) environmental governance.

<sup>8</sup> An ‘actor’ can be applicable to individuals, collectives, organisations or nation states (Kooiman 2003).

<sup>9</sup> Arts & Tatenhove (2004) describe this as a ‘new paradigm’ in governance research, referring to the shifting relationships between the institutions of state, market and civil society, underpinned by political modernisation and giving rise to new concepts and arrangements.

<sup>10</sup> The term is also considered a “catchword for various alternatives to conventional top-down government control, including collaboration, partnerships, and networks” (Folke et al. 2005, p.449).

management outcomes, governance encompasses interactions and feedback between social and biophysical components of a system and is therefore a fitting lens for analysing social-ecological systems (Chaffin & Gunderson 2016), explored further below.

*Institutions* form the fundamental components of governance and represent sets of explicit or implicit rules that guide (empower or constrain) the behaviour of individual actors, enforced by external agency (laws) or by the individuals themselves (norms), and which define practices, assign roles, and guide interactions (Ostrom 1990). *Formal institutions* are those such as government departments or agencies that typically have a legally defined role and structure and are represented, for example, by government ministries, conservation authorities, constitutions, laws, property rights and policies that define the roles and procedures for people to organise themselves. *Informal institutions* embody the socially shared rules or norms that impact behaviour, including business, social networks or associations, where groups may also have structure and sets of procedures but often no legal or written basis (and may also include culture<sup>11</sup>) (Hall & Taylor 1996). Governance draws attention to *institutional interplay* where formal and informal institutions interact horizontally (across the same level of social and political organization) and vertically (across levels of organization) (Young 2006; Berkes 2010). This is also referred to as *multi-level governance*, where governance takes place through processes and institutions operating at, and between, various geographical and organisational scales and involving a range of actors with different forms of authority (Hooghe et al. 2009). In this thesis, *structure* refers to “resources, social institutions, systems, or forces, generalized at a societal level, and manifest in recurring patterns of organization and practices”, and *agency* refers to “the ways in which individuals use their capacities or personal powers to act in purposeful and meaningful ways” (King 2005, in Cleaver & Whaley 2018, p.49)<sup>12</sup>.

As the fundamental basis of collective action and the functioning of society, institutions provide the broader foundations for social change (Ostrom 1990). Viewing institutions as dynamic and flexible, rather than static and operating with fixed rules and defined boundaries, is a key tenet of adaptive governance (Ostrom 1990; Koontz et al. 2015). However, understanding and facilitating these processes is not straightforward. Institutions are developed by humans in order to achieve predictability, stability and low costs for social interactions, which raises overall welfare (Pierre &

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<sup>11</sup> The definition of *institutions* used in this thesis leans towards political science but the view of sociological institutionalists is important in its focus on the relationship between institutions and culture. Alongside formal and informal rules, procedures and norms, culture includes the symbol systems, cognitive scripts, and moral templates that provide the ‘frames of meaning’ guiding human action (and therefore an institution in itself) (Hall 1996).

<sup>12</sup> The philosophical perspective of the interaction between structure and agency used in this thesis is addressed further in Chapter 3.

Peters 2005). However, this stability can lead to rigidity as institutions are prone to inertia and path dependency, and which may be further problematic since the conventions within them reflect circumstances and power dynamics present at the time of construction (Ibid.).

There is a growing diversity in modes of governance recognised as appropriate for contemporary understanding of socio-ecological challenges, with pluralism of structural characteristics promoted which include different forms of resource ownership, authority, accountability and responsibility across different scales (Meadowcroft 2002; Arts & Tatenhove 2004). These include 'bottom-up' governance, collaborative governance and co-management arrangements (e.g. Plummer & Armitage 2006; Armitage et al. 2009) which enable closer interaction of managers and user groups, and multiple centres of decision making ('polycentricity') (Ostrom 2010; Galaz et al. 2012). These recognise the contribution of self-organised action, which is often informal and nongovernmental, and which has been found in some cases to enable governance to adapt more readily to change in social-ecological systems than regulatory or market-driven approaches (Ostrom 1990).

### 2.2.2 The social-ecological systems (SES) framework

Social-ecological systems (SES) represent the co-evolving relationship between society and nature as a single dynamic system which is complex and adaptive, involving non-linear change, uncertainty, limited predictability and emergent properties (Duit & Galaz 2008). To add to the dynamism of these systems, adaptive cycles operating at different temporal and geographic scales interact with each other, a model of system complexity termed 'panarchy' by Gunderson & Holling (2002) (in Gunderson et al. 2017). Models have been developed to conceptualise and simplify such systems and enable their study although no consistent approach has emerged due to the highly contextual and complex nature of SESs (Chaffin et al. 2019). The SES framework (Fig. 2.1) is a commonly used approach and was originally developed by Elinor Ostrom and colleagues, building on her pioneering work on the management of common-pool resources (e.g. Ostrom 1990, 2009; Ostrom et al. 2002). These early studies generated the Institutional Analysis and Development (IAD) framework (Dietz et al. 2003; Ostrom 2009; McGinnis 2011) which has been applied to a diverse range of resource sectors, geophysical regions, political entities and cultural traditions (McGinnis 2011). Over time, researchers identified additional ecological and social variables and the SES framework represents ongoing revision of the IAD Framework to enable consideration of these factors and extend its usefulness in institutional analysis (McGinnis and Ostrom 2014; Whaley and Weatherhead 2014). The SES framework provides the basic vocabulary of concepts and terms which are used to construct and analyse a model of marine governance in Scotland in this thesis, using the definitions provided in McGinnis (2011) and McGinnis and Ostrom (2014).

The SES framework recognises the complex interdependencies of social and natural systems but allows analytical distinction between them, given the different roles they play and the distinct capacities they possess (Ostrom 2007). The properties of the social dimension reflect those of complex adaptive systems, with diverse institutions and behaviours, local interactions between actors and selective processes that continually shape future social structures and dynamics (Folke et al. 2005). Focussing on the social dimension, the SES framework enables analysing how changing institutional arrangements in diverse governance systems affects policy implementation and outcomes, and “people’s ability to solve problems” through policy processes (Whaley & Weatherhead 2014, p.10). These processes are dynamic and are also responding to exogenous factors which drive change, i.e. social, institutional and biophysical factors which influence the decisions made by individuals (either acting on their own behalf or as agents of groups or organizations). These include for example, climate-change related effects such as sea level rise and ocean acidification, as well as influence from economic power exerted by international markets and multi-tiered socio-political forces which arise externally from higher levels of governance (Ostrom 2007). These factors are only marginally susceptible to intentional human modification by the actors in those settings, illustrated by two-way arrows beyond the primary system outline (McGinnis and Ostrom 2014) (‘S’ and ‘Eco’, respectively in Fig. 2.1). In the SES, multiple sets of actors consume diverse *resource units* (RU) extracted from multiple interacting *resource systems* (RS), which represent the biophysical system where resource units are generated. Users of the resources behave according to a set of rules determined through *governance systems* (GS) which have authority over sets of actors by defining the options available to them and affect *interactions* (I) and *outcomes* (O), over time (Ostrom 2007).

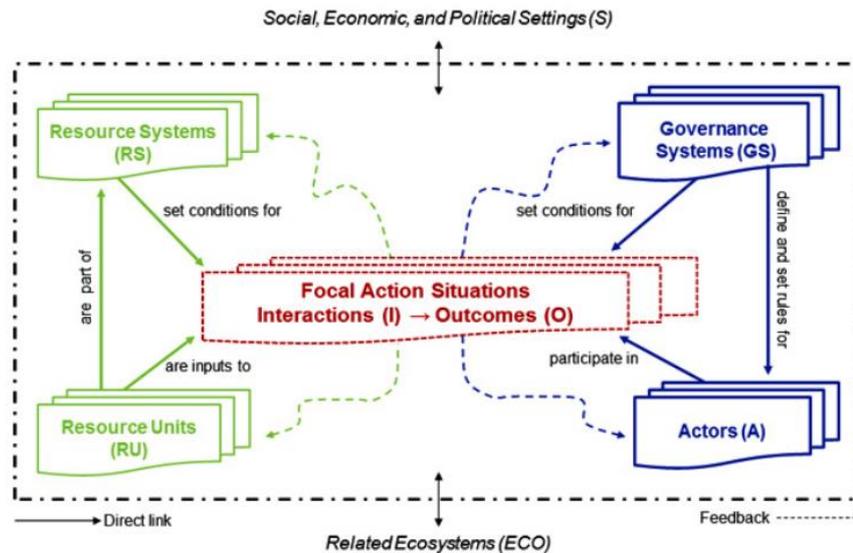


Figure 2.1 SES Framework (Ostrom 2007, p. 15182)<sup>13</sup>

The SES framework enables analysis of behaviour at multiple (theoretical) institutional levels. Ostrom (1999) and others describe: the *constitutional* level, the *collective choice* (or policy decision) level and the *operational* level of decision-making. Constitutional choice outcomes affect collective choice decision-making, which in turn affects operational activities, i.e. material outcomes in the physical world which cause change in the SES. Constitutional rules define certain institutional arrangements for collective choice processes including how participants will be selected, such as procedures for conducting elections and rules that determine the voting majorities needed for enactment of new policies. At multiple, nested collective choice levels *action situations* occur, where multiple individuals (acting on their own or as agents of organizations) observe information, select actions, engage in patterns of interaction and realise outcomes from their interactions (Ostrom 2007). ‘Higher’ collective choice levels (such as legislative development) influence those at lower levels (e.g. regulatory decision-making), and each exhibit different degrees of openness, participation and co-operation (McGinnis 2011). Action situations extend for a certain period or process but are finite and defined in scope to the specific issue they consider. The governance system includes existing formal institutions which define certain conditions of the action situations by regulating the setting, the information available, the ‘rules of the game’, as well as who is admitted to participate<sup>14</sup>. Within these conditions, *actors* (A) have the capacity to control some of the variation in their own actions and are presumed to be ‘boundedly rational’ - they seek to achieve goals for themselves and for the communities to

<sup>13</sup> Multiple boxes are used for each subcomponent to illustrate the potential for concurrent operation of multiple instances of each of the first-tier components (Ostrom 2007).

<sup>14</sup> Also called ‘arena rules’ or ‘interaction rules’ (e.g. Eshuis & Gerret 2019).

which they identify, but within the context of “ubiquitous social dilemmas and biophysical constraints, as well as cognitive limitations and cultural predispositions” (McGinnis & Ostrom 2014, p.29)<sup>15</sup>.

The *outcomes* of action situations include decisions and rules which affect human behaviour and can include institutions, where sets of rules are developed and which may continue to influence human activity and the SES; formally, informally or through the establishment of an organisation (which has greater continuity than the action situation). Decisions made at lower level collective choice action situations affect practical things and lead to decision-making outcomes which steer ‘operational’ behaviour (e.g. permitting decisions by regulatory authorities) which directly affect the SES. Some interactions are non-goal-oriented and result in unintended effects, contributing to emergent properties of the system. Multi-level governance therefore proceeds through numerous actions situations operating simultaneously and at different levels, within which individual decisions are aggregated to constitute patterns of interactions that, when combined with exogenous and emergent factors, produce outcomes. Evaluation of interactions and outcomes made by actors (or by other observers such as scientists) feed back into this continuous process at any stage which is thus adaptive (McGinnis 2011; McGinnis & Ostrom 2014).

The SES framework supports application of adaptive governance by enabling focus on the various levels, components and dynamics which constitute adaptive governance theory. These include the institutional setting (including the politics and the process side of governance, referring to actors and interaction processes); the structural side of governance; the ‘rules of the game’ that shape the interactions of actors and the instruments and political steering towards outputs in policy formulation and implementation (Lange et al. 2013).

### 2.3 Adaptive governance

Through the research by Ostrom and colleagues introduced above, features of governance were identified as essential in addressing uncertainty and unpredictability of SES, including participation, experimentation and collective learning, i.e. *adaptive governance* (Folke et al. 2005). The first use of the term adaptive governance is widely credited to Dietz et al. (2003) and since then it has gained prominence as an analytical approach to understanding and theorising forms and qualities of governance which can recognise complexity and uncertainty to enable response to environmental and

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<sup>15</sup> A social democratic society operating according to a ‘rule of law’ is assumed (Habermas 1996) and in this constructed model of society, we observe communicative acts (the behaviour and interaction of individuals in action situations) and the rules that structure those acts (the governance system). Structure and agency interact in governance, since people act according to rules in their interaction, influenced by societal institutions and values, which influence individual and collective choices (explored further in Chapter 3).

social change, in order to adapt and increase resilience<sup>16</sup> (Armitage et al. 2009; Chaffin et al. 2014; Wyborn 2015). Adaptive governance is framed around goals of social-ecological sustainability and policy solutions which aim at achieving a more sustainable future. These goals, and the adaptive capacity in governance to reach them, are assumed as inherently desirable (Chaffin & Gunderson 2016). It thus refers to “the evolution of the rules and norms that promote the satisfaction of underlying human needs and preferences given changes in understanding, objectives, and the social, economic and environmental context” (Hatfield-Dodds et al. 2007, p.4). While it is no panacea, adaptive governance opens up discussions about processes and situations that allow for the reorganisation of governance in a manner flexible enough to guide resource management despite extreme uncertainty and complexity in SESs (Ostrom 2007).

A key concept used in adaptive governance theory is *adaptive capacity* which refers to the ability of a system or individual to adjust to changing conditions or recover from the impacts of change (Armitage 2005; Folke et al. 2005; Plummer & Armitage 2010). Adaptive capacity is determined by the structures and processes that enable or constrain choices for action by actors, individually and collectively, and reflects learning and an ability to experiment to foster innovative responses and solutions to system change (Armitage 2005). At system scale, adaptive capacity (across actors and institutions) represents an emergent property of the system which enables adaptation and change in governance.

There is no single model of adaptive governance as it is derived from different theoretical fields (Hatfield-Dodds et al. 2007; Djalante et al. 2011) and it is “an umbrella term to capture emergent, collaborative and learning-based types of environmental governance” (Cosens et al. 2018, p.4). Further, a single definition would not be adequate for ‘contextual phenomena’ that depend on the complex results of interaction among society and nature in a specific system (Cosens et al. 2018). However, key dimensions of institutionalised adaptive governance are commonly identified (Djalante et al. 2011; Chaffin & Gunderson 2016), including: 1) polycentric and multi-layered institutions; 2) participation and collaboration; 3) learning and innovation; and 4) self-organisation and supporting activities. These are explained below and were used as an analytical framework and a basis for inquiry into Scotland’s marine governance system, including the marine planning process as a new governance arrangement addressing specific systems. It is important to highlight that features of adaptive governance described in the literature overlap and are interdependent, as actions, processes and characteristics combine within an SES to make it ‘adaptive’ (Chaffin & Gunderson 2016).

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<sup>16</sup> Adaptive governance has been conceptualised as the governance response to resilience theory, where ‘social-ecological resilience’ refers to the ability of a social-ecological system to absorb change and disturbance without shifting to a new regime with a different set of processes and structures, i.e. a new system state (Walker et al. 2004).

### 1) *Polycentric and multi-layered governance arrangements*

Adaptive governance scholarship promotes *polycentric* governance, based on collaborative and participatory institutional arrangements structured to involve actors across state, private sector and civil society in decision making, at multiple scales and levels (Ostrom 2010). Polycentric governance includes a combination of formal and informal arrangements, where community-based initiatives for developing policy within a broader governance frame are deemed to support self-organisation and advance the common interest, enabling features of adaptive governance to emerge (Brunner 2010). Smaller units of governance can better reflect local context, make problems more tractable and respond more quickly to learning and experience (Berkes 2010). Such arrangements can include devolution of responsibilities, rights and access to resources to heterogeneous local management bodies, which can promote innovation and experimental learning as well as enforcement through mutual observation and social incentives (Ostrom 2005, in Hatfield-Dodds 2007). While *decentralisation* refers specifically to transfer of authority and power away from the state (also referred to as devolution) and which is seen as beneficial for marine resource management in east Africa, for example (Cinner et al. 2012), polycentricity importantly emphasises a combination of arrangements, with integration and co-ordination between levels (Duit & Galaz 2008; Djalante et al. 2011). Due to low organisational flexibility, state-led hierarchical governance is assumed to be of lower adaptability than arrangements where the state has a weak role, although it may be more able to effectively monitor and steer governance in response to unexpected developments (Kooiman 2003; Pierre & Peters 2005). Hierarchical, centralised management is not excluded in adaptive governance and modes need to coexist (Berkes 2002), with a integration between 'top-down' structures and smaller scales of governance at which innovation is more likely (Garmestani & Benson 2013).

### 2) *Participation and collaboration*

Collaboration and participation are fundamental to adaptive governance to involve a wide range of stakeholders including those not conventionally engaged with decision making and management to share responsibilities, support learning and innovation and enhance decision-making in resource management (Plummer et al. 2013). Broad participation encourages more diverse perspectives on decision-making and enables integrated knowledge production on problems and their dynamics, and can enhance the democratic legitimacy of environmental governance (Smith & Stirling 2006)<sup>17</sup>. Participation is also necessary to enable deliberation in order to reconcile competing objectives and perspectives through negotiation and communication (Berkes 2002). There are challenges in

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<sup>17</sup> 'Participatory governance' is a theoretical sub-field of governance which specifically focusses on enhancing democratic processes by enhancing engagement of public citizens in governmental processes (see Fischer 2012).

facilitating this in practice and arenas which propose to address highly normative and negotiated goals of 'consensus', 'public interest' and 'sustainability' are vulnerable to underlying power dynamics, and pre-existing inequalities, a lack of trust, and ineffective government can significantly hamper participation and collaboration (Djalante et al. 2011). Prevalent power relationships and the features which relate to power (financial and human resources, etc.) are of critical importance in influencing governance processes and outcomes (Arts & Tatenhove 2004) and pertinent since higher participation results in greater transaction costs of governance (Hooghe et al. 2009) which can amplify imbalances (see Section 2.3.4 for further discussion of power).

### *3) Learning, innovation and adaptability*

Adaptive governance relies on iterative adjustments of goals and strategies (Norström et al. 2014), involving a wide range of actors across multiple levels and scales (Pahl-wostl et al. 2008; Galaz et al. 2012). Governance systems require constant attention and a capacity to adapt to changing circumstances to perform well and to remain resilient over time (Young et al. 2010; Allen et al. 2011; Chaffin et al. 2014; Koontz et al. 2015). Arrangements in structure and function need flexibility to counter uncertainty as well as platforms to learn from feedback. Learning takes place individually and collectively based on the participation of diverse actors who learn by doing and modify their actions based on feedback (Plummer et al. 2013). Social learning is a key contributor to adaptive governance and represents the collaborative or mutual development and sharing of knowledge by multiple stakeholders (both people and organizations) through learning by doing (Pahl-wostl et al. 2008; Pahl-Wostl 2012). It entails collective learning, reflexive practice and action (Wyborn 2015) and the capacity for social learning depends on the processes of interaction and participation, including formal and informal rules and norms affecting governance processes and behaviour (Pahl-wostl et al. 2008).

Mechanisms of learning in adaptive governance range from 'learning by doing', based on participation and social learning (experiential), to a greater level of control in learning through experimentation, including different forms of adaptive management (described further in Section 2.3.2). Ostrom (2007) proposed that resource users and officials must be empowered to "experiment with adaptive policies" in complex SES management and that this is best enabled through "parallel functionality" where policies are explored in one part of the system without imposing uniform formulas (Ostrom 2007, p.15182). Pierre and Peters (2005) also identify that to address high uncertainty governance needs processes of testing, evaluating, refining, and applying new forms of governance, institutional configurations, policies, and practices. Challenges include the higher costs and potential inefficiency of 'adaptive' responses based on learning and 'trial and error' approaches (Ibid.), and in reconciling new adaptive approaches with the rigidity and path dependence of existing institutions (Craig et al. 2017).

#### 4) *Self-organisation and supporting activities*

Self-organisation is fundamental to adaptive governance and includes emergent behaviour and actions by individuals, through formal and informal networks of individuals, organisations, agencies, and institutions at multiple organizational levels (Folke et al. 2005; Plummer et al. 2013; Karpouzoglou et al. 2016; Cosens 2016). Through these networks, actors interact in a collaborative and creative process, often drawing upon a range of knowledge sources, to solve management problems (Berkes 2010). Self-organising activities, supported by activities such as leadership, lower the costs of collaboration and conflict resolution (Folke et al. 2005), and play a role in generating new knowledge and synthesizing existing knowledge. Self-organising activities which support adaptive governance include trust-building, sense-making and consensus-building, innovation, co-operation, visioning, leadership (e.g. in mobilising support and managing conflicts), as well as developing knowledge and social networks committed to change (Leach et al. 2010). The value of ‘shadow networks’, where actors operate and co-ordinate independently of regulatory requirements, and ‘bridging networks’ (or organisations) that facilitate communication between levels and involve government and non-governmental groups as well as other stakeholders are recognised (Olsson et al. 2006; Galaz et al. 2012)<sup>18</sup>. Leadership is important in linking actors, initiating partnership among actor groups and compiling and generating knowledge. As described above, polycentric approaches based on self-organisation require ‘anchoring’ in more formal negotiation processes to act consistently with higher levels of government (Galaz et al. 2012), and self-organisation can be enabled by supportive legislation and governmental policies (Folke et al. 2005).

##### 2.3.1 The role of law in adaptive governance

The challenges of enabling adaptive governance in highly regulated systems of governing is a topic of recent scholarly focus, including adaptive governance researchers in the U.S. (e.g. Camacho & Glicksman 2016; De Caro et al. 2017; Cosens et al. 2018). In particular, the role of law in preventing, triggering and facilitating dimensions of adaptive governance is receiving increasing attention (Cosens et al. 2017; Craig et al. 2017; Gunderson et al. 2018; Cosens et al. 2018; Soinnen & Platjouw 2018). Cosens et al. (2018) note that the dimensions of adaptive governance outlined in seminal works such as Dietz et al. (2003) are “almost entirely composed of actions that may be facilitated by law: congruence of rules with ecological conditions; providing for analytical deliberation / participation; clear boundaries and defined rights; enforced sanctions; mechanisms for dispute resolution;

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<sup>18</sup> Boundary organizations are particularly important for managing the boundaries between knowledge and action (Cash et al. 2003, Kristjanson et al. 2009), whereas bridging organizations can connect local actors and networks with other levels of governance (Olsson et al. 2004b, Olsson et al. 2008, Schultz et al. 2011, Crona and Parker 2012, in Österblom & Folke 2013).

institutional variety; accountability; and nesting (Ibid., p. 4). However, the law can also present barriers to adaptive governance, where earlier legislative, administrative and judicial decisions are unable to be amended or respond to changing circumstances (Soinnen & Platjouw 2018). Understanding the potential within existing legal regime for adaptive approaches is therefore important to address the limited knowledge on barriers within existing institutions and regulatory frameworks to adaptive governance (Sharma-Wallace et al. 2018).

Attention is drawn to the relevance of *legal adaptive capacity*, the substantive and procedural legal mechanisms which support adaptive governance and allow governance to respond to dynamic social and ecological challenges over time (Garmestani & Benson 2013; Camacho & Glicksman 2016; Gunderson et al. 2018). Legal adaptive capacity provides flexibility in light of changing circumstances and emerging knowledge while preserving necessary stability in governance (Craig et al. 2017; Soinnen & Platjouw 2018). Legal procedures define how management decisions are taken including the scale of decision-making, who has the capacity (legal authority and resources) to participate and how to adjust and respond to change (Craig 2019). Law also defines the structure of government and the level at which decisions are made and therefore determines the role of government in adaptive governance (Cosens et al. 2018). Adaptive law needs procedural and substantive mechanisms that allow for new understandings of social ecological systems, and policy responses to their management to penetrate aquatic management practices (Soinnen & Platjouw 2018). In legal adaptive capacity terms, ‘flexibility’ refers to the degree of latitude possible within a given governance structure; within its substantive rules, standards, and norms (e.g. discretion in interpretation, implementation, and application; exceptions and variances; amendments); and within its procedural requirements (e.g. the use of more or less formal procedures or abbreviated procedures) without fundamentally breaching or displacing the governance system as a whole (as, at the extreme, in a revolution)” (Craig et al. 2017, p.1). However, reconciling adaptive approaches with the rule of law is notably challenging to achieve a balancing between the need for stability with flexibility ((Pierre & Peters 2005; Craig et al. 2017). To be adaptive, law needs to have capacity to adapt to changing social ecological circumstances in the systems it seeks to steer without losing its own core characteristics, such as coherence and due process (‘legal resilience’) (Soinnen & Platjouw 2018). Description of how features of legal adaptive capacity was considered in this research through an analytical framework based on adaptive governance is presented in Chapter 3, Section 3.3.6.

### 2.3.2 Adaptive governance, adaptive co-management and adaptive management

Adaptive co-management and adaptive management represent different theoretical conceptualisations of adaptive governance requiring different processes and structures for developing

more flexible environmental governance regimes. The use of these terms is notably confusing; they are used interchangeably with definitions which overlap (Plummer et al. 2013; Hurlbert & Gupta 2016; Hasselman et al. 2017). Distinction is useful for the purposes of analysis, and particularly in ensuring relevance to policy and practice where these terms are also increasingly common. A summary of the definitions used in this thesis is presented in Table 2.1 and described below.

*Table 2.1 Definitions of adaptive management, adaptive co-management and adaptive governance*

	Adaptive Management		Adaptive Co-Management	Adaptive Governance
	Active	Passive		
<b>Summary of theoretical description</b>	Structured decision making based on definitive and iterative experiments addressing a specific issue (Craig & Ruhl 2017).	‘Learn by doing’ at the level of governmental interactions which includes structured review and refining of management approaches (Craig & Ruhl 2014; Hasselman 2017)	Flexible, localised community-based systems of resource management (Folke et al. 2005). Experiential and experimental (Hasselman 2017).	A systems approach, describing institutional arrangements within which the other approaches can be included (Garmestani & Benson 2013; Hurlbert & Gupta 2016).
<b>Participants</b> (as described in Hasselman 2017).	Government responsibility involving regulatory authorities and scientific experts.	Government-led, involving policy-makers, experts and scientists. May also include resource users and community.	Local responsibility supported by government working with local resource managers, users and community who are central.	Shared responsibility between governments, policymakers, scientific experts, lobbyists, resource managers, resource users, community and politicians.
<b>Type of uncertainty addressed</b>	Imperfect knowledge, when knowledge is inadequate or inexact and can be reduced through research.	Unpredictability, resulting from the inherent variability of complex systems. Requires an ability to cope with or respond to unforeseeable change.	Incomplete knowledge, where multiple perspectives are needed to construct a full system understanding, is reducible through participatory processes, in addition to unpredictability.	Incomplete knowledge and unpredictability.
<b>Epistemological basis</b>	Positivist: uncertainty is reducible with decisions and management on the basis of observed and learnt outcomes (Huiteima 2009). Systematic, quantitative and statistical.	Primarily constructivist - including sharing of socially held knowledge in addition to statistical and quantitative information. Positivism can be included where management approaches represent hypotheses and policies as definitive experiments (Hasselman 2017).	Constructivist, although ideally also including power for active adaptive management (positivist). Reflects the local scale and scope, and steers towards local participation (Olsson 2004).	Primarily constructivist but related (encompassing) learning other forms. Different kinds of knowledge and institutional learning (Berkes 2007).

### *Adaptive co-management*

Adaptive co-management (ACM) merges the principles of collaborative co-management, which emphasises joint sharing of rights and responsibilities through collaboration of a diverse set of

stakeholders operating at different levels (particularly between communities and government) and adaptive, learning-based approaches to facilitate effective governance (e.g. Olsson et al. 2004; Armitage et al. 2009). ACM is described as extending adaptive management into the social domain, and a way to 'operationalise' adaptive governance through flexible, community-based systems of resource management tailored to specific situations (Olsson et al. 2004; Folke et al. 2005). It thus takes the broad principles of adaptive governance but considers them in relation to a specific set of resource users, managers and stakeholders who are empowered to engage in experimentation, monitoring, deliberations and responsive management of local scale resources. The sharing of management power and responsibility may involve multiple institutional linkages among user groups or communities, government agencies, and nongovernmental organizations (NGOs) (Folke et al. 2005). In ACM, the scale is localised, the scope is problem-specific and the emphasis is on resource managers with some empowerment leading to joint or devolved decision-making (Hasselman 2017). Resource problems are handled "less by experts but through negotiated agreements with stakeholders" (Hurlbert & Gupta 2016, p.341).

### **Adaptive Management**

Adaptive management (AM) has been proposed as a critical component of sustainable resource use and governance (Gelcich et al. 2010; Chaffin & Gunderson 2016; Hasselman 2017). While Ostrom referred to AM as a 'quality of governance' it has become recognised as a specific process and a *tool* for management in the face of uncertainty (Craig & Ruhl 2014). Traditional definitions of AM in natural resource management (e.g. Holling 1978; Walters 1986; in Rist et al. 2013) focus explicitly on the goal of reducing ecological uncertainty via the use of experimentation in management (Hasselman et al. 2017), while adaptive governance addresses incomplete knowledge and unpredictability via broader goals and processes, for example those of sustainability, participation or democracy (Rist et al. 2013). Folke et al. (2005) discuss adaptive governance as an essential basis for AM by influencing the political nature of decision-making, as well as the steering and accountability mechanisms (Brunner et al. 2005).

Different definitions of AM mean that there is potential for confusion (as reviewed in Hasselman 2017)<sup>19</sup> particularly given the increasing prevalence of the term in policy and legislation and which are also often poorly defined. Adaptive management has a strong policy basis, including in the Convention

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<sup>19</sup> For example, Dietz et al. (2003) state that "institutions must be designed to allow for adaptation because some current understanding is likely to be wrong, the required scale of organization can shift, and biophysical and social systems change, i.e. *adaptive management*" which confuses adaptive management and adaptive governance.

on Biological Diversity (CBD)'s Ecosystem Approach<sup>20</sup> and in EU law, but there is uncertainty around what it means in this context, being an undefined term in EU law (Soininen & Platjouw 2018). In the literature, definitions vary according to the level of structure applied to the process, i.e. from 'learn by doing' without the definition of specific and measurable responses, to explicit parameters identifying goals, hypotheses of causation and procedures for review, adaptation and alternatives (Allen et al. 2011). Distinction is drawn by some authors between *passive* adaptive management, a learn-by-doing approach to policy implementation through experience and responding to signals (which can still be planned with monitoring but without replication and controls), and *active* adaptive management involving elements of experimentation (e.g. pilot programs) in order to promote learning about the nature and dynamics of the system (Hasselman 2017). Hasselman (2017) highlights the relevance of the different types of uncertainty in managing complex SES, which are rooted in different epistemological positions and contributes to confusion in adaptive management and related concepts:

- Imperfect knowledge, when knowledge is inadequate or inexact and which can be reduced through research (Brugnach et al. 2011; Pahl-Wostl 2007; Walker et al. 2003, in Hasselman, 2017).
- Incomplete knowledge, where multiple perspectives are needed to construct a full system understanding, and which is reducible through participatory processes (Brugnach et al. 2008, 2011; Pahl-Wostl 2007, in Hasselman 2017).
- Unpredictability, which requires an ability to cope with or respond to unforeseeable change, including in community preferences and government objectives (Berkes 2007; Olsson et al. 2004, in Hasselman 2017).

Passive and active AM differ in the types of uncertainty they address (Table 2.1) and these are relevant at different scales of governance. Active AM involves definitive scientific experiments which aim to reduce scientific uncertainty by discovering new knowledge (a positivist approach) (Huitema et al. 2009; Hasselman et al. 2017), representing a technocratic approach to risk and uncertainty, orchestrated by decision-maker or policy makers (Hurlbert & Gupta 2016). In active AM, goals are set and the ability to control experimentation is high (Craig & Ruhl 2014), whereas other models of AM, ACM and adaptive governance imply passive adaptive management and invoke constructivism, where socially held knowledge is incorporated, including through 'learning by doing' (Hasselman 2017). Passive AM seeks responsiveness to unpredictability, and management itself can be seen as passive AM and include experimentation in policy implementation and might produce hypotheses which can

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<sup>20</sup> "Management must be adaptive in order to be able to respond to such uncertainties and contain elements of "learning by doing" or research feedback" (CBD 2004, p.6) <https://www.cbd.int/doc/publications/ea-text-en.pdf>

be specifically tested through active AM at the operational scale (Hasselman 2017). The feedback between experimenting at the management and policy scale is therefore an important link between AM and adaptive governance.

### 2.3.3 Empirical research in adaptive governance including in the marine realm

Empirical case studies have delivered important insights regarding how, and under which circumstances, governance systems can adapt to challenges and complex ecosystem dynamics (Ostrom et al. 2002). Research tends to present case studies which focus on determining specific conditionalities for adaptive governance to be realised (Karpouzoglou et al. 2016). A recent review of the expanding adaptive governance literature by Sharma-Wallace et al. (2018) found commonality across case studies, identifying contributing factors of: meaningful collaboration across actors and scales; effective coordination between stakeholders and levels; building social capital; community empowerment and engagement; capacity development; linking knowledge and decision-making through data collection and monitoring; promoting leadership capacity; and exploiting or creating governance opportunities. Lebel et al. (2006) provide empirical support for improved resilience in cases where participatory, deliberative, multi-layered and accountable institutions govern natural resource use.

Some researchers evaluate adaptive governance from the perspective of transitions and transformation, characterising change in relation to adaptive cycles (including the concept of panarchy<sup>21</sup>) and how such change can be enhanced or supported (Chaffin et al. 2016; Gunderson et al. 2017). In these studies the importance of social, ecological, and political drivers of change are highlighted, which can create the impetus for governance transitions and potentially create 'windows of opportunity' for adaptive governance (e.g. Olsson et al. 2006). Drivers of change can include donor ideologies, political shifts, crises (e.g. in global trade or fisheries collapse), shifts in governments, catalytic individuals, and changes in public perceptions (Gelcich et al. 2010) or 'policy windows' (Armitage et al. 2009). Other scholars focus on specific processes which underpin adaptive governance, including the fundamental role of social learning in governance (e.g. Pahl-wostl et al. 2008; Cundill & Fabricius 2009); others on changing structural arrangements, focussing on decentralisation and co-management (e.g. Cinner et al. 2012; Heylings & Bravo 2007), and / or the role of self-organising activities and behaviours including shadow networks and leadership which contribute to adaptive governance. All adaptive governance researchers tend to be critical in making recommendations for practice, often alongside theoretical contributions. Particularly prominent thematic areas of adaptive governance focus on water governance, such as trans-boundary water

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<sup>21</sup> For description of panarchy theory in relation to adaptive governance see Gunderson et al. (2017).

resources governance (Akamani & Wilson 2011), management of riverine and wetland social-ecological basins (e.g. Cosens et al. 2014; 2018), groundwater and ecosystem services (Knüppe & Pahl-Wostl 2013) and integrated water resource management (Herrfahrdt-Phäle 2013; Rouillard et al., 2013) (in Karpouzoglou et al. 2016).

Application of adaptive governance in the marine realm is relatively limited but increasing and includes, for example, Österblom and Folke (2013) who evaluated an international organisation (CCAMLR<sup>22</sup>) as a case of emergence of adaptive governance; similarly, Valman & Österblom (2015) developed and measured indicators of their 'ideal type' of adaptive governance within HELCOM<sup>23</sup>, the Coral Triangle Initiative<sup>24</sup> and CCAMLR, based on Ostrom's design principles, and reveal the role of interplay between actors, networks, organizations, and institutions in the emergence of adaptive governance in the Southern Ocean. They also highlight the need for improved consultation and information exchange and the need to develop evaluation mechanisms which help improve compliance, organisational effectiveness and conflict resolution in supporting adaptive governance in the Baltic Sea. Tuda et al. (2019) consider adaptive governance in a transboundary conservation initiative in the Western Indian ocean highlighting the positive contributions of social proximity and existing collaborative networks for learning, but the lack of compliance mechanisms, information and scientific input, and resource constraints as limitations. Focussing on marine governance in Kenya, Evans et al. (2014) focussed on institutional dynamics and the learning processes in adaptive management / governance (used interchangeably) by analysing differences in the use of local knowledge in decision making in the coastal zone at the local and the State level. They highlight the role of new local institutions and the factors that mediate learning, knowledge exchange and collective action as critical in enabling adaptive governance (in a developing country context) (Ibid.).

As yet, few studies consider marine planning from an adaptive governance perspective. Many articles refer to 'adaptive marine planning' or adaptive management as an important feature of marine (spatial) planning (e.g. Day 2008; Kelly et al. 2014; Mills et al. 2015) and adaptive management is a principle of its implementation (Ehler & Douvère 2009). Such emphasis on learning-based practice can be related to adaptive governance but this research is not situated in relation to governance theory. Similarly, important work such as Olsen et al. (2011) is related, who proposed assembly of a 'governance baseline' to inform the design of marine planning processes and provide a basis for learning from experience and responding to changing ecosystem conditions, invokes the 'essence' of adaptive governance but is not approached from this theoretical perspective. Recently, Craig (2019)

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<sup>22</sup> Commission for the Conservation of Antarctic Marine Living Resources

<sup>23</sup> Baltic Marine Environment Protection Commission

<sup>24</sup> Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security

highlighted the potential role of marine spatial planning in fostering the emergence of adaptive governance by promoting legitimate consideration of climate change adaptation measures for aquaculture, through public participation, collaboration and “experimentation with accountability” (Ibid., p.1). In this case, the focus is on the steering capacity of the marine planning process in potentially enabling adaptive governance, by supporting collaborative effort, flexibility and minimisation of ecological risk, for example by promoting co-location of marine activities (Ibid.). Applying adaptive governance to the analysis of marine planning and particularly through empirical analysis is therefore still at an early stage of development. (Further introduction to marine planning is presented in Section 2.4).

#### 2.3.4 Criticism of adaptive governance and the social-ecological systems framework

As an expansive field of literature, critiques of adaptive governance arise from a range of theoretical perspectives, while highlighting its strengths as a theoretical framework. There is broad agreement that although widely applied and gaining considerable purchase in both academic and policy worlds<sup>25</sup> there remains a lack of progress in understanding adaptive governance in practice, and a need for situated, contextualised analyses and empirical research (Chaffin et al. 2014; Wyborn 2015; Sharma-Wallace et al. 2018). Given the reliance on the use normative principles (from the resilience and commons literature), greater focus is needed on the challenges of “actualising” these principles and generating understanding of the “contextual forces” that make existing hierarchical governance resistant to change (Armitage 2008, p.7). Of critical relevance is understanding the nested political and social processes that give rise to the production and reproduction of institutional arrangements, including “cultural commitments and political relations that underlie the persistence of certain policy framings” and which sustain existing policy approaches (Cote & Nightingale 2012, p.482). Understanding the relationship between public policy and adaptive governance is essential (Chaffin et al. 2014; Karpouzoglou et al. 2016).

Power, representing the uneven capacity of different actors to influence the goals, process, and outcomes, is a key concern in criticism new forms of governance which emphasises the role of actors and processes ‘beyond the state’. Swyngedouw (2005), Clement (2010) and others question whether participatory or collaborative modes of governance lead to enhanced democratisation, since the methods of engagement and representation, such as through instruments of consultation, participation and negotiation are invariably mediated by power (whether political, economic, gender or cultural). Governance from outside the bureaucratic processes of government lack the democratic controls of state-based arrangements and therefore the legitimacy and accountability and

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<sup>25</sup> <https://www.stockholmresilience.org/research/research-streames/stewardship/adaptive-governance-.html>

decentralisation must be treated critically (Swyngedouw 2005). Similarly, analytical shortcomings have been highlighted in the treatment of power in polycentric governance and while the involvement of a wider number of actors is presumed ideal, diffusion of power is complex, messy and uneven, with potential for problems including “high transaction costs, inconsistencies, freeloading, unanticipated effects, gridlock, and implementation failure” (Morrison et al. 2017: 101934).

These analytical shortcomings have been levelled specifically at Ostrom’s SES framework, for example Clement (2010) who indicate that in its original form (the IAD framework) analysis of multi-level governance inadequately considers the role of power and interests in the crafting of institutions, the shaped by power distribution at the collective-choice and at the constitutional levels. From this perspective, power struggles and inequities are both a determinant and a result of institutional performance and require that the interaction between structure and agency is considered (Clement 2010). Other arguments are made for greater consideration of power and competing value systems in adaptive governance and the functioning of SES, including a need for critical examination of the role of knowledge (Côte & Nightingale 2011).

Situated system analyses are essential to enable analysis of socio-cultural issues and power mediating environmental decision-making. Links are made with political ecology, an approach that attempts to locate the ways in which power works in social-ecological systems by focusing on the relationships between political, economic and social factors (Ibid.). Further, the emphasis on adaptive governance in facilitating the ability to transform a system to a more desirable state (Chaffin et al. 2014) is challenged by those who observe that the processes of determining such a ‘desirable state’ and goals for future regime transformation are inherently normative, with multiple ways of judging and evaluating the governance of multi-scale problems (Smith et al. 2005; Munaretto et al. 2014). Some system regimes may be considered desirable by one segment of society and undesirable by another (Walker et al. 2006, in Cote & Nightingale 2012) and ecologically desirable goals need to be balanced with societal goals and political feasibility (Chaffin et al. 2014). A wide range of authors therefore raise the need to better address the political, social, and cultural dimensions of adaptive governance (Cleaver & Whaley 2018), including attention to the interaction of agency, culture, history and power in governance (Chaffin & Gunderson 2016; Cote & Nightingale 2012).

### 2.3.5 Related theories and concepts

Other more recent fields have many parallels to adaptive governance including deliberative and reflexive governance, but which focus more explicitly on the politics of knowledge and fundamental questions such as contestations over how ‘the system’ is framed in the first place, and what is to be sustained for whom and why (Leach et al. 2010). Deliberative governance emphasises negotiation

among multiple narratives and ongoing reflection on actors' positions and framings, particularly relevant to the ambiguity and contestation of sustainability goals and with focus on discursive processes and narratives to address issues relating to power (Smith & Stirling 2006). Building on constructivist approaches to knowledge and knowledge politics, governance is seen to be as much about shared problem construction as it is about collective solutions (Ibid.). Reflexive governance extends this to confront divergence in perspectives through sustained pluralistic reflexivity throughout the governance process and includes the need for regular critical re-assessment of the extent to which strategies are delivering the outcomes desired from different perspectives (Smith & Stirling 2006; Voß et al. 2007; Leach et al. 2010), including reflexivity in knowledge claims (Leach et al. 2010).

Chaffin et al. (2016) drew distinction between adaptive governance and *transformative environmental governance* which focusses more directly on “actively shifting degraded SES's to alternative, more desirable, or more functional regimes by altering the structures and processes that define the system” (Ibid., p.1) based on human agency. However, in more recent work (Chaffin et al. 2019) this distinction is less evident, with adaptive governance - environmental governance operating under the uncertainty associated with complex SESs and contemporary global change - seen as a desirable goal of “transforming environmental governance” (Chaffin et al. 2016, p.160). This aligns with earlier work where adaptive governance represents an approach which can consider ‘transformation’ to a more desirable state, responding to social as well as ecological change (e.g. Chaffin et al. 2014), and suggests an as yet unclear relationship between adaptive governance and transformative environmental governance.

A related subfield is transition management, which has parallel concepts to adaptive (and transformative) governance, but focusses explicitly on system change and new regimes (Chaffin et al. 2016). The concept is based on evolutionary and complexity theories and was developed for steering socio-technological change at the sector level (Voß et al. 2007) and has been recently promoted as an approach for conceptualising change in marine governance (Kelly et al. 2018). At its core is the creation of ‘transition arenas’ as platforms for the development of integrative strategies in interaction of diverse stakeholders, to “enable deliberate attempts to bring about structural change in a stepwise manner” (Voß et al. 2007, p.205). The relationship between adaptive governance and these fields based on the research presented in this thesis is considered in Chapter 8, Section 8.3.1.

## 2.4 Marine planning

Marine planning was a primary focus of this research, conceptualised as a new institutional space intended to inform and shape marine governance. Broadly, marine planning is a holistic process

introduced to address multiple and competing demands on marine resources, and achieve economic, social and ecological objectives based on principles of adaptive management, participation and integration (Douvere 2008). It is proposed to address certain deficiencies in current marine management approaches including coherence, integration and simplifying administrative complexity (Boyes & Elliott 2016). It is being increasingly adopted worldwide and expected to apply to over 60% of the Exclusive Economic Zones of the world's ocean (Santos et al. 2018). Although there is a generally accepted process of marine spatial planning (following the general steps outlined by Ehler & Douvere (2009), approaches vary widely, including allocation of space for different activities ('zoning' and most commonly associated with marine *spatial* planning), to policy-based planning which guides future decision making on marine resource use, and with varying relationships to other planning processes (Kidd & Shaw 2014). Marine planning programs and practices are highly context-specific, influenced by local factors such as the socio-political context, the emphasis placed on particular sectors and interests, the terminology used, whether it is legally binding, its relationship to other regulatory frameworks, the resources available for the planning process, its prior prevalence in a region, among others (Greenhill 2016).

Marine planning is described as a continuing, adaptive process that should include performance monitoring and evaluation as essential elements of supporting a learning-based management process (Ehler & Douvere 2009; Ehler 2014). An adaptive approach to marine spatial planning and management is indispensable to deal with uncertainty about the future and to incorporate various types of change, including global change (climate change), as well as technological, economic, and political change (Ehler 2014). However, implementing adaptive forms of marine planning is complicated in practice, due to factors such as the existing institutional setting and adaptive capacity to sustain on-learning and engagement (Mills et al. 2015), and a lack of understanding of existing baselines (Olsen et al. 2011). While often iterative, there is a lack of definition of systematic process for responding to learning with defined management responses in MSP (Ehler 2014; Jones et al. 2016).

While marine planning is promoted as a tool to support better governance, it faces wide ranging conceptual and practical challenges (Santos et al. 2018) and academic attention to MSP is increasing exponentially (Ehler et al. 2019). Marine planning has been emphasised as a social process<sup>26</sup> since it seeks to enable communication processes between groups of society and across spatial scales, linking diverse sets of information and stakeholders in processes of dialogue (Kannen 2014). Further, it is a political process, based on framing and discursive debates on marine problems and their solutions

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<sup>26</sup> MSP has been defined "as a public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas" (Ehler and Douvere 2007)

(Flannery et al. 2019). Recently, authors have questioned whether it can lead to more democratic governance through the participation it purports to enable, particularly given the underlying power imbalances in society and the unclear distribution of benefits (Flannery et al. 2016; Smith & Jentoft 2017; Flannery et al. 2018); or whether it simply sustains the status quo and the powers of 'elites' due to prevailing power dynamics and legacy arrangements (Kelly et al. 2018), instead of challenging underlying politics, unequal power relations and social injustices (Tafon 2018). The contribution of marine planning is proposed as challenged by 'post-political' processes in society where political processes of debate and contestation are excluded based on the dominance of free-market neoliberal capitalism and an unchallenged emphasis on continued economic progression, and where stakeholders are disempowered through focus on consensual procedures and technocratic environmental management, rather than 'good environmental governance' (Flannery et al. 2019).

Approaches to understanding change through marine planning is at an early stage. In their review of how change is considered in marine planning research, Gissi et al. (2019) highlight gaps in understanding how marine planning incorporates change at multiple spatial and temporal scales, in the SES as well as through the adaptive planning cycle based on implementing, monitoring and adapting. Methods for accounting for system dynamics, environmental variability and future change are needed including, for example, decision support tools to explore potential consequences of planning actions under changing conditions (Ibid.). Social dynamics are under-represented in the literature with emphasis needed on processes such as social learning in order to promote institutional transitions in marine planning. Kelly et al. (2018) recently proposed transition management as an approach to conceptualising change in MSP which could support learning from experimentation in management to support transformations in marine governance, but overall, there remains a lack of situated and detailed analysis of marine planning practice and whether it leads to beneficial outcomes for governance (Kelly et al. 2018).

## 2.5 Contribution of this thesis

This thesis seeks to make a practical and theoretical contribution to the understanding of the functioning of marine governance and how it can be improved. In particular, this research aims to contribute to understanding of the emergence of adaptive governance and how adaptive approaches can coexist with contemporary institutional arrangements (Brunner 2010) and addresses the need for highly situated, context-specific understanding of the opportunities and constraints to the institutionalisation of adaptive governance (Chaffin et al. 2014). Building on recent advances, it extends application of the broad theoretical approach of adaptive governance to the challenge of understanding institutional change in marine governance, including through marine planning.

Focussing at a national scale, with case studies presenting different angles of analysis, insight is gained into potential for adaptive governance (or ACM, or AM) and apparent constraints in a marine governance system. Adaptive governance requires focussing on specific case studies in order to consider regulatory systems, requirements and barriers. Given the relevance of the existing legal framework identified through the in-depth case study of marine planning (Case Study 1), later case studies (2 and 3) look more closely at the issue of the potential for institutionalising adaptive governance in current legal frameworks, as identified by Cosens et al. (2018), Soininen & Platjouw (2018), Craig (2019) and others.

This thesis does not propose to comprehensively address all critiques of adaptive governance, however, it does seek to account for some of the concerns described in Section 2.3.4 in the analysis and discussion. As described in Chapter 3 (Methodology), focus on a 'rich' analysis of a specific system of governance through detailed case studies provides opportunity to consider context-specific influences the emergence or hindrance of adaptive governance. The SES framework provides ability to focus on key dimensions of institutional dynamics relevant to the research questions posed and is a valid approach for identifying factors which arise from outside this system and beyond the direct control of actors within it. The focus on institutional dynamics via action situations and interaction between actors in relation to the governance system provides insight into these processes and outcomes in Scotland's system of marine governance. This is proposed as a reasonable balance between concerns regarding an "overly rational or structuralist models of human agency and institutional change" (Cleaver & Whaley 2018, p.49) and an approach which can structure an in-depth empirical analysis of institutional dynamics in a governance system.

Addressing marine planning specifically, the application of an analytical framework based on adaptive governance represents a novel approach, particularly with complementary case studies which support situating marine planning within a complex system of marine governance and a broader context of institutional change. Given the features that it ascribes to enable and the characteristics it may support, conceptually, marine planning was observed to provide certain structural and procedural characteristics which relate to the ideals of adaptive governance, particularly in Scotland where an innovative and experimental approach to marine planning might support institutional change towards adaptive governance. The emphasis in policy, explicit and implicit, on the potential of marine planning to change and improve marine governance indicate that adaptive governance is an appropriate frame for considering its contribution to sustainable resource governance.

Marine planning is therefore conceptualised in this thesis as a new framework for integrated governance, which must consider, and relate to, the broader framework of policy, planning and

management of marine uses. Marine planning includes the exercise of authority in terms of allocation of space for marine activities, guided by a broad range of policies relating to sector development (such as energy, climate change and food security), intended to guide the sector-specific licensing and management of marine activities within its boundaries. While marine planning does not replace existing decision-making processes, it is proposed here to provide an opportunity to reflect on the problems of current fragmented and inflexible approaches and consider more effective and adaptive marine governance.

## Chapter 3. Methodology

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### 3.1 Introduction

This chapter discusses ontological and epistemological issues relating to my study of adaptive governance, the adoption of a critical realist position and the methods used in the research. Natural social science research has been criticised for insufficient inclusion of such detail which compromises its validity to the wider academic effort (Moon et al. 2016) and detailed account is provided in this section to justify a robust and rigorous approach. Adaptive governance and natural resource governance are multidisciplinary concepts, resulting from different theoretical assumptions and paradigms which further justifies the need for detailed explanation of positionality, perspective and assumptions. The methodological discussion leads to a description of the methods used to address the research questions through the case studies (Section 3.4). This chapter is presented in the first person to clarify my own perspective and how choices were made.

### 3.2 Researcher positionality

Exploring philosophy of science during the PhD introduced me to deeper debates about subjectivity and how our values affect our perceptions and behaviour. Knowledge is not 'value free' and while I attempted to ensure that the methods used were applied rigorously, as a researcher my vision of social reality, influenced by my experience, shaped the research focus and methodology (Bryman 2016). This section reflects on this experience to make my position transparent and considers the implications for the research and support its evaluation.

Prior to joining SAMS, I worked in a regulatory setting for five years providing statutory conservation advice on offshore developments at the UK's Joint Nature Conservation Committee (JNCC), including policy, planning and consenting of projects such as offshore wind farms, oil and gas and aggregate extraction. As the regulatory requirements for marine planning were introduced (through the UK Marine and Coastal Access Act 2009 and the Marine (Scotland) Act 2010), I became active in the process on behalf of JNCC, principally as it appeared to me that this provided a new process and arena for interaction among stakeholders and which might enable broader conversations around balancing activities, risks and benefits in marine resource use through a strategic approach, which I had observed as problematic in general regulatory practice. As my position at JNCC became more challenging and pressured (due to rapidly expanding offshore wind development alongside the financial crash, consequent austerity and effects on the public sector), it seemed increasingly difficult to 'stop and think' regarding our approach to marine management and particularly to make changes. This led to

my move to academia as a Research Fellow at SAMS, my on-going interest and engagement with marine planning and subsequently the start of a PhD focussing on marine planning and governance.

During the PhD process (which began in November 2014) I was also employed in a full-time role and was involved in research and wider activities at SAMS, including being embedded in practical implementation of marine planning in Scotland, engaging with other actors (authorities, stakeholders, government, academics, ENGOs, etc.) where I both influenced, and was influenced by, the continuing debate on marine planning and marine governance in general. In addition to research projects (outlined in Chapter 1, Section 1.4), key activities included establishing and managing the MASTS Marine Planning and Governance Forum, co-organising the Sea Scotland Conference series from its inception in 2016, and other proactive activity aimed at supporting improvements in governance through communication and collaboration across diverse networks. A summary of the MASTS and Sea Scotland activities are shown in Table 3.1.

*Table 3.1 Examples of activities undertaken during PhD and observations relating to my positionality as a researcher*

Event / Activity	My contribution and outputs	Relevance to positionality
Marine Planning and Governance (MPG) Forum at MASTS <sup>27</sup>	<ul style="list-style-type: none"> <li>• Established and convened the MASTS Marine Planning and Governance Forum (2013 – 2018)</li> <li>• Key activities included workshops such as: <i>“Where are we? Exploring the National Marine Plan Review Process in Scotland”</i>); representing the Forum at regular meetings with Marine Scotland on the developing marine planning process; support activities such as the MASTS review of the regional assessments; worked with the Steering Group to develop a number of Small Grant Awards to support marine planning research in Scotland.</li> </ul>	Useful insight and involvement with the development of marine planning in Scotland. The value of multiple actors working in an effective and productive network; the need for new knowledge to inform practice; the extent to which this was valued by the marine planning community including practitioners and Marine Scotland.
Sea Scotland Conference Series <sup>28</sup>	<ul style="list-style-type: none"> <li>• Collaborated with ENGOs to established a new conference series and co-organise 4 events to date:               <ul style="list-style-type: none"> <li>○ Sea Scotland 2016 (<i>“Marine Planning in Scotland”</i>)<sup>29</sup></li> </ul> </li> </ul>	Positive and exciting cross-organisational collaboration in the Steering Group. The events were valued as an important opportunity for multi-stakeholder debate on important topics.

<sup>27</sup> Marine Alliance for Science and Technology in Scotland. The Forum website is: <https://www.masts.ac.uk/research/research-forums/marine-planning-governance-forum/>

<sup>28</sup> Details of Sea Scotland along with previous and current conferences can be found here: <http://www.seascotland.scot/> My engagement was supported by SAMS and MASTS until 2017 and from 2018 onwards I participate via my own company Ocean Dialogues Ltd.

<sup>29</sup> SS16 Conference Report: [http://www.seascotland.scot/wp/wp-content/uploads/2016/04/SeaScotland\\_16-Steering-Group-summary-report\\_final.pdf](http://www.seascotland.scot/wp/wp-content/uploads/2016/04/SeaScotland_16-Steering-Group-summary-report_final.pdf)

	<ul style="list-style-type: none"> <li>○ Sea Scotland 2017 (<i>“Sustainable Development of Scotland’s Seas: Securing Progress in Uncertain Times”</i>)<sup>30</sup></li> <li>○ Sea Scotland 2018 (<i>“Empowerment in marine stewardship: Emerging opportunities for citizens and communities in Scotland”</i>)<sup>31</sup></li> <li>○ Sea Scotland 2019 (<i>“Sea, Soul and Society: Adapting to climate change”</i>)<sup>32</sup></li> </ul>	
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The implications of my experience on my position as a researcher are that I held a relatively informed position from a practitioner / regulatory perspective with a good understanding of the policy framework, the practical functioning of government in policy delivery and the management of marine development. Further, historical active engagement with research subjects such as through the MASTS MPG Forum supported validity in the research as analysis began during this process of interaction with those shaping the phenomena under investigation (Flyvbjerg 2001). It also provided easier access to interviewees based on established relationships with the leads of the MPPs in each region. Based on experience and through extensive reading on the topic, I selected adaptive governance theory as the primary framework (supported by other theories and fields as discussed in Chapter 2). My experience fostered a more empirically grounded critique of adaptive governance theory in relation to marine planning and governance.

### 3.3 Ontological and epistemological assumptions

As reviewed in Chapter 2, governance consists of the structures and processes by which people in societies make decisions, share power and create the conditions for ordered rule and social coordination (Folke et al. 2005). Governance addressing human use of natural resources is complex and multi-level, comprised of institutions which include formal rules (laws and regulations) and informal institutions embodying socially shared norms that impact behaviour (Ostrom 1990). Adaptive governance proposes that addressing the limitations of the scientific management paradigm in environmental policy (contributed to by the dominance of positivism in the latter 20<sup>th</sup> Century) requires collective arrangements between governments and local participants, where context-specific knowledge and experimentation can enable flexibility, innovation and resilience (Brunner & Steelman

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<sup>30</sup> SS17 Conference Report: <http://www.seascotland.scot/wp/wp-content/uploads/2017/03/SeaScotland-2017-Summary-Report.pdf>

<sup>31</sup> SS18 conference report at: <http://www.seascotland.scot/wp/wp-content/uploads/2018/10/SS18-conference-report-1.pdf>

<sup>32</sup> SS19 conference report at: <http://www.seascotland.scot/conference-2019/about/>

2005; Ostrom et al. 1999). A philosophical approach is thus required which can account for the wider processes of governance, including the deliberation and determination of the goals of governance and the values, norms and principles underpinning them (Jentoft & Chuenpagdee 2009), to enable the negotiation of trade-offs between multiple, diffuse and changing interests (Brunner & Steelman 2005; Dietz et al. 2003).

Different ontological perspectives provide contributions to governance research (with none being 'complete'), but specific philosophical assumptions are rarely made explicit in the literature reviewed in Chapter 2. In general, positivism is inadequate for studying and understanding human-environment interaction and governance, given the problematic reduction of ontology to epistemology by limiting 'reality' to what can be empirically known (e.g. through scientific experiments), and with epistemological assumptions which cannot "fully account for the subjective nature of human reasoning and choices" (Evelly et al. 2008, p.51). At the opposite end of the spectrum, a social constructionist ontology is also considered insufficient as it assumes that reality is entirely constructed through and within human knowledge or discourse (Bhaskar 1998, in Fletcher 2016)<sup>33</sup>. While accepting that our understanding of the natural world is socially mediated, addressing governance of natural resources requires recognising an 'extra-discursive' natural world, which questions the ability of social constructionism to adequately account for human experience (Newton et al. 2011). This is not to deny that social constructivist approaches play a role: constructionist research can support governments and stakeholders to design contextually relevant responses to conservation problems (Moon & Blackman 2014); social constructivist notions of space make contributions to planning, as described in Jay (2012); and elucidating different perceptions of governance and sustainability among actors has led to recommendations on how to account for these in designing governance (Steins & Edwards 1999; Lawrence 2017).

### 3.3.1 Critical Realism

As an alternative paradigm, *critical realism* is considered a viable ontology which allows positivism to be abandoned without having to accept a social constructionist ontology (Elder-Vass 2012), presenting a 'third way' between positivism and relativism, and between modernism and post-modernism (Sayer 2000). Critical realism is increasingly applied in social science research including in corporate governance and study of organisations and management (Fleetwood 2004; Eveley et al. 2008) to develop practical policy recommendations to address social problems (Fletcher 2016). Critical realism is difficult to define since it is not one set of unitary philosophical beliefs and is instead a "family of

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<sup>33</sup> This is also the criticism levelled at *interpretivism* and its tendency to reduce social life wholly to the level of meaning (Sayer 2000).

resemblances” with commonalities between approaches taken (Archer et al. 2016). In critical realism, the existence of objective natural (material) and social realities is acknowledged, along with the socially constructed and fallible character of scientific knowledge (Bhaskar 2014; Danermark et al. 2002). For this reason, critical realism is considered compatible with a ‘moderate’ social constructionist *epistemology* (or ‘Epistemic Relativism’) which acknowledges the constructionism at work at the individual and collective level, but rather than seeking to establish what versions of social reality are created and why, these are considered to not present an obstacle to identifying causal processes and mechanisms (and can constitute causal processes themselves) (Elder-Vass 2012)<sup>34</sup>. While interested in subjective meaning systems and how these emerge, critical realists are also interested in how these combine to inform collective social processes, as entities or institutional mechanisms in themselves (Vincent & Wapshott 2014). Social structure is therefore recognised but interacting with, responding to, and generated by, constructionist discourse. Institutional structures are ‘real’ but informal rules, norms, etc. are constructed, meaning that social institutions are normative with processes steered by discursive rules and norms, with which there is general conformity (Elder-Vass 2012).

From an institutional perspective, critical realists recognise social reality as incorporating individual, group, institutional and societal levels, and collective, constrained decision making is the underlying mechanism that creates all social outcomes (Archer 1995, in Dalkin et al. 2015). Within this, agency and structure constitute different ‘strata’ of reality and both social structures and individual agents have emergent causal powers. Social structures both constrain and enable agency but agents are “real physical human beings capable of reflection and choice” (Elder-Vass 2012, p.18), which behave intentionally (are causally significant in their own right) and are involved in reproducing and transforming social structures through aggregation of decisions (Fig. 3.1). In governance, the structural dimension is thus acknowledged (and represents causal mechanisms), where the legitimacy of governance is determined partly by institutions including formal rules and how power is distributed, but these are refined and shaped through social processes and interaction (Bhaskar 2013). Actors make decisions on their actions (and consequently interactions) in the context of their perceptions of the social-ecological system. There is thus a mutually influential relationship where humans shape the society, which in turn affects human activities (Fig. 3.1).

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<sup>34</sup> Elder-Vass (2012) argued that social constructionism *must* be combined with a critical realist social ontology if it is to offer a coherent approach to developing critical social theory.

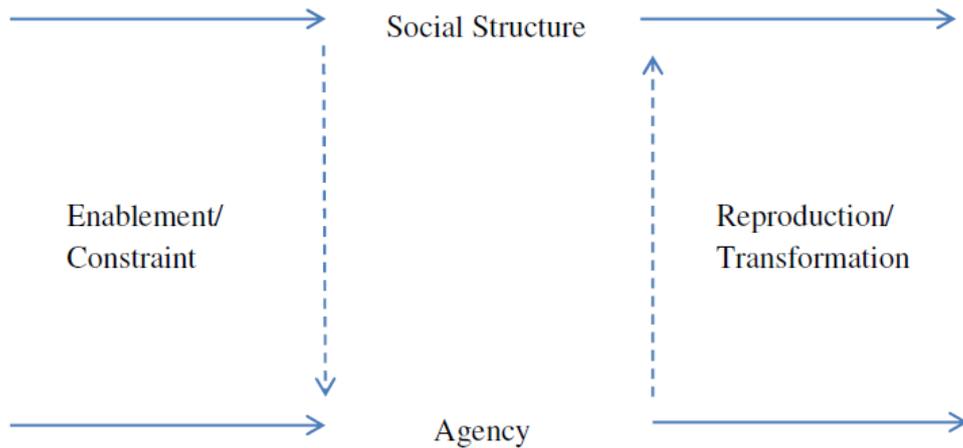


Figure 3.1 The relationship between structure and agency (Original Bhaskar reproduced in Elder-Vass 2012)

Due to its integrated explanation of human environment interactions embedded within multi-level governance, critical realism provides a powerful analytical tool to understand natural resource governance. In critical realist terms, real entities include those beyond the physical which cause human beings to act in a way that they would not otherwise, including ‘socially real’ practice - the market mechanism, social structures and organisations, for example (Fleetwood 2004) and which it is possible to conceptualise and theorise in order to describe. It focusses on the external or direct structural constraints of governance with analytical and explanatory significance attached to the institutionalised frameworks (which can include power and domination relations) within which specific governance mechanisms, programs and practices develop, and new forms of governance are emergent outcomes of historical and situational contingencies (Newton et al. 2011).

### 3.3.2 Critical Theory

In seeking to identify my philosophical perspective, I also found appeal in the descriptions of critical theory to which critical realism is closely related, both of which seek to ensure *critical* social science, that is, a social science which is critical of the social practices it studies (Sayer 2000). For example, Guba & Lincoln (1994) describe it as enabling focus on “informed capacity to facilitate change”, based on the greater insight gained through the study (of researcher and participants) where the researcher is a “transformative intellectual” (Giroux 1988; in Guba & Lincoln 1994, p.110). In critical theory, research is undertaken in such a way as to change situations and improve society and includes emancipatory, advocacy / participatory and feminist critical theoretical approaches (Moon & Blackman 2014). Further, the intention of the critical theorist to “initiate public processes of self-reflection” (Bohman 2016) is an intention of mine, in research and associated activities. The ‘critical’ aspect of both places central emphasis on critique in (and of) the research process, and can be distinguished from social science research in general (which notably represents “a practical,

intellectual activity aimed at clarifying the problems, risks, and possibilities we face as humans and societies, and at contributing to social and political praxis” (Flyvbjerg 2001, p.4)) by making the critique of social practices (and theories) an integral focus, rather than peripheral. Critical realism is considered potentially emancipatory through the development of causal explanations which can challenge dominant narratives and discourses. The work of Jurgen Habermas, an important critical social theorist, informs this thesis.

### 3.4 Methodological implications

The focus of critical realist research is to determine causal (or generative) mechanisms which influence events in the real world, through empirical data. This is based on the perspective of a real world that is complex and stratified into different layers (and hence sometimes referred to as using a ‘depth’ or ‘stratified’ ontology) (Sayer 2000), with three domains of reality (Smith & Johnston 2014) (Table 3.2).

Table 3.2 Domains of reality in critical realism

Real	The <i>real</i> refers to ‘whatever exists’ i.e. the realm of natural or social objects (individuals, groups, institutions) and the structures and causal powers of these objects (which are not usually directly observable) <sup>35</sup> (Sayer 2000). These structures and generative mechanisms create the <i>actual</i> , i.e. they are causal powers which give rise to something, or the reason that something <i>is</i> (Bhaskar 1993; in Smith & Johnston 2014, p.7).
Actual	The <i>actual</i> refers to real events or social phenomena generated when the causal powers or mechanisms are activated. In this research, the actual can be considered in relation to the functioning of action situations (including for example the interactions in the Marine Planning Partnerships), arising from processes in governance, and which lead to outcomes including decisions and formal rules. These <i>actual</i> outcomes are distinct from the ‘real’ underlying mechanisms which might include social factors influencing behaviour or the influence of the governance system, for example.
Empirical	The <i>empirical</i> is the level of experience and observations and can refer to the <i>real</i> or the <i>actual</i> . A case for the existence of (real) causal mechanisms can be made by reference to observable effects which can only be explained as the products of such entities (Sayer 2000). The empirical can include observations of an object or event, including people’s experiences or perceptions of that event (an ‘empirical trace’). In this study, data including responses to interview questions, documented conversations in meetings and statements in policy and legislation provide insight into structure and underlying mechanisms.

<sup>35</sup>This is a key distinction from empirical realism which assumes that what we can observe is all that exists (Sayer 2000)

Analysis is undertaken by applying theoretical predictions to the different layers of reality, including the insights gained through the 'empirical traces' into events, the nature of an event (e.g. a decision / action situation) and in explaining the causal mechanisms. Causal mechanisms can have different meanings depending on the scope of the intended explanation, with some focussing on the level of human reasoning to understand the implementation of a particular programme (Dalkin et al. 2014). In this research, given the focus on the dynamics of governance and understanding change in governance, causal mechanisms are those considered in line with Bhaskar (1978, in Dalkin et al. 2014) i.e. primarily the structural component of the social world and its interaction with agency.

Taking this perspective, marine planning and management is considered in this thesis as a 'socially real' practice or entity, defined by policy and legislation. This creates a new process which is both experienced and observed, leading to a change in behaviour and resulting in real events (action situations) and outcomes which change the SES. Research analysis is applied to the experience of participants within the action situations (agency) e.g. the MPPs and on the structural constraints, including formal and informal institutional mechanisms within which they are being developed, to consider causal mechanisms addressing its functioning in different contexts. These are related to theoretical constructs defined in adaptive governance and governance theory, including structure and agency, and includes the components of the SES Framework (described in Chapter 2, Section 2.2.2) as the basic vocabulary of concepts and terms used to construct causal explanations.

The use of a theoretical framework, combined with researcher motivations through the study for practical contribution, negates the validity of a grounded theory approach which intentionally avoids existing theory (Fletcher 2016). Further, in critical realism, this original theory may be supported, modified or rejected in attempting to explain reality (Ibid.), recognising that theories are only partial and knowledge is fallible<sup>36</sup>. Critical realism therefore requires capacity for inference beyond the deduction of an empiricist approach, employing both abduction and retrodution (Danermark et al. 2002). Abductive reasoning seeks to find the most likely explanation for observations and can consider explanation of broader social mechanisms beyond those explained by theory; retrodution is concerned with identifying the constitutive characteristics of social phenomena and involves argumentation that goes beyond the empirical facts in considering relationship of theory to data, to establish the contextual conditions that give rise to particular mechanisms (Edwards et al. 2014).

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<sup>36</sup> The term *transitive* is used in critical realism to refer to the concepts, theories and models we create and use to understand the world, where 'transitive' denotes the temporary or changeable nature of what we claim to know, suggesting that the current state of knowledge often represents our best understanding at present. *Intransitive* objects are the things that are real and that exist whether we know about them or not (Sayer 2000).

Generalising in critical realism is based on discerning the underlying structures and mechanisms at work in empirical phenomena or events and are both intuitive and empirical (naturalistic generalisation).

Critical realism (or critical theory) functions as a general methodological framework for research but is not associated with any particular set of methods (Fletcher 2016; Archer et al. 2017). A pluralist and pragmatic stance is taken with respect to methodologies and specification of methods that might be drawn on to theorise the complexity inherent in social phenomena (Bhaskar 2013). However, case studies are often employed where empirical observations enable considering the constitutive characteristics of social objects and the generative mechanisms in operation. The methodological choices of most adaptive governance studies are drawn from qualitative styles of enquiry more commonly associated with the environmental social sciences, including literature reviews, interviews and participant observation (Karpouzoglou et al. 2016) and a qualitative approach was adopted here, using a case study approach as described next.

#### 3.4.1 Case study approach

Case studies are a traditionally applied method in qualitative research and the usual method for a critical realism approach. Case study research allows insights on contextualized sustainability problems (Yin 2014) and is the most common approach to the study of adaptive governance (Sharma-Wallace et al. 2018). This thesis represents an intensive design (i.e. the collection of detailed data within one or more cases) through qualitative analysis, and an 'in-depth' analysis is presented based on the researchers' ability to gather higher quality and quantity of data than would be likely in other locations, provides a 'thick' description sensitive to local context (Gerring 2011). Focussing on the system of marine governance in Scotland is informed by different types of case studies. This approach recognises that governance is always contextually situated (Kooiman 2003) requiring detailed analysis of governance systems in specific societal situations, with the implication that insights into the application of theory may be more generalisable than the results themselves. Context-specific empirical research of governance (and marine planning) is essential in understanding functioning and causality (i.e. the extent to which the intervention caused the results, particularly outcomes and impacts).

In this thesis I consider the broad case of the marine governance regime of Scotland, focussing on the marine planning process and subsequently on governance of adaptation of aquaculture and commercial kelp harvesting as developed through research projects. The regime is delineated according to the administrative influence on marine management which is geographically bounded

according to jurisdictional responsibility. Seawards, this is defined according to the instrument of concern and which may extend to the extent of territorial waters (i.e. regional marine planning), or to 200nm (the Exclusive Economic Zone; EEZ) of Scotland (as addressed by Scotland’s National Marine Plan). The inshore extent is defined similarly, although there is a complicated interface between coastal (and marine) and land-use planning (which is not a focus of this thesis but a topic of relevance). Further, climate change adaptation (as addressed in Chapter 5) represents a policy agenda that is applicable to both marine and terrestrial systems.

Within this broad case of marine governance, emergence of adaptive governance is approached from three perspectives which developed during the research process and address Scotland’s marine governance system. The first study focussed on the regional marine planning regime and provided a detailed analysis of two in-depth, embedded case studies for the Clyde and Shetland Marine Regions. Secondly, the emergence of adaptive governance to support the adaptation of the aquaculture sector was considered, focussing on legal adaptive capacity and the role of marine planning in the context of climate change adaptation, and third, analysis was undertaken of the developing governance regime for wild seaweed harvesting. These provide different types of cases which provide insights to the overall study. An overview of the relationship between the studies within the broad case study is presented in Fig. 3.2.

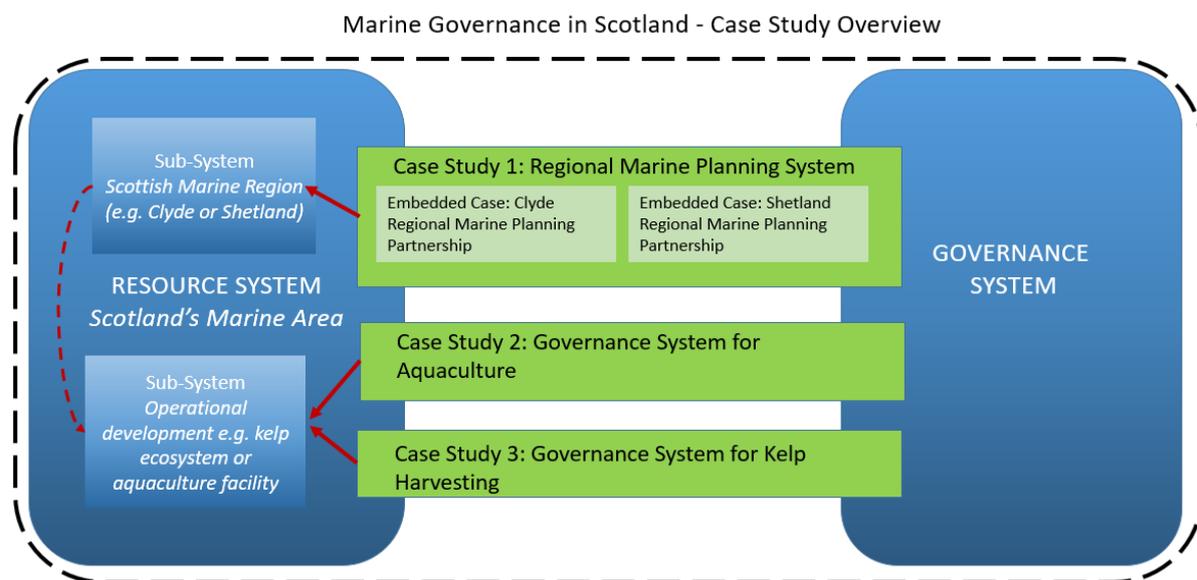


Figure 3.2 Relationship between the case studies in the overarching system of marine governance analysed in this thesis

Based on extensive literature review, a set of dimensions of adaptive governance were compiled and are the variables around which this case study research was designed (see Chapter 2, Section 2.3). This dimension-based structure provided entry points for the research and a framework for understanding some coherence in complex situations (Ison & Watson 2007) and to support more situated and local-level understanding of adaptive governance (Cinner et al. 2012; Wyborn 2015).

### 3.4.2 Regional marine planning

As outlined in Chapter 2, Section 2.4, the marine planning process was considered to relate to dimensions of adaptive governance literature and was thus proposed as a ‘representative or typical case’ of adaptive governance, whereby the case exemplifies the analytical object of inquiry (Yin 2014). An intensive case study approach was taken (Yin 2014) investigating the marine planning system of Scotland including two embedded cases of the Clyde and Shetland Marine Regions. These cases were selected for analysis as the only regions where Marine Planning Partnerships (MPPs) were established and active, and as an opportunity to explore two contrasting situations. A comparison of two embedded cases is suitable given the focus on ‘how’ questions regarding the processes or outcomes of an intervention (i.e. marine planning) which has only been implemented in the contexts analysed (with MPPs established under the Marine (Scotland) Act 2010). Case study approaches validate understandings of one case to explore the nuances and contextual influences on a broader phenomenon and to enable accumulation of knowledge (George et al. 2005). The analysis supports explaining how context influences marine planning and might help to tailor the intervention in other contexts. Since many conditions are shared across other regions where marine planning is to be developed, extrapolation can be made to other regions of Scotland. This contributes practically to the learning-based approach to implementation of marine planning in Scotland, where there is some flexibility in how it is developed and an intention to learn from experience in early regions. Capacity for generalisation is made according to clarified conditions to define other settings to which the results are relevant and could be further explored contributing to theory development (George et al. 2005), and condition-dependent generalisations are possible in terms of marine planning in other jurisdictions. The case study into marine planning was informed by semi-structured interviews and documentary analysis which are described next.

### 3.4.3 Semi-structured interviews

In line with a critical realist approach, first-hand views of participants were necessary to consider the interaction between structure and agency, and the influence of context on this interaction. Semi-structured interviewing is suitable as it places emphasis on how the interviewees frame and understand issues and events (Bryman 2004). This enables insight into the functioning of governance, including their behaviour as individuals and collectively, to reveal underlying processes. Semi-structured interviewing allows greater flexibility than structured interviewing as it enables the researcher to explore other issues that may be brought up by participants (Bryman 2004) and were selected here to gather information related to the research questions, but with flexibility to adjust the questions and questioning as appropriate. Unstructured interviews provide even greater flexibility and

the ability to obtain a greater range of data, however this can be vague and difficult to interpret (Bryman 2004). Focus groups were considered but individual interviews deemed more effective at understanding individual experience and perspectives, particularly considering underlying conflicts, and since the effectiveness of the focus group would also be influenced by the dynamics affecting the MPPs themselves.

### *Sampling*

Individuals involved in marine planning were the primary unit of analysis. Interviewees included 8 representatives of the Shetland Marine Planning Partnership and Advisory Group and 8 members of the Clyde Marine Planning Partnership<sup>37</sup>. These were identified non-randomly and recruited to cover a range of representative sectors and interests with 5 representing industry (fishing, aquaculture, a ferry operator and port operations), 2 representing recreation and tourism, 6 public bodies (planning authorities including a council, harbour authorities, the delegated MPP leads and a Member of Scottish Parliament) and 3 ENGO representatives. Most had been involved in marine planning in the regions since the SSMEI pilots in 2006 and had extensive experience of interacting at the regional scale. Negative responses were received from the aquaculture industry in the Clyde and no responses were received from local authority representatives from the Clyde MPP. This led to sixteen semi-structured interviews of members of the MPPs (or Advisory Group; AG) of Shetland and the Clyde which was determined as acceptable given the balance across actor groups and feasibility. Interviews of the Shetland MPP and AG were undertaken in Lerwick, Shetland in one week during December 2018 and with Clyde MPP representatives at various locations in January and February 2019. Timing of the interviews coincided with the finalisation of the first draft of the Shetland Isles Draft Regional Marine Plan 2019<sup>38</sup>, and the issuing of a 'pre-consultation draft' Clyde Regional Marine Plan<sup>39</sup>. Interviews lasting approximately one hour were recorded using a dictaphone. Fourteen interviews were carried out in person with two undertaken via Skype due to availability constraints.

A questionnaire was designed to guide the interview process and the same guiding questions were used in interviewing each participant with flexibility to adjust questions, the order in which they were asked and to explore emerging themes. Questions were designed to assess changes in governance in Scotland and the role of marine planning in influencing change at the structural and agent level in

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<sup>37</sup> The Clyde Marine Planning Partnership (CMPP) was formally established in February 2016 by a number of the members of the Core Group of the Firth of Clyde Forum including some of those who served as members of the Steering Group of the Clyde Scottish Sustainable Marine Environment Initiative.

<sup>38</sup> <https://www.nafc.uhi.ac.uk/research/marine-spatial-planning/shetland-islands-regional-marine-planning-partnership/sirmp-2019/>

<sup>39</sup> <https://www.clydemarineplan.scot/marine-planning/consultations/>

relation to the analytical framework. This included general questions to understand the role and experience of the participant in the marine planning process and others to inform the overarching questions of:

- What are stakeholder perceptions of how governance is changing?
- Do these changes relate to the key dimensions of adaptive governance?
- How are the roles and activities of actors changing through regional marine planning?
- What are perceptions of the role of regional marine planning in relation to other governance?
- What are key differences between the regions currently undertaking marine planning and how can these be explained?
- How does stakeholder discourse reflect the conditions which enable or constrain adaptive governance?

The question guide used during interviews is included in Appendix 2 and was shared with participants prior to the interviews. Analysis of transcripts began before interviews were complete which enabled the questionnaire to be adjusted based on experience. Research ethics protocols of the researchers' institution (UHI) were observed and all participants granted consent to participate in the research. Interviews were recorded and a written consent process was used, including an information sheet which was also provided beforehand.

### *Analysis*

Interviews were transcribed verbatim and coded using computer-assisted analysis through QSR NVIVO 11, a software package used for qualitative analysis. The coding procedure was a flexible deductive process of coding and data analysis that is consistent with critical realism (Fletcher 2016), where codes were developed based on the theoretical framework (the primary dimensions of adaptive governance) and applied to marine planning. This gave flexibility and as I undertook the analysis new codes were assigned, as 'sub-codes' within the main dimensions, as each category was broad and I was aware that answers would depend on how the questions were interpreted. Coding was adjusted and revised as more data was analysed and produced sub-categories as nodes in NVIVO, shown in Table 3.3. Data was also considered in terms of structure and agency as key concepts of critical realism and as necessary to inform the description of the SES framework. An example of coding of transcript data is presented in Appendix 3 to show how this analysis was undertaken.

Table 3.3 Coding categories based on analytical framework and further codes identified through analysis.

Coded analytical dimension	Sub-category based on transcript analysis
D1 Polycentric and multi-layered institutions	<ul style="list-style-type: none"> <li>• Role of RMP in influencing regional governance</li> <li>• Advantages or disadvantages of a regional approach</li> <li>• Contextual factors – enablers and constraints</li> <li>• Other mechanisms (for enabling local governance)</li> <li>• National and regional interaction including the role of government</li> </ul>
D2 Participation and collaboration	<ul style="list-style-type: none"> <li>• Dynamics between actors in the MPPs</li> <li>• Engagement of civil society</li> </ul>
D3 Learning, innovation and ability to adapt	<ul style="list-style-type: none"> <li>• Formal review processes</li> <li>• Innovation</li> <li>• Barriers to responding to learning</li> <li>• Social learning</li> <li>• General perceptions of adapting in marine planning</li> <li>• Future concerns</li> </ul>
D4 Self-organisation and supporting activities	<ul style="list-style-type: none"> <li>• Leadership</li> <li>• Networking</li> <li>• Key individuals / agents</li> </ul>
Other	<ul style="list-style-type: none"> <li>• Benefits of RMP</li> </ul>

NVivo enabled me to analyse which themes were supported by different participants, which actor group they belonged to (e.g. environmental, industry or public authority) and which region they were active in. Presentation of results accounted for this, clarifying where statements were broadly supported by multiple actors; key regional differences; key differences in actor groups, and where singular statements were made but unsupported by others this is made clear.

A number of actions were taken to improve the data gathering and analysis as the research proceeded. The questionnaire was adjusted based on initial interviews in Shetland and again prior to the Clyde interviews. Original material was re-read following analysis to check coding and for other information that might have been missed. In addition, as the research was being developed for publication, early drafts were shared with the lead of each MPP. At this point concerns were raised by these respondents principally in relation to the level of anonymity in the draft paper: in this, ‘actor group’ was recorded but given that the participants of the MPPs are well-known it was possible to determine which quotes were attributable to which individual in some cases. This was subsequently amended and further input provided by them was incorporated and supported validation of the analysis. I also held informal conversations on my developing work with others involved in the process including observations from Orkney Islands Council who are beginning their own RMP process.

#### 3.4.4 Document analysis

Document analysis (DA) was undertaken to inform the research process and addressed different aspects of the enquiry. Documents were used to provide information on the structure and governance system, as defined primarily in policy and legislation, and minutes of meetings, verbatim reports of parliamentary hearings and correspondence between stakeholders and authorities provided information on the functioning of governance, i.e. the action situations. Documents were analysed throughout the research process as described below.

Firstly, in relation to marine planning (Case Study 1), policy and legislation documents were targeted to address two purposes 1) to provide information on 'structure' and the formal rules defining the operation of the MPPs and 2) meeting minutes and other reports of the MPPs provided further information on the functioning of the MPPs and interactions at a regional level, to corroborate data from interviews.

Based on the analysis of marine planning, the importance of the adaptive capacity of existing regulatory and management frameworks in determining adaptive governance outcomes was identified as important. This led to further literature review to understand other changes in marine governance and included focus on legal adaptive capacity which required specific analysis of policy and legislation, as considered further in Case Study 2 in relation to climate-change adaptation to ocean acidification and Case Study 3, developing governance of commercial seaweed harvesting (described below). Analysis of legal adaptive capacity was also informed by new research in this field and the approaches used by e.g. Craig et al. (2017) and Cosens et al. (2018), as shown in Table 3.4.

DA has several benefits including efficiency, availability of data, cost-effectiveness and lack of obtrusiveness and the researcher does not affect the research as is likely the case in interviews (Bowen 2009). It therefore provides a secondary source of data which supports interpretation of interviewee responses. It provides a systematic approach and is particularly applicable to qualitative case studies and intensive studies producing rich descriptions of a single phenomenon, event, organisation, or program (Yin 2014) as undertaken here. The approach taken was also informed by Qualitative Document Analysis where focus on content, meaning and relevance in context distinguishes the methodology from a search for key words (IDS 2013).

#### *Sampling*

Documents were selected given their quality and the evidence they contain, given the purpose and design of the study. The categories of documents analysed are listed below and all documents were

publically available, accessed online and downloaded to a database. Documents analysed are listed in Appendix 4.

- *Legislative and policy documents:* Documents were selected as viable descriptions of policy, which could not be collated through other means, and provides a vital aspect of context, in terms of the institutional provisions for governance actions at the regional level through the MPPs and other action situations. Documents were restricted to ‘official’ documents, i.e. policy and legislation produced by Scottish Government, related agencies and the Scottish Parliament, and other documents including Research Briefings which accompany legislative text.
- *Official records of relevant meetings and debates:* Meeting minutes and parliamentary debates relevant to the processes analysed included all minutes of the meetings of the Clyde MPP and Shetland MPP (and Advisory Group), and the parliamentary debate during the development of the Scottish Crown Estate Act. All available documents were reviewed, as available on the MPP websites<sup>40, 41</sup> and the Scottish Parliament website<sup>42</sup>, respectively.
- *Official correspondence including public consultations:* Letters authored by government officials relating to licensing processes; letters submitted by individuals and organisations to consultation processes e.g. kelp harvesting and submitted to the Environment, Climate Change and Land Reform (ECCLR) Committee during the parliamentary debate on kelp harvesting during the development of the Scottish Crown Estate Act 2019.

## Analysis

DA involves skimming (superficial examination), reading (thorough examination), and interpretation. This was undertaken in line with the process outlined below, which progressed based on the information gathered at each stage and to inform understanding of marine governance system from different perspectives. Certain key documents (such as Scotland’s National Marine Plan and the Scottish Crown Estate Act 2019) were relevant to all studies.

**Case Study 1 RMP:** Analysis was guided by codes based on the dimensions of adaptive governance (Table 3.2) which provided a basis for combining results of the DA with the interviews. This focussed on describing the governance system in relation to marine planning (defining the structure and functioning of the MPPs) and analysis of all available meeting minutes of the MPPs provided further information on their functioning and supporting understanding of key dimensions, particularly the

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<sup>40</sup> <https://www.clydemarineplan.scot/about-us/cmpp-meeting-documents/>

<sup>41</sup> <https://www.nafc.uhi.ac.uk/research/marine-spatial-planning/shetland-islands-regional-marine-planning-partnership/sirmp-2019/>

<sup>42</sup> <https://www.parliament.scot/parliamentarybusiness/Bills/107415.aspx>

interaction between participants in meetings, representation of different actors and the role played by government.

**Case Study 2 OA:** Building on the conclusions arising from Study 1, DA was undertaken to specifically consider the concept of legal adaptive capacity, as introduced in new research addressing adaptive governance and relevant to considering further the role of marine planning in relation to the wider governance system (see Chapter 2, Section 2.3.1 for description of legal adaptive capacity). Focussing on the adaptation of the aquaculture sector to climate-change related OA and analysis of policy and legislation, the DA focussed on legal adaptive capacity, i.e. substantive, structural and procedural provisions in policy and law which are considered precursors to adaptive governance (e.g. Cosens et al. 2018) and which support identified adaptation responses. For this I adapted the analytical framework to draw distinction between the emergent properties denoted by *dimensions* of adaptive governance and *provisions* which support these dimensions as shown in Table 3.4.

Table 3.4 Analytical framework for document analysis for legal adaptive capacity

Adaptive governance dimension	Sub-category for analysis of legal adaptive capacity (Craig et al. 2017; Cosens et al. 2018)
D1 Polycentric and multi-layered institutions	<ul style="list-style-type: none"> <li>• Provisions relating to devolution of authority from central government to lower level entities consisting of other actors, at different scales; empowerment; localisation; decentralisation; etc. (e.g. <i>delegation of marine planning authority to MPPs; devolution of Crown Estate Scotland assets in the Scottish Crown Estate Act 2019</i>)</li> <li>• Degree of power sharing between levels, the role of government and the extent of flexibility (e.g. <i>responsibility of MPPs to deliver national policy as articulated in the NMP</i>)</li> <li>• Interaction between levels including feedback mechanisms between regional / local and national initiatives (e.g. <i>approval of RMPs required by Scottish Ministers; review of NMP and RMP</i>).</li> </ul>
D2 Participation and collaboration	<ul style="list-style-type: none"> <li>• Mechanisms to support greater participation and collaboration in problem-solving (e.g. <i>“place-based” approaches to adaptation promoted in the CCAP; emphasis on community empowerment in the Community Empowerment (Scotland) Act 2015 and the Planning (Scotland) Act 2019</i>)</li> <li>• Rules relating to participation of stakeholders.</li> </ul>
D3 Learning, innovation and ability to adapt	<ul style="list-style-type: none"> <li>• Provisions relating to adaptive approaches including reference to ‘learning-based’ approaches, adaptive management, experiments, pilots, etc. and capacity for this (e.g. <i>Crown Estate Scotland’s Local Asset Management Pilot Scheme</i>)</li> <li>• Procedural aspects relating to monitoring and evaluation.</li> <li>• Provisions which limit flexibility or define what can be accommodated within the law.</li> <li>• Mechanisms through which law and policy are developed and amended.</li> </ul>
D4 Self-organisation and	<ul style="list-style-type: none"> <li>• Relating to D2, provisions which support identification of leaders and promote behaviour change including development of partnerships, networks, trust-</li> </ul>

supporting activities	building, consensus-building, innovation, co-operation, visioning and leadership.
Other	<ul style="list-style-type: none"> <li>Statements regarding change accountability, responsibility etc. (e.g. in CCAP).</li> </ul>

The analysis was supported by a stakeholder workshop which was used to develop potential adaptation responses to OA and to gain information about present and potential capacity for adaptive governance at national and regional levels (described in Section 3.3.7).

**Case Study 3 Kelp:** The opportunities provided under the Scottish Crown Estate Act which was adopted in 2019 were indicated as of relevance in enabling adaptive governance including through collaborative arrangements in Case Study 1 and 2. Focussing on kelp as a new sector and the significant debate associated with a controversial application which led to changes to the governance system, provided opportunity to analyse this in more detail and the extent to which adaptive governance can be supported including the capacity for adaptive *management* of a new activity. Further DA in this section included analysis of the development of governance of commercial seaweed harvesting in Scotland and analysed: legislation addressing kelp management and kelp conservation to understand the governance system; publicly available documents relating to the application for harvesting licenses and submission, including consultation responses and parliamentary proceedings and associated material (online meeting minutes of ECCLR Committee debates) during the deliberation of the Bill as it progressed through Parliament.

### 3.4.5 Stakeholder workshop

To inform Case Study 3, a workshop was organised by the PhD researcher on behalf of the ACIDCOAST project. It was held over one day at the Scottish Government Regional Government Office, Edinburgh, attended by nine participants selected to represent different actor groups. Invitations targeted 20 actors identified through attendance records of previous groups concerning coastal and marine issues in Scotland and included representatives of the shellfish aquaculture industry (including the main industry association), Scottish Government, Marine Planning Partnerships, environmental statutory consultees, scientists and environmental non-governmental organisations (ENGOS). The workshop was hosted by Marine Scotland, the Directorate of Scottish Government responsible for marine management in Scotland, with 3 staff attending from Marine Scotland Science (MSS) and Marine Scotland’s Planning and Policy Division (MPP). A national environmental non-governmental organisation (ENGO) representative was present, and invited scientists<sup>43</sup>. Participants were provided

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<sup>43</sup> Although the workshop was rearranged twice, securing attendance was difficult due to capacity and resources among stakeholders, and a response from an industry association stated that OA wasn’t considered a priority at this stage (reported in Chapter 5).

with detailed information about the project and workshop activities and agreed the use of the information discussed at the workshop, based on the circulation of a workshop report to attendees which would provide a collectively agreed record of the discussion.

The workshop was chaired by the PhD researcher, who moderated and participated in the discussion, supported by Dr Jasper Kenter (SAMS). Activities in the workshop included presentations and facilitated discussion following a logical progression to enable framing of the group sessions addressing questions during interactive discussion across the group. This included an introductory presentation from the PhD Researcher to provide an overview of the impacts of OA and introduction to the workshop methods. Discussion followed on: 1) What are the potential impacts of OA across policy areas in Scotland? and 2) How could OA affect different sectors in Scotland? Will there be positive effects or opportunities? A further presentation was given by the researcher on response options, based on the evaluation of policy and management responses by Bille et al. (2013) to consider response options at different scales. We then discussed as a group the questions: 3) What are potential response options to OA impacts in Scotland? 4) How does current planning and management consider OA? Who can respond and how? and 5) What are the barriers to responding to OA? A further session focussed on knowledge exchange between Norway and Scotland addressing a knowledge-exchange aspect of the ACIDCOAST project which supported the discussion but which is not presented in this thesis.

A record of the discussions in response to the structured questions was made by the chair and two supporting project researchers. Records were firstly compiled and synthesised to collate the response options which were developed by participants through the discussions during the workshop. A first draft workshop report was circulated to participants for their feedback, as an agreed record of the event, and at request, a finalised report was issued. Next, outputs were analysed and response options described in relation to the themes of adaptation interventions proposed by the FAO (2018), as a logical framework and to promote coherence with emerging international guidance for the adaptation of aquaculture (and fisheries). Document analysis of relevant Scottish legislation, policy and planning documents was subsequently undertaken to identify provisions which support identified adaptation responses and legal adaptive capacity, i.e. substantive, structural and procedural mechanisms for institutionalising adaptive governance for responding to OA (see Section 3.3.6).

### 3.5 Establishing scientific rigour

Evaluating qualitative research is challenging, particularly in relation to critical realism, and debates are on-going regarding criteria which reflect those used in natural sciences including reliability, validity

and generalisability. Definitions of criteria are grounded in positivism with limited relevance to practice-orientated research which includes socially constructed or experiential aspects and which cannot be researched in a ‘closed system’ (Smith & Johnston 2014). Establishing validity in critical realism research is particularly challenging as it requires inductive and retroductive reasoning in constructing arguments about the validity of assumptions in other contexts and which “cannot be tested directly through observation” and would not be considered valid in empiricism (Ibid., p.5). In critical realism, validity is not primarily a property of the data, but a logical assessment of the relationship between data and event. Related criteria are proposed by some, articulated in ‘non-empiricist’ terms (e.g. Smith & Johnston 2014), but views differ on what these should be, particularly since critical realism is non-specific in terms of methods. Given the use of qualitative methods in this research, the guidance for evaluation of research rigour set out by Moon et al. (2016) is applied here. These authors undertook a review of qualitative research articles addressing ecology and conservation based on the criteria set out by Lincoln & Guba (1985), i.e. dependability, credibility, confirmability and transferability (which have parallels to empiricist criteria). These are set out in Table 3.5 along with details of how they are addressed in this research.

Table 3.5 Criteria for evaluating qualitative research, based on Moon et al. (2016)

Criteria	Description	Approach
Dependability <i>(paralleling reliability in empiricist terms)</i>	The consistency and <b>reliability</b> of the research findings and the degree to which research procedures are documented, allowing someone outside the research to follow, audit, and critique the research process.	Detailed documentation of the research design and implementation, including the methodology and methods, the details of data collection and reflexivity to reduce bias and increase transparency.
Credibility <i>(internal validity)</i>	The degree to which the research represents the actual meanings of the research participants, or the “truth value” (Lincoln and Guba 1985), and is based on credible research decisions are those that are <b>consistent with the researchers’ purpose</b> .	Credibility is supported here through use of multiple sources of data and methods, ‘peer debriefing’ through sharing of research design and findings with supervisors, and ‘member checking’ where findings were returned to participants to determine if the findings reflect their experiences. Credibility is also supported by the academic review process through which aspects of this research have been evaluated and amended in response to reviewer feedback, and in situating the research in relation to other literature in particular addressing institutionalisation of adaptive governance.

<p>Confirmability (<i>objectivity</i>)</p>	<p>The degree to which the findings of an inquiry are a function solely of the subjects (respondents) and conditions of the inquiry and not of the <b>biases, motivations, interests,</b> perspectives of the researcher. Researchers must demonstrate that the results are clearly linked to the conclusions in a way that can be followed and, as a process, <b>replicated.</b> Bias is not removed it supports the reader in understanding how these prior assumptions and beliefs manifest in the research findings while still yielding useful insights (Moon et al., 2016).</p>	<p>Describing my positionality as a researcher and the philosophical perspective which this leads to, including ontological and epistemological assumptions addresses a major aspect of confirmability. This includes experiential biases, how this combines with my research questions and steps taken to ensure that results are based on the data and not my preferences.</p> <p>The use of a questionnaire in the interviews, followed by transcription and analysis would be repeatable and is beneficial for reliability (George et al. 2005). My interview guide as shown in Appendix 2 could be used to test this. The interviewer influences results based on personal relations, trust, context and timing, and a different interviewer might have gained different answers, but similarities could also be expected of participants answering the same questions. In DA, an example of coding is provided to demonstrate how text was assigned to particular themes which is auditable by others. During interpretation I reflected upon the interviews and potential biases based on my questioning and as far as possible related answers between interviewees to build a general picture. Meeting minutes and documents also enabled corroboration of the responses provided by participants.</p>
<p>Transferability (<i>external validity</i>)</p>	<p>Transferability is a type of external validity and addresses the applicability of the research findings to theory, practice and future research i.e. theoretically or empirically <b>generalisable</b> (Moon et al. 2016).</p>	<p>In considering extrapolation to other theoretical and practical application, explanation is given regarding the extent to which the research is relevant in other contexts. Given the highly context-dependent nature of complex governance regimes, the main objective can only be to explain phenomena such as marine planning in a particular context, however transferability (as in CR) could be based on developing new conceptualizations of the phenomenon and supporting future theorising, in this context or elsewhere.</p>

The methodological approach outlined above, along with acknowledgement of my engagement in the construction processes at work throughout the research process is presented as a “passionate participant”, which may also lead to change (Guba & Lincoln 1994). This has been explained in this Chapter in order to clarify my position and to be transparent with regard to bias, and that based on the explanation of scientific rigour given above, my ‘good intentions’ are aligned with my intention to undertake rigorous research and inform future research and practice. From this perspective, my position as a ‘policy-orientated’ researcher is evident in the discussion of results, where they are considered in terms of their validity and interpreted as recommendations for the enhancement of governance.

## Chapter 4. Regional marine planning and adaptive governance (Case Study 1)

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### 4.1 Introduction

Based on analysis of stakeholder experience using the methods set out in Chapter 3, this chapter presents detailed insight into the functioning of the two active MPPs as semi-autonomous units within a polycentric governance system and the role that this novel process plays in enabling adaptive governance. An introduction to marine planning was provided in Chapter 2 (Section 2.4) and the following section describes the process as it is developing in Scotland as context for this case study.

#### 4.1.1 Marine planning in Scotland

Marine planning has been advancing in Scotland since the Scottish Government's Scottish Sustainable Marine Environment Initiative (SSMEI) in 2006, which aimed to develop and test new management approaches to improve the sustainable management of Scotland's marine environment<sup>44</sup>. This included 'pilot projects' in the Clyde and Shetland, leading to the non-statutory Firth of Clyde Marine Spatial Plan (2010) and subsequent iterations of the Shetland Marine Spatial Plan (with the Fourth Edition published in 2015<sup>45</sup>) and associated reviews (Kelly et al. 2014)<sup>46</sup>. Later, the UK's Marine and Coastal Access Act 2009 and the Marine (Scotland) Act 2010 ('the Act') introduced statutory requirements for a two-tier system of marine planning. This includes Scotland's National Marine Plan (2015) which sets out strategic policies for the sustainable development of Scotland's marine resources out to 200 nautical miles. This overarching plan will be supplemented by Regional Marine Plans (RMPs), sequentially addressing the eleven Scottish Marine Regions<sup>47</sup> and responsibility for delivering RMPs is delegated by national government to Marine Planning Partnerships (MPPs) to develop regional marine plans, intended "to allow more local ownership and decision-making<sup>48</sup>." Sub-national marine planning initiatives occur in other countries but tend to be led by national agencies, such as in England where development of six regional marine plans is being led by the Marine Management Organisation, or in Iceland where the National Planning Agency leads on regional plan development in two planning areas. Most applications of marine (spatial) planning are led by a single national authority (Jones et al. 2016). Although partnership-led at the regional level, resulting plans

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<sup>44</sup> <https://www2.gov.scot/Topics/marine/seamanagement/regional/activity/SSMEI>

<sup>45</sup> [https://www.shetland.gov.uk/planning/documents/SIMSP\\_2015.pdf](https://www.shetland.gov.uk/planning/documents/SIMSP_2015.pdf)

<sup>46</sup> A Pentland Firth and Orkney Waters Marine Spatial Plan was also produced in 2016 and a Marine Planning Partnership is currently being established.

<sup>47</sup> As defined under the Scottish Marine Regions Order 2013

<sup>48</sup> <https://www2.gov.scot/Topics/marine/seamanagement/regional>

in Scotland must support implementation of national policy and final versions are subject to adoption by Scottish Ministers, the highest level of government in Scotland. On this statutory basis, public authorities responsible for the regulation of licensable marine activities (such as aquaculture, dredging or shoreline construction) must take decisions in accordance with the plan and the policies set out within the RMPs, including authorisation or enforcement decisions, and any decision affecting the marine area<sup>49</sup>.

The MPPs may consist of regional public authorities (or a single authority in the case of Scottish islands<sup>50</sup>) and stakeholders who reflect marine interests in the region<sup>51</sup>. MPPs have so far been established for the Scottish Marine Regions of the Clyde and the Shetland Isles, where each have prepared an “assessment of the condition” of the region<sup>52</sup>, as required by the Act<sup>53</sup>, and are currently undertaking public consultation on their first iterations of a statutory marine plan. Once adopted, the Act requires monitoring of marine plans based on a report on implementation at least every 5 years, at which point Scottish Ministers will decide whether plans will be amended or replaced<sup>54</sup>. Beyond producing a marine plan, MPPs also act as statutory consultees in marine licensing processes under the Marine Licensing (Consultees)(Scotland) Order 2011, meaning that they must be consulted by authorities on marine license applications and can provide advice based on the plan.

The phased approach to marine planning, building on pilot projects developed under the SSMEI, is intended to enable learning through ‘natural experiments’ in different jurisdictions and is described as an “evolving process” by Scottish Government<sup>55</sup>. The design of the statutory planning process has been directly informed by regional experience as ‘pioneers’ in marine planning practice (Kelly et al. 2014). This context of marine planning practice forms a valuable case for study, focussing on the MPPs as a new social and institutional space to influence governance of marine resource use. Drawing on adaptive governance theory, this case study considers the extent to which the regional marine planning process in Scotland enables features of adaptive governance to emerge, including with apparent conditions or constraints.

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<sup>49</sup> Marine (Scotland) Act 2010, s15

<sup>50</sup> Islands (Scotland) Act 2018, s27

<sup>51</sup> <https://www2.gov.scot/Topics/marine/seamanagement/regional/partnerships>

<sup>52</sup> Published as the ‘Shetland Islands Marine Region State of the Marine Environment Assessment’ and the ‘Clyde Marine Region Assessment – 2017’. Production of the ‘Orkney Marine State of the Environment Assessment’ is underway.

<sup>53</sup> Marine (Scotland) Act 2010, s5(4)(c)

<sup>54</sup> Marine (Scotland) Act 2011, s16

<sup>55</sup> <https://www2.gov.scot/Topics/marine/seamanagement/regional>

## 4.2 Summary of methods

Within the case study analysing a process of marine planning which is defined by the national context set out above, the Clyde Marine Region and Shetland Marine Regions were examined as embedded cases and provide contrasting experience and situations. The Clyde Marine Region, in south-west Scotland, is complex with a diverse coastline of sea lochs and islands and extends inland towards the large port city of Glasgow. It constitutes a sea area of approximately 4000 km<sup>2</sup>, is bordered by eight local authority regions and hosts a diverse range of interests, and the Clyde MPP is comprised of 24 members. In contrast, the Shetland Islands Marine Region comprises an archipelago of islands surrounded by an extensive sea area of over 12,305 km<sup>2</sup> and a total population of around 24,000 (NAFC, 2018). The Shetland Islands MPP is comprised of 2 members, the NAFC Marine Centre, University of the Highlands and Islands (NAFC UHI) and the Shetland Islands Council, and at the time of study was supported by a stakeholder Advisory Group of 20 members.

As described in Chapter 3, this case study was informed by semi-structured interviews and document analysis (see Section 3.3). In the results presented here, quotes are anonymised, and ‘C’ or ‘S’ after each quote denotes the marine region within which the participant is active. Analysis of the data focussed on the four main dimensions of adaptive governance described in Chapter 2 and shown in Table 4.1 along with the questions that guided the analysis. These questions were referred to during analysis of the transcripts and supporting documents and provided the structure for the results presented in section 4.4 with sub-themes that emerged.

*Table 4.1 Dimensions of adaptive governance forming the analytical framework for the study*

Dimension of Adaptive Governance	Questions for Analysis of Regional Marine Planning
Local governance, power sharing and integration	Is there a perception of greater power at the regional level through RMP? How do devolved arrangements through marine planning interact with other levels?
Participation and collaboration	Do marine planning arrangements support greater participation and collaboration among actors?
Learning, innovation and adaptability	What is the capacity for learning and innovation? Is there adaptability to respond to change through marine planning?
Self-organising and supporting activities	What self-organising activities are evident in relation to RMP?

## 4.3 Applying the social-ecological system framework

Using the SES framework introduced in Chapter 2 (Section 2.2.2), a model is presented in Fig. 4.1 which supports the analysis and understanding of the relationship of this case study to the other case studies in this thesis. The governance instrument (marine planning) influences a specific sub-system

of the wider system which is delineated according to the geographical boundaries defining the jurisdiction of a MPP i.e. Scottish Marine Regions. Analysis of the two-tier marine planning system includes the MPPs delivering marine planning at regional level, represented by multiple action situations (the MPPs) in Shetland and the Clyde, operating at the same level of governance. The MPPs are comprised of public–private–civil society actors and represent concurrent action situations at the lower collective choice level of AS2. At the national scale, the two-tier marine planning process includes the NMP which represents a higher level of national policy development (AS3) and which the MPPs must address in their regional plans. Interactions (within AS) and outcomes (of AS) identified through the analysis are shown in Fig. 4.1 (with key provided in Table 4.3) and are explained in Section 4.4.

*Table 4.2 Key for interactions and outcomes identified through the analysis and presented in Figure 4.1.*

<p><b>Key (GS = Governance System; O = Outcome; I = Interaction)</b></p> <p>GS1 – enabling legislation delegating marine planning to MPPs</p> <p>O1 – National policy in the NMP which MPPs must deliver</p> <p>I1 – Deliberation and communication in the MPP</p> <p>I2– Participation and collaboration</p> <p>I3 – Self-organising, leadership and networking</p> <p>I4 – Learning within and between MPPs across regions via networks</p> <p>I5 – Monitoring and evaluation activities</p> <p>I6 - Conflict between users in the MPPs based on conflicting demands for resources</p> <p>I7 – Consensus building</p> <p>O1 – Regional marine planning policies which influence human activities via decision making in AS1, reducing conflict and environmental impacts</p> <p>O2 – Collaborative activity by marine users to address local issues which are not formally in the scope of RMP</p> <p>O3 – MPP providing advice as statutory consultee on license applications after publication of the plan</p> <p>O4 – Indirect influence on behaviour of resource users in MPP</p>
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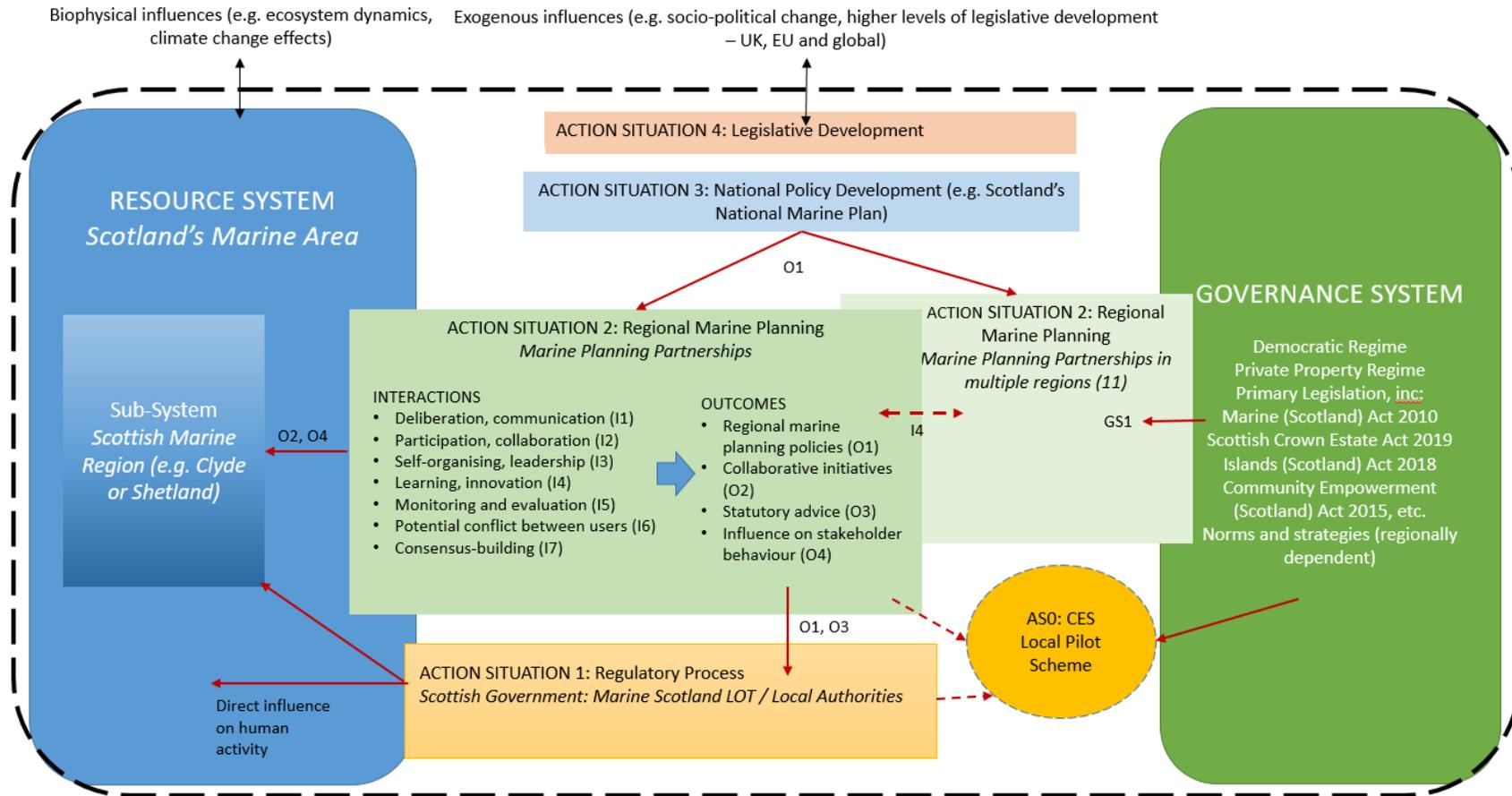


Figure 4.1 Model of regional marine planning based on the SES Framework

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3  
4

## 4.4 Results

A synthesis of the analysis of the transcripts in relation to the four dimensions of adaptive governance is presented. As the analysis proceeded, it became evident that in response to questions relating to the broad categories the views of participants coalesced around ‘sub-themes’ and these are used as sub-headings in each section.

### 4.4.1 Local governance, power-sharing and integration across levels

#### ***Is there a perception of greater power at the regional level through marine planning?***

Addressing the influence of RMP on local ownership and decision-making (as described by Marine Scotland) participants raised: a) the role of marine planning in influencing licensable marine activities in the region (O1); b) the on-going role of the MPPs as statutory consultees (for licensed activities) (O3); c) the influence on wider regional issues beyond licensed activities (O2 and O4); and d) other mechanisms for enhancing local governance. Views addressing the question of interactions between national and regional levels are subsequently presented.

#### ***a) Role of RMP in influencing licensable marine activities***

In Shetland, marine planning was described as increasing accountability of developers and local authorities: *“at least if you have a plan, it's got everything in it, you can hold developers to account and question decisions on applications”* (S); and as giving the fishing industry new *“established written legitimacy”* (S) since their activities are now documented. Participants considered that marine planning has influenced siting of aquaculture proposals in relation to fishing interests, and provides a foundation for addressing ‘social licence’ and issues related to public acceptance of the expansion of aquaculture faced in the region and across Scotland (Billing 2018). Higher quality data and a more detailed understanding of social-ecological interactions at regional scale also contributes to improved national planning which affects the Shetland region such as sectoral planning for renewable energy. The fourth edition of the SIMSP produced in 2015 had already been adopted as Supplementary Guidance to local development planning and hence given legal weight prior to the introduction of the formal RMP process, and adoption of the new regional marine plan is anticipated to further influence development in the region. This was regarded positively by the participants with one delegate of the Shetland MPP referring to marine planning as *“taking charge of our space”* (S).

In the Clyde, marine planning is at an earlier stage and the draft plan was described as a significant step forward in understanding regional issues. However it was widely considered that the ‘strength’

of region-specific policies set out in the draft plan was low, with a number of participants considering them to be “*high level*”(C); largely re-articulating strategic policy and existing legislative requirements with limited further regional direction. Some considered that regional policies could be more ambitious and spatially specific, including identifying areas for recreation and tourism, and providing stronger “*direction of travel*”(C) for development of non-licensable activities. However, there is also resistance to new spatial constraints on development as documented in minutes of a CMPP meeting in December 2019: “*...sectoral stakeholders are not interested in spatial policy yet*”<sup>56</sup>. A lack of specificity in national policy was considered a problem in guiding policy development in both regions, being general in some cases, or: “*...in broadly rhetorical terms that no one could possibly disagree with*”(S). But many participants in the Clyde also cited the large number of interests, competing uses and existing tensions as compromising the collaborative process and constraining consensus beyond the generic in development of policies (discussed further in Section 4.4.2).

Some participants, including two public bodies, anticipated that later iterations of the plan would become more prescriptive, however others indicated that if positive outcomes of marine planning were not evident in the short term, on-going stakeholder commitment could decrease. This view, combined with concerns of potential “*downscaling*”(S) of RMP activity due to uncertain funding after plan adoption, raised questions in both the Clyde and Shetland regarding the future influence of RMP. A view was also expressed by a participant in each region that the process was leading to additional bureaucracy, and: “*adding another layer of complexity into something that is already quite difficult to manage*”(S).

#### ***b) The Marine Planning Partnerships as statutory consultees***

Beyond the content of the plans, the new MPPs are statutory consultees on marine licence applications, meaning that they must be consulted on planning applications for proposed development in the region and can provide advice to respective consenting authorities in relation to the plan. This process provides an opportunity for the MPP to provide collectively agreed advice to authorities on specific proposals for coastal and offshore developments which require licences. However, how this would function was unclear to most and in the Clyde, participants identified difficulties in reaching a collective view across a large MPP with different, and sometimes conflicting, perspectives. Most participants considered that consultation advice provided by the MPPs would not provide meaningful direction and would become an indication of alignment with the plan only, with an ENGO commenting that this was of limited additional value:

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<sup>56</sup> <https://www.clydemarineplan.scot/wp-content/uploads/2020/01/Minutes-3-December-2019.pdf>, p.4

*“It is conceivable that if it keeps going the way it is that the plan can exist and not really change anything, and that would be a completely wasted opportunity [...] is it going to actually change the way we manage the Clyde? [...] All we are ever going to be able to say is, this does or doesn't seem to comply with or fit with the policies in the plan, it doesn't seem to me that's adding an awful lot to decision-making at all” (C).*

It was noted by a public authority that given the statutory basis of the written plan once adopted, it would not be feasible for the MPP to provide advice beyond this and: *“My view of that is all the CMPP should do is say is this application consistent or not with the plan; ‘yes’ or ‘no’”(C).* Capacity to provide consultation responses was also a concern particularly for complex developments requiring multiple consents and because organisations would represent their own interests in separate consultation responses in any case. Details on how the CMPP will function in its role as statutory consultee are anticipated<sup>57</sup>.

#### ***c) Regional influence beyond licensing and management***

In addition to providing material considerations for licensing authorities in decision-making, participants considered that regional marine planning could influence other issues including social or ecological concerns such as marine litter and invasive species: *“.. [RMP] brings management actions as well as the licensing side of things, and so there are significant areas in which the plan can support improvements”(C).* Detailing these as wider policies in the plan, or in associated ‘Action Plans’, could present a basis for these to be considered by regional stakeholders, including future action: *“We do need this overarching plan in place before we can start going down into the nitty gritty”(S).*

However, there are concerns about whether RMP can, or should, seek to influence issues not subject to the licensing process and establishing its role in this regard is on-going, with recent feedback on the Clyde draft plan from Marine Scotland in December 2019 outlining that such policies are *“...outwith the scope of the Clyde Regional Marine Plan (CRMP) because (1) they cannot be enforced or monitored and (2) they are outside the scope of the Marine (Scotland) Act 2010.”*<sup>58</sup> While providing a useful framework for considering a wide range of regional and local issues beyond licenced activities, there is therefore some lack of clarity regarding the scope of marine planning in addressing them.

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<sup>57</sup> <https://www.clydemarineplan.scot/wp-content/uploads/2018/12/Minutes-19-November-2018.pdf>

<sup>58</sup> <https://www.clydemarineplan.scot/wp-content/uploads/2020/01/Minutes-3-December-2019.pdf>, p.3

#### *d) Other mechanisms for enhancing local governance*

Other legislative and policy changes emerged through discussion as relevant to local governance in coastal and marine resources. In Shetland, a strong maritime history and existing devolution of planning powers under the Zetland County Council Act 1974 means that there is already significant local control and regulation of marine developments. Other established processes of self-organisation were referred to as being influential locally, including the voluntary management of shellfisheries out to 6 nautical miles through the Shetland Shellfish Management Organisation (SSMO). The Shetland Partnership community planning for the islands was referred to as potentially relevant to marine planning in the region, as it places a central emphasis on integration, participation and collective visioning for the island<sup>59</sup>.

Participants also referred to developments in national public policy in Scotland which emphasise localisation, including new primary legislation and opportunities for changing models of local ownership and management. The devolution of the Crown Estate in Scotland<sup>60</sup> and the recently adopted Scottish Crown Estate Act 2019 and associated potential for transfer of assets including the Local Pilot Scheme<sup>61</sup> were considered of potentially greater relevance particularly since this includes some transfer of property management rights: *“I would have thought that the work with devolution of the management of the Crown Estate assets probably gives more local control [than RMP]”*(C).

In Orkney, which will be the third Scottish Marine Region where RMP is to be developed, it is intended to establish the Orkney Islands Marine Planning Partnership through this Scheme, to better align planning and management rights, maximising local control and accountability for marine developments in the region. In Shetland, a Sullom Voe Master Plan<sup>62</sup> is being progressed under the Local Pilot Scheme to develop planning guidance for a re-opened area for aquaculture development around the Sullom Voe Oil Terminal, facilitated by the interaction supported by the RMP process. A planning authority in the Clyde also referred to the adoption of the Planning (Scotland) Act 2019 as emphasising greater community empowerment and more flexible planning approaches, in addition to requiring the authority's role to change significantly.

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<sup>59</sup> <https://www.shetland.gov.uk/communityplanning/ShetlandPartnership.asp>

<sup>60</sup> Following the 2014 referendum on independence for Scotland, the Scotland Act 2016 made provision for the devolution for the management and revenues of Crown Estate assets in Scotland, and the formation of Crown Estate Scotland. Crown Estate Scotland is a public corporation of the Scottish Government which manages a range of rural, coastal and marine assets on behalf of the Crown.

<sup>61</sup> <https://www.crownestatescotland.com/what-we-do/local-pilot-scheme>

<sup>62</sup> <https://www.nafc.uhi.ac.uk/research/marine-spatial-planning/sullom-voe-master-plan-project/>

In Orkney, Shetland and the Western Isles there are also increasing opportunities for self-governance since the adoption of the Islands (Scotland) Act 2018, which includes legal provisions requiring government to ‘island-proof’ national policy and legislation (including retrospectively) and enables local deviation from national approaches as appropriate. More broadly, exiting the EU has wide and uncertain implications for national governance, including marine management. Establishing new control of fisheries management for Scotland is of major importance, and this was also raised in Shetland where fishing is a significant economic contributor. These multiple and overlapping opportunities for local influence adds complexity to the understanding of the contribution of RMP to local governance, although the opportunity to convene diverse stakeholders in RMP was indicated by one participant as providing a basis to consider these other opportunities.

### *How do devolved arrangements through marine planning interact with other levels?*

National government was identified as playing an important role in providing resources to MPPs (including funding and extensive data resources), as well as guidance and oversight to ensure coherence with national policy and legislative frameworks. An industry participant in the Clyde also considered that government provided neutrality and fairness which to them is compromised within the MPP. Government was also described as playing an important role in responding to issues extending beyond the boundaries of marine planning, such as large-scale fisheries management and climate change, and in representing regional marine interests at national and international scale.

However, difficulties were observed in determining the interaction of marine planning with other governance arrangements, including between national government and the regions:

*“Throughout the process we come up against national versus local [...] We’re constantly trying to find out where regional planning fits within the landscape that is already there, and also the changing landscape”(C).*

In Shetland the MPP was described as a *“regional version of central government”(S)*; a ‘top-down’ approach, ‘owned’ centrally, particularly since final plans must be reviewed and approved prior to adoption by Scottish Ministers. Some described a limited role for government as appropriate;

*“...they don't want to be seen to be involved too much in directing”(C) and; “...there's no prescribed way in saying this is how you do things, in fact the less of that the better”(S).*

To others in the Clyde, the government was not sufficiently involved at regional scale during plan development and should be more accountable for RMP (*“...it does feel to me quite often but they are just absolved of responsibility in this process”(C)*). Late government involvement in Clyde marine

planning was seen by ENGOs as ‘diluting’ attempts to be locally specific and constraining efforts to improve regional governance, with guidance preferred earlier in the process. In Shetland, government action towards further sectoral planning for offshore wind development surprised the fishing industry and was described as a lack of co-ordination between sectoral and regional planning. Lastly, uncertainty regarding sustained resourcing by government beyond publication of regional plans meant that the future of the RMP process was unclear to all participants.

#### 4.4.2 Participation and collaboration

##### *Do marine planning arrangements support greater participation and collaboration?*

Results here relate to engagement of participants in the marine planning process and the extent to which it has influenced their interactions with others. Key sub-themes are: a) participation in the MPPs and influence on interactions (I1, I2, I6, I7); b) specific support for collaboration between actors (I2, O2); and c) the engagement of civil society in RMP (I2).

##### *a) Participation and interactions*

In addition to the compilation of data and information at regional scale, a key benefit of the marine planning process was regarded as the participation and engagement of a wide range of stakeholders through the partnership approach. In both regions, a non-governmental lead and greater involvement of stakeholders in developing marine planning was welcomed. Regional actors lead in shaping the process and developing the content of the plans including regional policies. In Shetland, it was consequently felt that the plan was not imposed on industry:

*“We were closely involved with drafting [the plan] with other stakeholders and everybody else in Shetland [...] it wasn't a plan that came down from on high” (S).*

An industry participant in the Clyde indicated that the partnership approach was more effective compared with their experience of marine planning in England, where regional marine plans are being developed but led by a central governmental authority.

This approach has supported an understanding of different perspectives amongst stakeholders and building of trust between organisations:

*“The greatest value of marine planning process is not the production of the plan, it's the discussion that goes on in developing the plan...”(C), and; “...it's definitely been about networking and building closer relationships with other people, including people that might have been seen as our competitors”(C).*

Trust-building was also notable in Shetland where plan development was reported to have supported pre-emptive conflict avoidance by enabling developers to explore appropriate siting of activities such as aquaculture in relation to fishing activity.

Many relationships between regional stakeholders were already established through the SSMEI and regional groups which were pre-cursors to the MPPs, however RMP has provided a structural and legal imperative for stakeholders to participate and has enhanced commitment. Participants provided similar articulations of the broad purpose of marine planning and were in collective agreement on the high level vision of sustainable development for the regions. Engaging in the formative stages of marine planning was particularly important, to support the process (as identified in the Clyde where planning authorities provided useful expertise) and ensure representation of interests. The level of involvement of stakeholders in attending and contributing to the MPPs thus far is significant, according to participants and meeting records.

While encouraging constructive interaction between stakeholders, participation and collaboration differed across the regions. In Shetland, good co-operation is evident and largely ascribed to its island setting which presents a more tractable situation for marine planning, administered by a single local authority and with fewer perceived conflicts:

*“...it's easier in an island group where I wouldn't say we are one big happy family but it is one community and there is a sense that if a compromise is possible, let's talk, and framework of the plan allows that to happen. I guess it's bound to happen we're stuck out in the middle of nowhere, we kind of hang together. And it's hard to see that would be replicated anywhere else”(S).*

Difficulties were observed in the more complex region of the Clyde where the functioning of the MPP was considered challenged by the large number of actors, some with diverging interests. Consequently, while involvement of stakeholders in partnership activities is high, much time in meetings is spent on defending individual interests which limits constructive and creative thinking, as commonly reported by different actors:

*“...in an area like the Clyde, you've got lots of single issue groups who want to say things and influence things but who are not necessarily prepared to get into the business of working together to produce the plan”(C); “The problem with having a wide range of members is it's difficult to get agreement on things and move forward”(C), and; “It's much more adversarial here rather than collaborative”(C).*

Concern was raised by an industry representative in the Clyde that the group is biased towards environmental interests given their representation on the partnership, while a public authority observed that the leadership ensured a balanced and fair approach. An industry representative and ENGOs indicated the importance of continuing to engage nationally, directly representing their interests to government to address their concerns in the region.

Sustained participation in the Clyde MPP beyond publication of the plan was considered problematic to some given increasing capacity constraints on members and uncertainty regarding the benefits of the process. The risk of “*loss of momentum*”(C) was noted as motivation to engage declines if practical outcomes are not forthcoming, a perspective echoed in Shetland: “*Well yes, it's the practical application, and if it doesn't seem to have practical relevance then people will stop engaging with it*”(S). Consequently, active participation may become biased in favour of those with resources to act and exert influence, when others may lack time, funding or technical capacity, as articulated by an ENGO representative:

*“The structure then becomes just who can resource it, who can be part of the partnership, who can afford that time, you don't necessarily have a well-balanced partnership”*(C).

#### ***b) Collaboration***

Collaborative action has been facilitated by the marine planning process, and may contribute to addressing local issues identified during plan development even if beyond the legal scope of RMP. This includes early stage “*spin-off*”(C) partnerships, including between scientists and an ENGO for gathering data at a local scale on cetaceans through community engagement. In the Clyde, RMP has supported co-operation between industry and an ENGO on vessel-based collection of cetacean data, collaboration led by industry to develop ideas for the re-use of dredging material and between industry and Scottish Government on marine litter:

*“Particularly the marine litter side of things was borne out of relationships that we've had through the partnership...it's given extra impetus to move forward...”*(C).

#### ***c) Engagement of civil society***

Each MPP has prepared a Statement of Public Participation as required by the Act, detailing opportunities for engagement in marine plan development. Groups representing community interests are included as members of the MPP (in the Clyde) or MPP Advisory Group (in Shetland) and targeted engagement exercises seek to ensure the input of citizens. Civil society engagement in marine planning is influenced by local context: in the Clyde, there are challenges in defining

representative ‘communities’ across eight local authority areas and a large associated population, as described by a public authority: *“As a planner with years of experience [in the Clyde], it is very difficult to meaningfully involve the community in the planning process”*(C). The CMPP have made significant efforts in public engagement, through past projects working with communities, extensive regional workshops and the employment of a Public Engagement Officer. Shetland provides a geographically distinct and easier ‘community’ to define and is accessed via 11 strongly functioning community councils, in addition to direct engagement of members of the public, fishermen and recreational users. MPP members and stakeholders in Shetland also consider themselves representatives of the community: *“...we’re such a small place, we are always members of the community anyway”*(S). The ENGOs were described as playing an increasing role in public engagement in Shetland, providing further evidence that traditional roles of some ENGOs are changing, with further recognition that the interaction between environment and society in sustainable development and can support public participation in marine planning in certain contexts (Brooker et al. 2019). A number of participants described marine planning as too technical and difficult for the public (and even for themselves) to engage with, and considered that involvement of experts was important in the formative stages of marine planning.

#### 4.4.3 Learning, innovation and adaptability

##### ***What is the capacity for learning and innovation in marine planning?***

Addressing the questions regarding learning enabled by marine planning, responses are themed in relation to: a) the learning-based approach to marine planning in Scotland (I4); b) the formal review processes (I5); and c) social learning among actors (I5).

##### ***a) RMP as a learning-based process***

It was acknowledged by participants across the regions that they are still *“feeling our way a little bit”*(C) and a ‘learn by doing’ attitude prevails, as they address new requirements with no precedent. Significant effort is underway at the regional scale, and there has been innovation in both Shetland and the Clyde, including obtaining alternative financing for regional initiatives to advance marine planning, demonstrating agility in responding to opportunities and deploying resources. In the Clyde this included using innovative tools to engage school pupils in developing a vision for the region<sup>63</sup> and engaging communities through a new public dialogue process (Phillips et al. 2018). Nationally, learning is transferred between regions in developing marine planning (I1) and is supported through

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<sup>63</sup> <https://www.clydemarineplan.scot/marine-planning/clyde-regional-marine-plan/clyde-schools-engagement-final-report/>

proactive interaction between regional marine planning counterparts and across national organisations involved in multiple regions. However, while there is flexibility in regional approaches, too much diversity or deviation from national standards in marine planning approaches was perceived as a potential concern in influencing regional investment: *“You don't want to jeopardize your own region against someone else's region”*(C).

#### ***b) Formal Review of Regional Marine Planning***

Participants acknowledged the need for marine planning to adapt in the future, to respond to changes in national policy, climate change, technological developments and to consider new social and ecological data: *“it has to adapt according to need and to change”*(S). The Act requires review of regional plans at least every 5 years but effort is currently on the development of plans and participants were unclear on how this would proceed: *“We are not entirely sure what that will involve because we have not been directed by government on what they anticipate that review involving”*(C). It was suggested that review processes will focus on the baseline assessment undertaken to inform regional marine planning and indicators relating to policies set out within the plan. However, evaluation of progress in a particular direction was perceived as being difficult where policies are general and without measurable objectives. Others raised concerns that the timing and frequency of review may not enable response to interim social or ecological changes. The relationship of RMP review to the Scottish Governments' review of the National Marine Plan and other national cycles is also unclear, and resources were a major concern in the on-going evaluation of RMP and developing marine planning: *“I think we can adapt further, but we need to have that continued resource provided by the Scottish Government to do that”* (S).

#### ***c) Social Learning***

The MPPs provide a locus for interaction and *“provides a framework that guides your thinking”*(S). For actors involved in both regions adjustment to operating as part of the newly established MPPs contributes to learning and awareness raising of regional marine issues: *“I've learnt so much from just being able to sit around the table and I suppose try to understand what other people's interests are”*(S)<sup>64</sup>. Social learning occurs through development of experience and learning at individual and organisational scale (Wyborn 2015) and will continue during the iterative planning cycles based on on-going engagement of regional actors. Results indicate that greater reflexivity to consider how

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<sup>64</sup> Further representative quote: *“There's a better understanding on all sides I think because of this process.”* (S)

marine planning is functioning in addressing broader governance challenges would be valuable in promoting learning and developing collective understanding of RMP, e.g.:

*“I never get the opportunity to talk at this kind of out of the box level...and actually these things are really, really important but they are just pushed aside all the time by the day-to-day stuff because we have no staff and no resources” (S).*

The inclusion of more detailed representations from wider members of the partnership in the Clyde, in reports to government in particular, would be welcomed: *“...other partnerships I’m involved in...you would carry out regular reviews on how the partnership is feeling, how it’s working, what stakeholders think needs to change...” (C)*, although resources are again a concern.

### ***Is there adaptability to respond to change through marine planning?***

RMP is enabling design of policies and process shaped by regional conditions which will be amended through future iterations of planning. However, decisions on marine development are still taken (and challenged) through existing regulatory frameworks which were considered slow to change. To an industry representative, a pace of change through *“small steps” (C)* is dictated by existing legislation and is appropriate:

*“People need time to work out the right decision at the right level and the right changes at the right level... it’s always a case of saying how can we try and recognise what we can get out of this in terms of legislation without going too far so that you expose yourself to challenge” (C).*

However, a public authority in Shetland, and ENGOs in the Clyde, expressed frustration at a perceived lack of possibility for change through RMP, for example:

*“You created a structure that allows nothing to happen, no changes to be made actually. So that’s why [...] we have to fight so hard for any plan to be radical and to make a difference” (C).*

An industry representative agreed that the governance system within which RMP is embedded is slow to respond, and that regulation is *“constraining what we’re doing”* and needs to *“catch up” (S)* with development, but that focus should be on problems in existing management frameworks and *“challenge what’s not working within the existing system”* rather than *“wholesale change” (S)*.

A need to collectively develop understanding of what marine planning should achieve over the long-term was expressed across actor groups, including in relation to the wider governance system, supporting development in the future:

*“Nobody sits down and says “Does anyone have any idea about where we should be going? And you kind of take it that there is a plan”(S); “I still think after all these years of talking about what we're trying to develop, I don't think people have got a fully formed idea about what [marine planning] is”(S), and; “Without guidance on what a regional plan is supposed to be doing from government, which we don't have, then it's difficult to know how they are expecting the regional plans to make a huge difference”(C).*

In the Clyde, it has recently been suggested by the MPP that future plan development should focus on “1 - what is the strength of the Plan?; and 2 - how good is the Plan at doing what it is supposed to be doing?”<sup>65</sup>.

#### 4.4.4 Self-organising and supporting activities

##### *What self-organising activities are evident in relation to RMP?*

Self-organisation and co-operation are present in both regions, between individuals and organisations, influenced by existing context and behaviour (13). Such action, particularly in leadership, is essential in the implementation of RMP, and in adaptive governance. It has developed in response to the opportunity provided through marine planning, from pilots to the statutory process. Collaborative action identified above as supported through the marine planning process is self-organising, since actions are voluntary and proactive, responding collectively with shared responsibilities. Other activity pre-dates marine planning in the regions and provides a supporting context, such as existing voluntary management measures developed through the partnership-based SSMO and interactions supported by the Firth of Clyde Forum which led on pilot planning in the Clyde.

Building on an existing forum was problematic to some in the Clyde as it allows existing tensions to influence MPP functioning and contributes to confusion on the fundamentally different remit of the new MPP. Coalition-building to form an environmental “*bloc*”(C) was observed by a number of participants, including the ENGOs themselves, in order to “*maintain the levels of scrutiny and rigour we have done with other systems and processes in the past*”(C). While intended to promote better planning in the Clyde (according to environmental interests), concerns were raised by an industry representative that this compromised the democratic functioning of the CMPP.

Leadership is critically important in facilitating interactive processes and the delegated regional organisations were considered as providing valuable leadership in Shetland and the Clyde. Their commitment to the development of a new process which facilitates broad input at regional scale was

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<sup>65</sup> <https://www.clydemarineplan.scot/wp-content/uploads/2019/02/Minutes-31-January-2019-A2875959.pdf>

noted, including by a planning authority: *"I do think they do quite a good job of listening to everyone and managing to tease out the consensus and they do the best they can, given the challenges."*(C). Both MPP leads have demonstrated self-organisation in acting beyond their formal mandate including seeking funding by other means to steer action at the local level. Other proactive individuals were described as particularly influential in the development of marine planning, including those embedded within different organisations.

#### 4.5 Discussion and the implications for adaptive governance

In examining how marine planning enables adaptive governance the analysis above indicates mixed results. There are positive indications of the emergence of identified dimensions (to different degrees) and with some benefits of the process indicated at regional scale, but important barriers and challenges were observed which may limit its overall contribution to adaptive governance in marine resource use. Discussion of the implications of marine planning for adaptive governance is addressed in this section.

Regional marine planning was shown to represent an emerging interface between 'top-down' government authority and collaborative governance based on empowerment of regional actors. Based on enabling legislation, national government provides legal legitimacy, economic incentives and policy oversight, while at the regional level there is flexibility to shape marine planning processes according to local context. Development of marine planning is highly learning-based with varying approaches and innovation in each region, and the MPPs are demonstrating significant adaptive capacity, continuing as pioneers with little precedent and limited resources. Approaches are shaped by proactive and self-organising actors who lead and advance marine planning practice, translating learning between regions through formal and informal networks. Participation and self-organisation are high, particularly considering resource and capacity constraints. The process is enabled by leadership of the MPPs who have facilitated development of marine planning (including by mobilising funding) and supported consensus-building through collective policy making. This programme of marine planning is 'experimental' governance at national scale based on initial pilot projects and learning from early regions informing subsequent regions as they proceed with marine planning.

The partnership-led approach is enabling participation, collaboration, learning and innovation, supported by strong leadership which aims at consensus-building and development of collectively agreed regional marine planning policies. These provide rules for decision making which are encoded in a marine plan through which the MPPs aim to steer interactions and decisions taken at the operational level (AS1). Outcomes include the collective policies contained within the plans (O1) and

varying levels of effectiveness of collective policy-making and influence on decision making is indicated across the regions. Compilation of higher quality data and information on human activities and the state of social-ecological system at regional scale than is available at broader scales is supporting improved decision-making in AS1. This 'place-based' regional approach provides a new locus for marine governance and the benefits of an adaptive governance approach are indicated, tailoring the process to regional circumstances and enhancing capacity to respond to local conditions through social learning and adaptive approaches (Young et al. 2010). Local knowledge can inform local actions in ways that a single centralized system cannot (Lebel et al. 2006) and derivation of marine planning policies through regional collaborative processes enable MPPs to address multiple interacting goals based on local context and priorities. The process also supports negotiation and debate at regional scale which has been shown to have enhanced decision-making in Shetland, and resulted in informal rules and norms ("*ground rules*"(C)) which influence developers in their decision-making processes and encourage compliance, co-operative behaviour and conflict resolution, in addition to the formal policies outlined in the plan document. Other important outcomes included collaborative activity and initiatives (O2) supported by the plan process in addressing local and regional issues, demonstrating self-organisation and adaptive governance beyond the formal scope of marine planning. RMP thus constitutes a multi-stakeholder process which enables collaboration and learning and provides an opportunity to address competing objectives through communication and negotiation (Berkes 2002), and suggests a model of marine planning described by Craig (2019) as supportive of adaptive governance: a mandated participatory forum supporting polycentric and creative processes based on learning and increased collaboration.

#### 4.5.1 Functioning of the MPPS and the influence of context

Focussing on the experience of actors within the MPP as an AS shows some positive effects of marine planning in enabling participation, learning and increased collaboration which can support and encourage future collaboration (Schultz et al. 2015). Based on participant feedback and meeting records, participation is high and effort to secure participation from a broad range of actors is increasing as shown by developing activity focussing on public engagement in the Clyde. However, the analysis revealed differences in how the MPPs functioned, highlighting the context-dependent nature of participatory processes, which affects the outcomes in terms of material influence on marine development at regional scale. The more complex governance landscape of the Clyde, with multiple local authorities and diverse and sometimes competing stakeholder interests, presents challenges and a different context for adaptive governance through marine planning. Here, marine planning provides a useful scale for understanding regional issues and is supporting learning and

collaborative action, but achieving consensus among members is evidently difficult, where the number of members and diversity of perspectives across the MPP complicate development of policies which actively steer regional development. While participants readily engage with the process, the constraints of competing interests and strategic behaviour on the ability of the CMPP to collectively develop meaningful policies can be seen to result in 'collaborative inertia' which often stalls emerging collaborations with "propensity to develop second best or vague outcomes in order to achieve consensus agreements" (Gunton et al. 2006, p.22) and is confirmed by the unanimous perception that outcomes (in terms of policy) are 'weak' in the Clyde. Increasing local ownership is also less tractable in this region and difficulties in engaging a 'local' community in a large and populous region are evident. Trust-building and collaboration between actors has increased in the Clyde and positive effects are observed, including the 'spin-off' collaborations and learning among stakeholders, and over time, repeated interaction could foster critical trust and collaborative social norms (Wyborn 2015). However, on-going commitment to the process requires understanding of outcomes to justify the high transaction costs of engagement which are problematic to many. Concerns about sustained engagement in marine planning based on resource constraints raise risks of 'elite capture' where participatory processes become dominated by those with resources (Schultze et al. 2015). There is concern regarding the capacity for marine planning in the long-term, particularly as other MPPs are established in other marine regions, but although some participants reported challenges, results do not suggest that this has constrained the effectiveness of either the Clyde or Shetland MPPs to this point.

Socio-cultural and governance arrangements in certain island contexts are indicated as better enhancing legitimacy and accountability through marine planning, building on existing (and increasing and desirable) devolution of management powers to the same scale. Shetland provided a comparative case where socio-cultural factors and structural factors were identified that positively influence the functioning of the MPP (and adaptive governance) in that region. In the Clyde, dominance of *strategic action* is observed, defined by Habermas (1996), where actors operating in action situations are motivated by their own / organisations' stake which they may be mandated to defend and where compromise may be seen as a trade-off, with no creativity or greater value of the collective outcome. In Shetland, a situation closer to Habermas' ideal of *communicative action* is observed, where participants represent individual interests (such as aquaculture, fishing or nature conservation) but are motivated by collective solutions for the benefit of the community, including through marine planning. This provides a stronger basis for adaptive governance where participants in marine planning seek to "integrate their interests into policy that advances their common interest" (Brunner 2010, p.304). Shetland is likely to be a rare case where social capital is higher due to geographic and

cultural factors, along with drive for local control of decision-making and a more cohesive and community-based stakeholder group is leading to better collaboration and strength of marine planning outcomes (and may justify the expectation of similar experience in Orkney). Social capital develops over time however the analysis indicates that this is unlikely to be replicated in mainland regions, particularly since the Clyde process has been developing for a long time and continues to experience problems (Flannery & Ó Cinnéide 2012). The insights into the collaborative processes of the MPPs are useful for practical consideration in the development of collaborative marine planning, and variability across regions could be considered in institutional design for collaborative marine planning in other regions, in Scotland and elsewhere<sup>66</sup>.

Researchers have highlighted a lack of inclusivity and breadth of participatory processes in marine planning processes e.g. Flannery et al. (2018), including in Scotland (Smith & Jentoft 2017). In contrast, this case study indicates significant effort in addressing participation in both Shetland and the Clyde (where public engagement continues to expand) including involving wider communities in the planning process. Moreover, this study indicates that institutional arrangements beyond the MPP (addressed below) are of greater importance in determining the outcomes of marine planning initiatives, including in justifying the greater transaction costs of increasing participation.

#### 4.5.2 Extent of institutionalisation of adaptive governance

Adaptive governance implies not just collaborative processes and multilevel arrangements, but that these are consequential in terms of the ability to shape governance responses at the local scale. It should enable diverse stakeholders to pool their knowledge and resources to “solve shared environmental or natural resource dilemmas” based on learning and experience (Djalante et al. 2011, p.5). The formalization of the MPPs based on legislative powers represent ‘stronger’ polycentricity compared to the pre-existing groups, i.e. the non-statutory Clyde Forum, and where social relations have changed in character from purely information sharing, to relations that require a mutual commitment among actors (Galaz et al. 2012).

However, while demonstrating adaptive governance during the development of the planning process and the production of regional marine plans, consideration of implications for adaptive governance at system scale through marine planning has proven to be more complicated. In addition to the dimensions described, recent research by (Eshuis & Gerrits 2019) provides a useful perspective by distinguishing between whether adaptive governance (in an urban planning context) *institutionalises*

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<sup>66</sup> Discussion of the governance structure of individual MPPs has not been included here but is also relevant to the functioning of the MPPs.

i.e. transforms the existing governance system, and whether it *materialises* in the built environment (noting that these are intertwined). Applying this to marine planning is useful for interpretation of results which focus on a planning tool which intends to create institutional change and influence human use in the marine regions. In marine planning, materialisation can be considered the creation of objects, including the marine plan and associated reports, and material influence on decision-making which leads to a change in physical use or activity in the material world (including licensing and consenting processes at AS1). Institutionalisation represents the sustained ability to respond to learning through development of new rules, including cognitive institutionalisation (framing), normative institutionalisation (general norms) and policy (regulatory institution) (Eshuis & Gerrits 2019). A degree of institutionalisation is indicated through the derivation of new rules developed by the MPPs through a local collaborative process and the formal and informal rules which influence behaviour and decision-making. However, interviews and meeting records do not indicate that the process has led to ‘transformed frames’, and institutional change is not reflected in other regulatory and management processes which reduces the materialisation and wider institutionalisation of adaptive governance. Further analysis will be required when the marine plans have been adopted but at this stage, while a catalyst, the ‘transformative’ capacity of marine planning as a tool for adaptive governance that leads to new “norms, institutions, and incentive structures for social innovations” (Norström et al. 2014, p.7), and which lead to deep, structural, and enduring change to the existing governance system and its institutions (Kelly et al. 2018), appears constrained.

The analysis shows important region-specific functioning of the MPPs with positive benefits at regional scale, but perhaps more importantly, indicates broader complexity regarding the role of marine planning in the wider governance system. Challenges are revealed in this regard, particularly in relation to: a) the vertical interaction between regional and national authority in multi-level marine planning arrangements; b) the interaction with other management processes and the adaptive capacity of prevailing legislative regimes; and c) enabling adaptive governance over the long-term, beyond publication of marine plans. These factors, which relate to key tensions characteristic of institutionalising adaptive governance, are reflected upon next and are relevant to understanding the potential for enabling adaptive governance through marine planning in Scotland and in other jurisdictions.

#### *a) Interplay between central and decentralised authority in multi-level marine planning arrangements*

An adaptive governance perspective has brought focus on marine planning in Scotland as an emerging interface between regionally-led experimental approaches within a national framework. Nested

marine planning is found elsewhere and such arrangements have been shown to support its implementation as seen in community-based marine planning in British Columbia, Canada (Diggon et al. 2019). In Scotland, central government plays an important role in providing legal and economic legitimacy for the development of statutory marine plans, as well as technical resources and oversight to ensure coherence with national policy and legislative frameworks. However, analysis of the interaction between the regional MPPs and national government shows that this interplay is complicated, evolving and might constrain what can be expected through marine planning.

In this case study, polycentricity is indicated with flexibility enabling vertical interplay to vary in each region according to existing governance arrangements and social characteristics. Support is found for the proposition that devolved arrangements which enable participation of a broad range of actors, including non-state actors, enables innovation and development of context-relevant governance. However, power and hierarchy were revealed by the analysis and while power is vested in the MPPs and regional arrangements they develop, challenges were noted regarding the relative power of the MPPs and national government. While a regional approach, legal arrangements define a prevailing 'top-down' process and results indicate a widely held perception that this remains the case. MPPs are legally required to implement *national* policy, but interpreting national policy, including policy which is relatively non-specific, is difficult and there is limited guidance for the MPPs. Further, marine planning policies which make new demands beyond existing legislative requirements, for example in relation to 'non-planning' issues such as marine litter, are necessarily indicative, using less binding terminology and are harder to enforce. It is also not yet clear whether such policies can be included in the final statutory plans due to risk of legal challenge and, at the time of writing, the CMPP are yet to reach agreement with Marine Scotland (and across the partnership) on what it is appropriate to include within the plan<sup>67</sup>. Establishing structurally and functionally polycentric governance is compromised by on-going debate regarding the relative power at regional and national level, including what can be included in the plan, and risks undermining the regional process. Defining influential regional marine plans which demonstrably shape regional marine use within this national framing and on-going uncertainty is challenging for the MPPs. While providing flexibility to 'experiment' with forms of marine planning, this vertical interplay may limit adaptive capacity and the materialisation of adaptive governance in the development of plans which influence human activity at regional scale.

Polycentric self-organisation and adaptive governance within extant, 'top-down' authority processes are difficult (De Caro et al. 2017) with vertical linkages between local-level institutions and

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<sup>67</sup> <https://www.clydemarineplan.scot/wp-content/uploads/2020/01/Minutes-3-December-2019.pdf>

subnational or national ones often characterized by tensions (Young 2006). It is also not a straightforward debate: ‘top-down’ processes are shown here to be necessary in RMP to provide structure, capacity and to address issues at larger scale, including climate change, and government provide a perceived ‘neutral’ voice where regional tensions exist<sup>68</sup>. Increased authority granted to the MPPs is not desirable to many, particularly in the Clyde with its associated complexities, and would require greater attention to ensuring effective local democratic processes and capacity. This is very different to the island regions, where local ownership and control is a powerful and politically desirable goal<sup>69</sup> and intervention from “*central belt bureaucrats*”(S) is unwelcome to some. Further, while flexibility for different forms in each region is of benefit in enabling situated and locally relevant programmes, too much diversity in marine planning approaches was indicated as problematic for economic development (creating preferential investment in some regions over others, for example), indicating a potentially negative consequence of flexibility and experimentation.

Problems of coherence in nested marine planning arrangements are evident at this stage, and clarity is needed to ensure stakeholder understanding and adherence, and to ensure that authorities at different scales avoid impeding outcomes (Halpern et al. 2012). Confusion regarding RMP during the early stages of the process was identified by Smith & Jentoft (2017) and is shown here to continue to affect the long-term prospects for RMP and its impact on governance, combined with unclear funding for existing MPPs and for other regions as they develop. Clarity on the interaction of marine planning with other planning and management processes would support stakeholder understanding and expectations of the role of RMP as well as their commitment to the process in the long term. This may develop as marine planning proceeds; for example, the intention of greater future co-operation between MPPs and the Regional Inshore Fisheries Groups (RIFGs) in planning and management of fisheries in the regions (SIFT 2018<sup>70</sup>). As participants raised, this also highlights the need for in-depth review processes connected to other processes across governance, which might better enable *enduring* change towards adaptive governance (Eshuis and Gerrits 2019).

#### ***b) Cross-scale linkages: interaction with other management processes***

In addition to vertical integration, emphasis on existing legislation and regulatory processes at different scales was indicated as limiting capacity for influencing change through RMP. There is a

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<sup>68</sup> The recent Local Governance Review by Scottish Government sets out the challenges in determining what level of ‘control’ is appropriate for communities, and for which decisions, and that this is not a straightforward issue (<https://www.gov.scot/policies/improving-public-services/local-governance-review/>)

<sup>69</sup> As is evident from the Our Islands Our Future campaign led by Scotland’s three island councils and which resulted in the Islands (Scotland) Act 2018 ([https://www.holyrood.com/inside-politics/view,the-journey-from-our-islands-our-future-to-the-islands-act\\_8977.htm](https://www.holyrood.com/inside-politics/view,the-journey-from-our-islands-our-future-to-the-islands-act_8977.htm))

<sup>70</sup> <https://www.sift-uk.org/wp-content/uploads/2019/03/RIFGs-Policy-Practice-and-Problems-SIFT-2018.pdf>

tension between marine planning which intends to support collaborative, adaptive processes and the rigidity and lower flexibility of existing policy, planning and management arrangements. Marine planning is intended to guide licensing and permitting decisions based on statutory consideration of the marine plan by regulatory authorities and activities in the regions remain influenced by a complex system of decision-making at different scales. This includes policy development (e.g. aquaculture policy; AS3), development planning (e.g. land-use planning or sectoral planning such as for offshore renewable energy) and the management (including licensing and enforcement; AS1) of specific activities by different authorities. In Scotland, this influence is based on the articulation of regional marine planning policies set out within the plans, some of which are spatial and many non-spatial, and these rules support improved decision-making to varying degrees. But ultimately, decisions concerning specific projects such as aquaculture and renewable energy are taken through national and local licensing processes which focus on site selection, environmental impact assessment and local social acceptance, and the regulatory process at AS1 remains an important arena for public debate on proposed developments at sea requiring a license. Other mechanisms are also important such as the RIFGs who lead on management of inshore fishing which is not subject to licensing and for which integration with marine planning is still in development. Decisions on human activity in the regions are taken through different regimes and constrains the materialisation of adaptive governance through responsive decision-making and learning from experience at regional scale. Adaptive governance is limited to the marine planning arena and achieving adaptive governance in marine resource use thus depends crucially on its interaction with decision-making at other scales, particularly at AS1.

Marine planning is predominately supported and constrained by existing laws and regulations (Halpern 2012) and based on the observations in this study, two main implications for adaptive governance emerge which are relevant to marine planning as a process in general rather than a criticism of the approach in Scotland. Firstly, although the marine planning process is shown to provide 'enhanced' decision-making by setting out rules based on locally-relevant data, trust-building and collaborative behaviour (albeit with context-specific differences), there is a distinct lack of 'power' in considering 'alternative *management* options' as referred to in descriptions of marine planning, and "exploration of new and novel system configurations" as fundamental to adaptive governance and particularly adaptive co-management (Olsson et al. 2006, p.17). Capacity to consider management options and test different approaches to the location, duration and type of activity, with flexibility to respond seems limited and relies primarily on the processes of regional policy development, revised through infrequent and uncertain review processes. Although aiming to address environmental challenges through a collaborative and learning-oriented, place-based process

(Folke et al. 2005; Plummer et al. 2017), decision-making power resides in other structures which retain significant capacity to influence regional development.

This also explains why the developing opportunities under the Scottish Crown Estate Act 2019 addressing changing ownership models including the CES Local Pilot Scheme are seen to hold greater potential for adaptive capacity. This Scheme combines devolution to local scale with shared management rights through transfer of property management rights (through leasing arrangements) and may in fact support conditions of adaptive co-management, where a collaborative group has greater control over specific activities. This is further suggested by the intention of the Orkney Islands Marine Planning Partnership to progress RMP through this Scheme, to better align planning and management rights<sup>71</sup>, along with a scheme in Shetland<sup>72</sup>, maximising local control and accountability for marine developments in the region. In this case, new action situations could be described, defined spatially according to the particular project and resource (indicated as AS0 in Fig. 4.1) to be managed at local scale, noting that licenses may still be required for certain activities through AS1.

This leads to the second implication of overlaying marine planning on existing processes and commonality is found with recent adaptive governance researchers (Craig et al. 2017; Gunderson et al. 2018; Cosens et al. 2018) who bring specific focus on the rule of law (in water governance) and the need to understand flexibility within the existing planning and management regimes in enabling adaptive governance. The challenge of integrating adaptive approaches into highly regulated systems posed by existing formal institutions and the rule of law is well documented (Chaffin 2014; Camacho & Glicksman 2016; Cosens et al. 2018). Conventional institutional responses, including strictly enforced regulations, are still needed (Pierre & Peters 2005; Armitage et al. 2009) and adaptive governance requires balancing stability in governance with flexibility to adapt to changing circumstances and emerging knowledge (legal adaptive capacity) (Soininen & Platjouw 2018). Identifying this tension in marine planning underlines the need to better understand the interaction between marine planning and other management (the extent to which it can influence decision-making in other domains), and to address governance deficiencies attention is required on the adaptive capacity of existing legislative frameworks which govern licensing and decision-making of activities at sea. Craig (2019) goes further to suggest the need for procedural reform in marine

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<sup>71</sup> “The integration of local seabed decision making and marine planning at the local level will greatly enhance the alignment of asset management with local polices for sustainable development.” (Orkney Islands Council, 2018: [https://www.orkney.gov.uk/Files/Committees-and-Agendas/Policy-and-Resources/PR2018/25-09-2018/I13\\_\\_Local\\_Marine\\_Asset\\_Management\\_Pilot\\_Scheme.pdf](https://www.orkney.gov.uk/Files/Committees-and-Agendas/Policy-and-Resources/PR2018/25-09-2018/I13__Local_Marine_Asset_Management_Pilot_Scheme.pdf))

<sup>72</sup> In Shetland, a Sullom Voe Master Plan is being progressed under the Local Asset Management Pilot Scheme to develop planning guidance for a newly opened area around the Sullom Voe Oil Terminal, and is building on the RMP process.

planning in the U.S., to legally connect permitting processes, marine planning and adaptive management to enable flexibility and adaptive governance institutions to emerge. Legal adaptive capacity formed a key focus of the subsequent case studies particularly in adaptation to climate-change related OA and is discussed further in Chapter 5, including the role of marine planning from this perspective.

This 'constrained' institutionalisation of adaptive governance through marine planning is important in determining governance outcomes. It also suggests a need for specificity in terminology, both in practice, and in the application of theory, noting that marine planning takes different forms with varying relationships to other planning processes (Kidd & Shaw 2014). Marine (spatial) planning and the decisions it involves is often considered 'management' or regulation in the literature, but it is not equivalent to regulatory management and decision-making which remains fundamentally decisive (Kidd & Shaw 2014). For example marine (spatial) planning is described by some as "place-based *regulation* of allowable ocean uses" (emphasis added) (Craig 2012, p.5), and considered supportive of adaptive governance based on substantive (legal) adaptive capacity, where "a community has both the resources and the legal authority to respond to change with appropriate adjustments" (Craig, 2019, p.6). This refers to a form of MSP which focusses on definitive spatial allocation of activities (zoning), which become defined in regulations and directly relate to permission or prohibition of activities, but other regulatory processes still apply (Halpern et al. 2012). There is a lack of specificity in the literature regarding different forms of marine (spatial) planning and the extent to which the process has legal authority, and this detail is shown here to be essential when considering its governance outcomes.

### *c) Long-term adaptability in marine planning*

Adaptive governance is fundamentally based on incremental improvements supported by knowledge generation developed through the on-going participation of actors in the processes of governance and reflecting on practical experience (Brunner 2010). On-going assessment and reflection is essential to respond to feedback (Armitage et al. 2009). Looking ahead, mechanisms of on-going, adaptive improvements beyond plan adoption in Scotland are limited and uncertain and compromise these feedback processes. The formal review cycle defined by the Act presents a structured opportunity to adapt the marine plans, and the updating of the regional assessments supports understanding of the current trajectory of the system (which is necessary to support adaptation; Gunderson et al. 2018). However, this process is still to be defined, and, legally, a report is only required every 5 years, which will inform a decision on whether a new plan is required<sup>73</sup>. Interim activity initiated through the MPPs,

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<sup>73</sup> Marine (Scotland) Act 2010, S.16. Art.26

such as collaborative data collection on cetaceans, can continue to develop understanding of issues at regional scale and facilitate on-going interaction between stakeholders, but limited financial and technical capacity was indicated as constraining the depth and scale of reflection and ability to act, particularly beyond immediate remits or concerns. Infrequent review compromises adaptive processes since the benefits require fostering over a long time (Armitage et al. 2009), yet participants rely on successful interim outcomes to augment resources for the next steps (Brunner 2010). The potential for substantially reduced activity post-plan production therefore raises concerns regarding adaptation to changing context through on-going interactions and learning (Craig 2019).

Adaptive governance promotes evaluation that focusses on institutions and processes in addition to policy outcomes (Olsen et al. 2011), for example the extent to which there are multiple interests, perspectives and linkages among organisations; communication and negotiation, and social learning (Armitage et al. 2009). Greater emphasis on the learning process beyond the monitoring of implementation of national policy required by the Act is required, such as reflecting on functioning of RMP when defining the parameters of the monitoring and review process. This could acknowledge and enhance its wider contribution, including data collation, co-operation and learning between actors and better understanding of the status of the region, respective stakeholder concerns and spatial needs. More structured, frequent and on-going participatory evaluation across the MPPs and wider stakeholder groups was indicated as desirable and may enhance such learning, encourage debate on the purpose of marine planning and capture benefits for stakeholders and planning managers. The need for evaluation of governance performance itself in marine management and not just policy outcomes has been emphasised (Ehler 2003) and increasing accountability and capacity to learn through greater reflexivity of actors on the governance process in marine planning is indicated through this research.

Adaptive governance also depends on the 'scaling up' of learning at the regional level to governance and decision-making at higher scales (Brunner 2010; Garmestani & Benson 2013), to ensure the benefits of learning and experience developed through a bottom-up and adaptive process is transferred into the dominant hierarchical, top-down regime (Brunner 2010). More work is needed to identify how new understanding gained through practical experience through regional marine planning can inform national policy, planning and management approaches. Conceptual frameworks for understanding change, including transition management, could support learning from experimentation in management to support transformations in marine governance (Kelly et al. 2018).

Negotiating different perceptions and attitudes to change in adaptive governance, and the cognitive biases which may be at work (De Caro et al. 2017), is important in considering adaptive capacity.

Through the interviews, there were conflicting views between those who consider the inertia of prevailing governance as constraining what is possible through marine planning, including “*transformative change*”(C), and those who consider it provides predictability, efficiency and a basis for adapting incrementally over time. These underlying differences can undermine proposed changes to environmental governance systems (such as through marine planning) and can amplify the influence of power imbalances on adaptive governance (De Caro et al. 2017).

The wider context of governance reform in Scotland affecting the governance of marine resources may provide greater opportunity for adaptive governance by enabling changes in management in addition to planning. Recent policy and legislative changes include the potential for new models of locally-led, collaborative and learning-based asset management under the Scottish Crown Estate Act 2019; emphasis on community empowerment and flexibility through the Planning (Scotland) Act 2019; increasing self-governance for islands provided by the Islands (Scotland) Act 2018, and other changes following the UK’s exit of the EU. On-going reflection on the role of marine planning in the broader context is essential to understand its relevance as a complementary governance process and to ensure that the learning gained through marine planning is transferred.

#### 4.6 Conclusion

In Scotland, over a decade of marine planning experience has informed the implementation of regional marine planning, and the MPPs continue to ‘learn by doing’ and advance as pioneers of marine planning practice. This analysis has brought attention to the way in which marine planning can support features of adaptive governance, including engagement of diverse actors in collective negotiation of policies, learning, trust-building, collaboration and contextualisation of management decisions. Two cases provide different examples of how a regional approach is developing, demonstrating intense activity and different experience particularly in relation to the influence of context on partnership-led marine planning. While the marine planning process can be seen to provide structural and procedural adaptive capacity which supports adaptive governance (Craig, 2019) the extent to which this enables better management and decision-making depends on the influence of marine planning on human activities which affect the regions.

Addressing the marine planning system more broadly, the challenges of the development and coexistence of sub-national models of marine planning within a hierarchical system are observed, with implications for adaptive governance. In Scotland, the MPPs are empowered to develop a marine plan, but the ‘empowerment’ is partial, with overriding decision-making power maintained in existing, top-down governing structures. This may constrain the overall outcomes of the marine planning

process and the benefits of adaptive governance gained through its development. Delegation of further powers to the MPPs (for example in relation to licensing and management) is shown not to be necessarily desirable or appropriate and would require much greater focus on democratic functioning at regional scale. But ambiguity in these arrangements and a lack of clarity on the relationship between national government and the MPPs contributes to confusion among stakeholders on the purpose, scope and contribution of marine planning, particularly given the increased transaction costs.

The case also provides insights into RMP as an experimental governance design and an interface between traditional management approaches and adaptive, innovative practice. Resulting tensions are evident and adaptive governance in marine planning to enable responsive, locally-influenced management of marine resources is limited by the adaptive capacity of defining legislation and broader management structures. Marine planning has a legal statutory basis to guide the development of decision-making rules (and therefore a role in governance) but this is often distinct from management authority, which remains predominantly influenced by existing institutions and practice, with lower flexibility for change or reform. This has implications for the consideration of adaptive governance through marine planning which by its nature as a planning process to guide other decision-making will be constrained in its ability to lead to materialisation of adaptive governance.

This research contributes to the much needed empirical investigation of the influence of marine planning on social and governance change (Gissi et al. 2019) and provides a further theoretical perspective to the observations made by Kelly et al. (2018) who highlight the limits in achieving 'transformational' change in governance through marine planning due to prevailing regimes. Generalising to other marine planning contexts must be considered carefully since governance contexts including power, planning and legislative arrangements vary widely (Kidd & Shaw 2014) and justify the need for thorough analysis of the 'governance baseline' as a basis for adaptive marine spatial planning as detailed in Olsen et al. (2011) to inform its design, purpose and outcomes.

The prevailing rule of law justifies greater focus on the legal adaptive capacity of marine management arrangements to enable flexibility and adaptive governance, as advanced in relation to water governance in the U.S. (e.g. Cosens et al. 2018; Craig 2019), including legislation defining the marine planning process as well as other planning, management and decision-making addressing marine activities. To experiment and consider alternative management options, wider regulatory innovations may be required, based on consideration of how law can be reformed or re-interpreted to facilitate adaptive governance as explored in Craig et al. (2017).

Adaptive governance cannot be mandated but can be supported or enhanced (Folke et al. 2005). Marine planning plays a role as a new institutional arrangement and this analysis has enabled identification of how its contribution can be enhanced, based on: 1) clarity in accountability, power and authority between marine planning and overlapping planning and management; 2) demonstrating flexibility in wider management to respond to learning; 3) supporting learning processes and reflexivity among stakeholders; and 4) ensuring sustained funding and capacity for marine planning initiatives.

## Chapter 5. Adaptation to climate change–related ocean acidification: an adaptive governance approach (Case Study 2)

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### 5.1 Introduction

Climate change is a challenge facing societies and governance and requires adaptation to respond to the predicted threats including increasing extreme weather events, sea level rise, coastal erosion, flooding and ocean acidification (IPCC 2019). In SES framework terms, it presents a significant exogenous factor influencing the SES which governance must address through continuous response to changing conditions, predictions and the effectiveness of interventions. Climate-change related ocean acidification (OA)<sup>74</sup> is causing rapid change to global ecosystems and poses a significant threat to marine life, however governance responses to OA are not yet forthcoming, and marine issues in general have been largely lacking from the international climate change agenda (Galaz et al. 2012). Aquaculture, the farming of fish and shellfish, is particularly vulnerable to the impacts of OA and adaptation is essential to address the threat to an important economic sector and to the food security of human populations. As a complex issue with highly uncertain effects in coastal areas, adaptive governance is needed to respond to OA with responses across multiple levels (Craig 2019). Focussing on the adaptation of the aquaculture sector to climate-change related OA, this case study provides a further perspective on the adaptive capacity in marine governance to consider potential adaptation interventions in Scotland and the extent to which policy, planning and management arrangements constrain or enable adaptation responses to OA. Case Study 1 described the potential for adaptive governance through regional marine planning (RMP) in Scotland, which must consider aquaculture alongside other sectors and interests, and indicated the need to understand flexibility and adaptive capacity in the wider governance regime to enable adaptive governance outcomes. Building on these conclusions, Case Study 2 specifically considers the concept of legal adaptive capacity, as introduced in recent research addressing adaptive governance, i.e. substantive and procedural provisions in policy and law which are considered precursors to adaptive governance (e.g. Cosens et al. 2017) and which might support identified adaptation responses.

#### 5.1.1 Ocean acidification

Ocean acidification (OA) refers to the increasing acidity of seawater due to anthropogenic emissions of CO<sub>2</sub>, with far-reaching effects on ecosystems and marine users (Fabry et al. 2008; Frommel et al. 2011; Kroeker et al. 2013). In 2019, reporting on OA as Target 14.3 of Sustainable Development Goal

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<sup>74</sup> Distinction is drawn between the general increasing acidity of the oceans due to climate change and local fluctuations in acidity due to changes in terrestrial contribution to coastal areas ('coastal-OA').

(SDG) 14 of the United Nations 2030 Development Agenda indicates increasing concern of “serious consequences to marine life” (United Nations Economic and Social Council 2019). But ecosystem impacts across scales are difficult to predict, difficult to distinguish from effects due to other causes and the scale and complexity, from global to local, make OA a ‘wicked’ problem for institutions to address (Galaz et al. 2012; Billé et al. 2013).

In the coastal zone, the OA problem is further complicated by high local variability, driven by a combination of climate change-related and local factors. Local perturbations, caused by precipitation, changing land-use patterns, deforestation and nutrient pollution increase the vulnerability of coastal systems to OA (Kelly and Caldwell 2013). Global, climate change-driven OA and coastal processes interact dynamically presenting a complex management challenge for coastal nations. Policy and management responses to OA are limited and, besides monitoring and modelling of OA, remain scant (Dannevig et al. 2019; Tiller et al. 2019).

Rising acidity and the associated decrease in carbonate ions in seawater negatively affects growth rates in calcifying marine organisms including shellfish (Gazeau et al. 2013). Impacts on fish and wider ecosystems are anticipated although difficult to predict (Frommel et al. 2011). Marine aquaculture<sup>75</sup>, the farming of marine fish and shellfish for human consumption, is particularly vulnerable to the impacts of OA. Aquaculture is the fastest growing food production industry globally, with 28.7 million tonnes (USD 67.4 billion) of production from marine and coastal aquaculture in 2016 (FAO 2018). The sector plays an increasingly important role in global food security, supporting growing human consumption of protein while production from wild capture fisheries has remained stable with signs of decline (FAO 2018). Enabling sustainable expansion of the aquaculture industry and mitigating the negative impacts of OA is of global importance.

Impacts on aquaculture are already being felt on the west coast of the U.S. where episodic upwelling supports a productive industry but a state of low carbonate saturation creates particular susceptibility to OA (Feely et al. 2010). In Puget Sound, commercial production of Pacific oysters has suffered including major losses due to negative effects of OA on seed production in 2007 to 2009 (Barton et al. 2015). Through collaborative effort, research and strategies to support adaptation of the regional shellfish industry in Puget Sound are on-going (Craig 2019). Adaptation responses to date include water quality monitoring and chemical buffering of oyster hatcheries which reduce losses during periods of higher acidity (Clements & Chopin 2017). Elsewhere, research effort mainly focusses on

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<sup>75</sup> Marine aquaculture is also referred to as ‘mariculture’. ‘Aquaculture’ is used here to refer generally to production undertaken in coastal and marine areas.

modelling of ecosystem effects such as further south in the California Current System (Gruber et al. 2012) and in Tasmania where warming seawater is modelled to support salmon aquaculture management (Spillman & Hobday 2014). Development of adaptation responses is at an early stage globally and little is known about how governance can facilitate adaptation to OA.

Climate change is occurring, regardless of mitigation measures, and so responding to OA requires *adaptation* i.e. the “anticipation of the adverse effects of climate change and action to prevent or minimise the damage they can cause”<sup>76</sup>; enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change (UNFCCC 2015). To support this, in their 2018 report on the state of world fisheries and aquaculture sectors, the Food and Agriculture Organisation of the United Nations (FAO) set out guidance for the adaptation of aquaculture to climate change, recommending that this is addressed within National Adaptation Plans, required by all countries who are parties to the UNFCCC<sup>77</sup>. These plans provide a means for integrating adaptation across the existing policies, programmes and activities of national governments and a basis for developing iterative, country-specific programmes for adaptation. The FAO also describe possible *adaptation interventions* for the aquaculture (and fishing) sectors in adapting to the broad range of climate change risks, including OA, with action required across public and private actors to develop adaptation across scales (FAO 2018, p.134). Three categories of adaptation interventions are presented: institutions and management, livelihood adaptation and resilience and risk reduction, and are summarised in table 5.1.

Table 5.1 Categories of adaptation interventions for the aquaculture sector in responding to climate change effects (FAO, 2018: 135)

Category of Adaptation Interventions	
Institutions and management	Interventions, mainly on the part of public bodies, addressing governance mechanisms, legal, regulatory, policy and management frameworks and public investments and incentives, including the planning, development and management of aquaculture.
Livelihood adaptation	Interventions, mostly in the private sector, including a mix of public and private activities, within or among sectors, most commonly through diversification strategies within or outside the sector to reduce vulnerability.

<sup>76</sup> <https://sdg.iisd.org/issues/climate-change/adaptation/> (accessed 25 October 2019)

<sup>77</sup> United Nations Framework Convention on Climate Change

Resilience and risk reduction	Interventions including a mix of public and private activities to promote early warning and information systems, improve risk reduction (prevention and preparedness) strategies and enhance response to shocks.
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But while adaptation policy is advancing, in general, adaptation action outlined by countries has “limited specificity and ambition”, due principally to the difficulties in understanding impacts of climate change at spatial and temporal scales relevant for decision-making (FAO 2018, p.130). Action by the public and private sectors across different levels and scales of governance is needed to develop specific adaptive responses, in the face of uncertainty, to adapt to climate change.

### 5.1.2 The need for adaptive governance

Addressing climate change in marine governance is hampered by substantial complexity with need for consideration of impacts and interventions across multiple scales. Multi-level systems, cross-scale interactions and networks that connect individuals, organizations, agencies, and institutions at multiple organizational levels seem to be crucial for climate change adaptation (Adger et al. 2005; Olsson et al., 2006; Munaretto et al. 2014). Adaptive institutions are needed which are able to cope with complexity and uncertainty in the face of new challenges and possible surprises (Huntjens et al. 2012). In this context, enabling the expansion of marine aquaculture while adapting to key challenges including OA requires an adaptive governance approach (Craig 2019). Adaptive governance provides a framework for understanding the characteristics of governance which has the ability (capacity and flexibility) to adapt to changing conditions, in order to maintain and enhance the resilience of socio-ecological systems (Dietz et al. 2003; Chaffin 2014). Literature aligns around key characteristics of institutionalised adaptive governance (Chaffin & Gunderson 2016) with four major themes described in Chapter 2 and presented as an analytical framework in the analysis of regional marine planning in Chapter 4. In summary, firstly, adaptive governance scholarship promotes polycentricity: distributed decision-making, informed by local context and supported by vertical and horizontal co-ordination across organisational levels (Folke et al. 2005; Ostrom 2010). Polycentricity can facilitate experimental efforts and learning at multiple levels as is observed at the international level in addressing OA (Galaz et al. 2012). Secondly, collaboration and participation of a wide range of stakeholders across state, private sector and civil society enables learning and knowledge co-production in resource management (Plummer et al. 2013). Such collective action also supports legitimacy and adaptation to change and surprise (Cosens et al. 2014). Third, adaptive governance requires incremental improvements supported by on-going assessment and reflection on the processes and practical experience of governance (Brunner 2010), with learning enabled through flexibility to experiment and

respond to feedback (Armitage et al. 2009). Multi-stakeholder dialogues, including social learning processes, negotiation and co-production of knowledge are crucial for adaptation processes (Huntjens 2012). Fourth, self-organisation, which underpins adaptive governance, is supported by leadership, visioning, consensus-building and networks committed to change (Leach et al. 2010).

Understanding the emergence of adaptive governance within highly regulated systems of governing is a contemporary challenge facing its scholars and was shown to present a constraint to the institutionalisation of adaptive governance through regional marine planning (Chapter 4). The role of law in preventing, triggering, and facilitating dimensions of adaptive governance is receiving increasing attention (Craig et al. 2017; Gunderson et al. 2018; Cosens et al. 2018), since legal procedures define how management decisions are taken including the scale of decision-making, who has the capacity (legal authority and resources) to participate and how to adjust and respond to change (Craig 2019). Attention is drawn to the relevance of *legal adaptive capacity*, the substantive and procedural legal mechanisms which support adaptive governance and thus allow governance to respond to changing circumstances and emerging knowledge (Garmestani & Benson 2013; Camacho & Glicksman, 2016). However, tension is observed between ensuring flexibility to adapt while preserving necessary stability in governance and a balance is needed (Soininen & Platjouw 2018).

Taking this perspective, Craig (2019) recently highlighted marine spatial planning<sup>78</sup> as an “inherently flexible” process which provides potential for “procedural innovation” to support adaptive governance of aquaculture in adapting to OA in the U.S. (Craig 2019, p.7). Marine spatial planning can support the spatial allocation of aquaculture activities in relation to other demands, promoting colocation with other industries and enabling the management of ecological impacts to support ecosystem resilience. As a forum for public participation it is suggested to contribute to “creative collaboration and promote experimentation with accountability” and should be considered as an iterative process providing a basis for on-going re-negotiation of priorities and adapting over time (Craig 2019, p.1). Based on the case study presented in Chapter 4, the partnership-led approach to marine planning in Scotland is enabling participation, collaboration, learning and innovation which may enhance decision-making at regional scale. However, as described in Chapter 4 (Section 4.5.2) problems were observed in translating this to adaptive governance in the wider system due to the interaction between marine planning and existing policy, planning and management, vertical integration between central and decentralised authority, and outcomes are constrained by the adaptive capacity of prevailing management structures.

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<sup>78</sup> *Marine spatial planning* is referred to as such in the U.S. whereas *marine planning* is used in the case study of analysis and this latter term is used in this paper, noting that it refers to the same concept.

The case study presented in this chapter intended to advance understanding of how to facilitate adaptive governance in response to the complex management challenge of OA. This addresses increasing concern regarding the threat it poses to food security of human populations and the limited progress in advancing adaptation of the aquaculture sector. Building on recent work by Craig (2019) and others, an adaptive governance perspective is applied to the adaptation of aquaculture in Scotland, where there is increasing evidence of the potential detrimental effects of OA combined with a dynamic policy context. This includes recent and rapid progress in climate change adaptation policy, concurrent implementation of marine planning and other legislative developments affecting coastal and marine governance. The feasibility of adaptation of aquaculture to OA is considered i.e. what are potential adaptation responses in Scotland, and, to what extent do policy, planning and management arrangements constrain or enable adaptation responses to OA?

## 5.2 Background to the Scottish Case

Aquaculture is a critically important sector in Scotland and contributes over £1.8 billion annually to the Scottish economy along with socio-economic benefits, particularly for remote rural and coastal communities (Marine Scotland 2014). The industry is dominated by the farming of Atlantic salmon, with significant rainbow trout and mussel production, along with oysters, scallops and growing interest in seaweed cultivation. Shellfish cultivation primarily focusses on mussel farming, and over 80% of Scotland's farmed mussels was produced in the Shetland Islands in 2017 (NAFC 2018, p.105). Scottish Government's policy is to support the aquaculture industry's vision of expanding the sector and to double its economic contribution by 2030 (Scottish Government 2019a) and ensuring the sector's sustainability, resilience and adaptability is of national importance.

In 2017, the Marine Climate Change Impacts Partnership (MCCIP)<sup>79</sup> reported that global ocean pH continues to decrease with increasing risk of deleterious effects on ecosystems, particularly shellfish growth, within 50 years, and that OA is happening at a faster rate in the United Kingdom (UK) than the wider North Atlantic (MCCIP 2017). As required by the UK's Climate Change Act 2008<sup>80</sup>, the UK Climate Change Risk Assessment (2017) identified priorities for adaptation across devolved administrations of the UK based on emerging science and details OA as of particular risk to marine species and habitats in Scotland (DEFRA 2017). In response, Scotland's second Climate Change Adaptation Programme 2019-2024 (CCAP) was laid before the Scottish Parliament in September

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<sup>79</sup> In the UK, the MCCIP co-ordinates the development of scientific evidence on marine climate change impacts along with guidance on adaptation to policy advisors and decision makers, see <http://www.mccip.org.uk/>

<sup>80</sup> The UK's Climate Change Act 2008 was the world's first long-term, legally binding framework law to address climate change.

2019<sup>81</sup>, fulfilling a requirement of the Climate Change (Scotland) Act 2009 (S.53). The CCAP is the Scottish Government's statutory five year programme for adapting to climate change and presents a cross-cutting strategy to promote integration of adaptation into wider Scottish Government policy development and functions (Scottish Government 2019b). It details provisions in relation to OA alongside wider climate change risks such as rising sea levels and increased extreme weather events, and identifies policies and activities which support adaptation of vulnerable sectors, including aquaculture. In addressing implementation of the SDGs, Scottish Government identifies OA as a future concern regarding suppressed shell growth and potential to cause reproductive disorders in some species of fish (Scottish Government 2019c, p.252). National adaptation activity in Scotland and the UK has so far focussed on monitoring (of seawater chemistry) and research, including contributing to, and engaging with, relevant national and international groups<sup>82</sup> as has been reported annually since Scotland's first statutory CCAP (Scottish Government 2017). The CCAP adopted in 2019 places increased emphasis on the potential effects of OA and the need for action beyond monitoring, but more work is needed to identify specific responses to OA and how these can be facilitated.

Delivering Scottish Government's policy to expand the aquaculture sector faces significant challenges, including sea lice, disease, public objection and conflict for space with other activities (O'Hagan et al. 2017). Various national initiatives therefore seek to promote the growth of the aquaculture sector while addressing the constraints, including spatial guidance for finfish development based on environmental sensitivity to nutrient enrichment and benthic impacts (Marine Scotland Science, 2019), designation of protected areas for shellfish growing<sup>83</sup>, guidance on addressing visual impacts (SNH 2008), among others. Development of larger sites further offshore is encouraged to avoid sensitive inshore locations and there is a presumption against further marine finfish farms on the north and east coasts due to potential for interaction with wild salmon (Scottish Government 2015). As owner and manager of a range of rural, coastal and marine assets including the seabed and most of the foreshore, Crown Estate Scotland's<sup>84</sup> objectives are to enhance the value of their assets and revenue from activities including the aquaculture sector (finfish, shellfish and seaweed), and they invest in strategic research and development to support the industry.

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<sup>81</sup> This updates Scotland's First Climate Change Adaptation Programme 2014-2019.

<sup>82</sup> For example, the United Kingdom Ocean Acidification (UKOA) Research Programme, the Ocean Acidification International Reference User Group (OA-iRUG) under IUCN, and OSPAR.

<sup>83</sup> Areas designated under the Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013

<sup>84</sup> Crown Estate Scotland is a public corporation of the Scottish Government which manages a range of rural, coastal and marine assets on behalf of the Crown. Following the 2014 referendum on independence for Scotland, the Scotland Act 2016 made provision for the devolution for the management and revenues of Crown Estate assets in Scotland.

The regulatory regime addressing aquaculture in Scotland has been described as overly complex, costly and presenting a barrier to the expansion of the sector, and has led to the process being reviewed (Scottish Government 2016a; SARF 2016). This issue is faced across the European Union and there is an identified need to simplify administrative procedures and minimise regulatory burden across Member States to enable industry growth (European Commission 2013; O’Hagan et al. 2017). In Scotland, multiple agreements are required for developing an aquaculture facility, including: a seabed (or foreshore) lease agreement from Crown Estate Scotland; planning permission from local authorities in accordance with terrestrial Local Development Planning<sup>85</sup>, which must be accompanied by Environmental Impact Assessment; and other licenses and consents from regulatory bodies for installation of equipment, discharges and predator control. Crown Estate Scotland plan to review and amend their aquaculture leasing and terms by 2022<sup>86</sup>.

Alongside sector-specific planning, marine planning is being implemented in Scotland through a two-tier approach, at national and regional level as described in Chapter 4. Marine planning seeks to support sustainable development in Scottish seas including the development of the aquaculture industry in line with ambitious government policy. Scotland’s National Marine Plan was adopted in 2015 and sets out a strategic policy framework for the sustainable development of Scotland’s marine resources out to 200 nautical miles and must be considered in all decisions taken by public authorities that affect Scotland’s marine area (Scottish Government 2015). This overarching plan is to be delivered through regional marine planning, addressing the eleven Scottish Marine Regions of territorial waters<sup>87</sup> through a phased, learning-based and experimental approach intended to enhance “local ownership and decision-making”<sup>88</sup>. Development of regional marine plans is delegated to regional Marine Planning Partnerships, comprising public authorities and stakeholders<sup>89</sup> and there is flexibility in how the process is developed in each region. Marine Planning Partnerships are established and active in two regions (the Clyde and Shetland Islands Marine Regions) which are in the process of preparing their statutory regional marine plans<sup>90</sup>. Although regionally-developed,

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<sup>85</sup> Under the Town and Country Planning (Scotland) Act 1997 (planning permission in respect of operation of marine fish farm).

<sup>86</sup> <https://www.crownestatescotland.com/what-we-do/marine/asset/aquaculture> (accessed 7<sup>th</sup> December)

<sup>87</sup> Defined under the Scottish Marine Regions Order 2015. The 11 Scottish Marine Regions are: Argyll, Clyde, Forth & Tay, Moray Firth, North Coast, North East, Outer Hebrides, Orkney Islands, Shetland Isles, Solway and West Highlands.

<sup>88</sup> <https://www2.gov.scot/Topics/marine/seamanagement/regional> (accessed 8 June 2019)

<sup>89</sup> <https://www2.gov.scot/Topics/marine/seamanagement/regional/partnerships> (accessed 8 June 2019)

<sup>90</sup> As at November 2019, Clyde Marine Planning Partnership are developing the plan following consultation on the “Pre-consultation draft of the Clyde Regional Marine Plan” in March 2019, and Shetland are consulting on the “Shetland Islands Draft Regional Marine Plan 2019”. Preparations are underway for regional marine planning in the Orkney Islands Marine Region where the next Marine Planning Partnership is anticipated to be established.

resulting plans must be consistent with national policy and are subject to adoption by Scottish Ministers<sup>91</sup>.

Scottish coastal and marine governance is thus polycentric as described by Ostrom (2010) and McGinnis (2011): it is multi-level, multi-sectoral and involves overlapping jurisdictions. In these nested arrangements, the governance system includes: 1) primary (and secondary) legislation; 2) nationally-led policy and planning processes in government and its agencies; 3) regional and local collaboration in marine planning and other mechanisms; and 4) decision-making in the licensing and management of aquaculture facilities. Our attention is on how this governance system is, or might become, adaptive in supporting adaptation of aquaculture to the impacts of climate change. The term *response option* is used herein to represent an action or societal change that supports adaptation to OA, and corresponds to the term *adaptation intervention* used by the FAO. A system model based on the SES framework as described in Chapter 2 (Section 2.2.2) was developed through the analysis and is presented in the discussion section (Section 5.4, Fig. 5.1). This shows the components of the governance system which define the operation of action situations (AS) at different levels, where individuals interact in different ways and produce outcomes. These outcomes produce formal or informal rules which influence behaviour and the functioning of other AS or human activities in the resource system (Ostrom, 2007).

### 5.3 Summary of methods

To identify potential response options, a one day workshop was held in March 2018 at the Scottish Government Regional Office in Edinburgh and the approach to the workshop is detailed in Chapter 3 (Section 3.3.7). Potential response options which were developed at the workshop were analysed and response options described in relation to the themes of adaptation interventions proposed by the FAO (2018) (Table 5.1), as a logical framework and to promote coherence with emerging international guidance for the adaptation of aquaculture (and fisheries). Analysis of relevant Scottish legislation, policy and planning documents was subsequently undertaken to identify provisions which support identified adaptation responses and legal adaptive capacity, i.e. substantive and procedural mechanisms for institutionalizing adaptive governance for responding to OA. This was based on the analytical framework which identifies how provisions in policy and legislation relate to the properties denoted as the four dimensions of adaptive governance (see Chapter 3, Table 3.4).

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<sup>91</sup> Scottish Ministers represent the highest level of Government in Scotland.

### 5.3.1 Participation at the workshop

Nine participants attended the event including staff from Scottish Government’s Marine Scotland Science, Marine Scotland’s Planning and Policy Division, an environmental non-governmental organisation (ENGO) and academic scientists. The aquaculture industry was invited to attend but all invitees declined with response from a major shellfish industry association indicating that OA is an issue of some interest but is not sufficiently tangible to be of immediate concern. The large, mainly international companies that make up most of the Scottish salmon farming industry appear to be focussed on shorter-term issues (e.g. sea lice, escaped fish and changing regulatory demands) which have visible and direct economic consequences (HIE 2017) and across the sector resources and capacity to participate were a concern. In contrast, public officials of Scottish Government engaged with the workshop including hosting the event, participating and presenting on the activities underway relating to OA and adaptation across policy and scientific departments. Despite the lack of industry representation discussion centred on the impacts on the aquaculture sector and how to mitigate them, given its vulnerability and socioeconomic significance.

## 5.4 Results

### 5.4.1 Potential adaptation response options in Scotland

At the workshop, 15 response options (ROs) were identified as potential approaches for adapting to OA in Scotland. These are presented in Table 5.2, categorised under the FAO themes of adaptation interventions, and are described in three subsequent sub-sections.

*Table 5.2 Response options (RO) identified at the stakeholder workshop*

Response Options to OA in Scotland identified at the workshop	
Institutions and management	
RO1	Mitigation of OA at a large scale by addressing emissions reductions and enhanced focus on marine interests in national climate policy and legislation.
RO2	Integrate OA into the broader climate change adaptation agenda to support adaptation responses at other scales.
RO3	Consider further the integration of OA into the EU Water Framework Directive and Marine Strategy Framework Directive implementation as a water quality issue.
RO4	Integrate OA concerns into regional marine planning in Scotland supported by refined objectives in Scotland’s National Marine Plan.
RO5	Undertake scenario analysis based on modelling to inform regional management responses.
RO6	Integration of terrestrial and coastal issues to understand and manage co-stressors at regional scale.
Livelihood adaptation	

RO7	Account for adaptation to local changes and consider whether aquaculture may need to re-locate to other locations in future.
RO8	Aquaculture site-level responses could include moving installations vertically in response to changing acidity, combined with early warning systems.
RO9	Diversification of species farmed including more resilient species or cultivation of seaweed.
RO10	Collaborative working and facilitating cross-sector relationships to explore feasibility of operational response options.
Resilience and risk reduction	
RO11	General measures to strengthen ecosystem resilience including identifying particularly vulnerable areas and protecting these by identifying co-stressors and compensating negative impacts.
RO12	Identify how current monitoring programmes can be informative about OA, for example jellyfish and Harmful Algal Blooms (HABs), phosphorus levels recorded under the WFD, and others, in order to measure ecosystem responses.
RO13	Frame monitoring and data collection on a regional scale to best inform understanding of ecosystem changes.
RO14	Awareness raising to improve stakeholder and public understanding of OA and the need to adapt.

### *Institutions and management*

Most responses identified at the workshop fall within the FAO's category of institutions and management and address the development of rules that guide interventions including creation or enhancement of public policy, legislation, institutional design and planning or management frameworks (FAO 2018, p.134). Responses at this level were noted as essential to underpin and support subsequent planning, management, adaptation and resilience building responses, particularly in the short-term (1-5 years). National government and other public bodies or regulatory authorities were identified as lead actors in these responses, working with regional management bodies and wider stakeholders.

Although addressing adaptation, mitigation was emphasised as a crucial aspect of reducing impacts of OA over the longer term. The overarching response of mitigation of OA (RO1) thus relates to policy and measures already being taken to mitigate climate change and participants considered that policy development in Scotland is robust in this area, suggesting only that increasing understanding and awareness of the socio-economic and ecological consequences of OA may 'add weight' to national policy on emissions reductions<sup>92</sup>.

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<sup>92</sup> The Climate Change (Emissions Reduction Targets) (Scotland) Act received Royal Assent on 31 October 2019 and represents further ambitious national climate change legislation and policy.

As impacts are predicted regardless of mitigation, climate change adaptation was indicated as the main policy agenda for supporting responses to OA. RO2 identifies increasing emphasis on OA in the broader climate change adaptation agenda in relation to more familiar risks such as flooding and coastal resilience as a fundamental step. Further, RO3 promotes use of existing water quality management frameworks to support understanding and managing local factors which contribute to OA in the coastal zone, including commitments under the EU Water Framework Directive (WFD) (Directive 2000/60/EC) and Marine Strategy Framework Directive (MSFD) (Directive 2008/56/EC). Both the MSFD and WFD include targets and objectives for 'acceptable' conditions ('Good Environmental Status' or 'Good Ecological Status', respectively) and a framework for monitoring and understanding ecosystem changes, including those related to pH. The WFD is implemented through River Basin Management Plans<sup>93</sup> (RBMP) which applies to inland and coastal waters out to 3 nautical miles and provides a framework for integrated management of co-stressors including pollution from agriculture. The Scottish Environmental Protection Agency (SEPA), which is responsible for implementing the WFD in Scotland, is preparing the third iterations of RBMPs for publication in 2020<sup>94</sup> and could support addressing OA and developing resilience in the coastal zone.

Workshop participants also considered the developing regional marine planning process an important mechanism for supporting adaptation of aquaculture in coastal areas (RO4). Although at an early stage, marine planning provides a framework for considering specific measures at a regional scale including spatial options for flexible siting of aquaculture operations in relation to OA changes, according to the characteristics and constraints of individual marine regions. It also provides a mechanism for strengthening ecosystem resilience including identifying vulnerable areas and reducing coastal pollution which contributes to pH fluctuations as well as other stressors (RO6). This should relate to, and be informed by, the RBMPs to target the reduction of cumulative stressors and other inland influences on acidity in coastal waters. Other resilience-building measures identified which could be supported by marine planning included compensatory action (RO11), such as protecting or restoring other vulnerable areas such as fish nurseries in order to counteract potential negative effects of OA on fish recruitment. Further, regional marine planning was considered as providing an appropriate scale for the design of monitoring programmes to understand trends at a smaller scale (RO13). Lastly, the regional and partnership-based model of marine planning being implemented in Scotland was considered to potentially enable greater participation and collaboration between public and private actors in the development of OA responses.

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<sup>93</sup> There are two River Basin Management Plans in Scotland, one covering the Scotland River Basin District and the other cross border for the Solway Tweed River Basin District.

<sup>94</sup> <https://www.sepa.org.uk/environment/water/river-basin-management-planning/>

### *Livelihood adaptation*

This category includes specific responses at the operational level of human activities to adapt and reduce vulnerability to OA, supported by institutional and management responses. Responses raised included re-locating aquaculture installations to areas of more favourable pH as conditions change (RO7). However, spatial relocation was perceived to be challenging due to the inflexibility of the current planning process for aquaculture in enabling relocation and the limited space suitable for aquaculture development given the constraints due to pollution, sea lice problems and conflict with other users. Considering optional re-siting areas in areas which have been licensed but not developed was suggested, an issue which is limiting space for aquaculture in Scotland<sup>95</sup>. Uncertainty in predicting change at an appropriate spatial scale was noted as compromising spatial adaptation in the coastal zone.

At individual farms, there may be scope for adaptation responses by aquaculture facility developers, such as adjusting their operations to respond to changing pH of surface waters, for example the height of shellfish cultivation in the water column (RO8). These ‘fine-scale’ and real-time responses require carbonate chemistry monitoring systems which it was noted may already be in place at aquaculture sites for optimising water treatment (Barton et al. 2015). Participants identified other responses by industry which could include diversification of fish or shellfish species to those more tolerant to higher acidity or to consider cultivation of macroalgae (e.g. kelp) (RO9) given that acidification of coastal waters increases favourable conditions for algae growth and which may also assist in mitigation (Chung et al. 2013). Collaboration between public bodies, industry at a collective (association) and individual (company) level, along with scientists was noted as necessary to determine economically and technically feasible adaptation responses, and enables sharing of accountability (and cost) of developing response options (RO10). Given the difficulties in engaging industry on the issue, raising awareness of OA and its implications was considered an important next step.

### *Resilience and risk reduction*

All options discussed require more scientific evidence to improve preparedness and inform adaptive strategies, in particular the prediction of ecosystem effects and determining thresholds which may cause regime shift. There was strong emphasis throughout on the role of science, including monitoring, to assess how the ecosystem is changing in relation to OA in order to inform refined prediction of effects and response options. Government activity in relation to OA was presented as currently focused in this area through the activities of Marine Scotland Science<sup>96</sup>, and participants

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<sup>95</sup> Scottish Government, 2016, p.9

<sup>96</sup> Marine Scotland Science is a Directorate of Scottish Government.

noted that knowledge in relation to chemistry is well developed but gaps remain in understanding biological ecosystem effects, from primary production upwards. Undertaking a comprehensive monitoring strategy for changing pH of seawater was noted as difficult due to background variability, and the influence of run-off in influencing OA in coastal waters. As predictive models are improved, tools such as scenario analysis (RO5) were proposed as useful to explore changing conditions and appropriate response options, or combination of response options, across a range of possible outcomes.

In addition to the on-going support of Scottish Government's contribution to UK-scale monitoring of OA changes, identified actions to develop capacity for understanding trends at a smaller scale included reviewing existing monitoring programs to ascertain which data collected can be informative about OA, even if indirectly (RO12). For example, occurrences of jellyfish and harmful algal blooms and phosphorus levels which are monitored under the WFD may relate to OA and be used as indicators for ecosystem responses to acidification, particularly where long-term data sets are available. A regional approach was suggested as a relevant scale to frame monitoring and data collection in relation to OA in the coastal area and could be facilitated by integrated planning frameworks such as regional marine planning.

Communicating and raising awareness of OA emerged as necessary although challenging, particularly given the relationship between OA and climate change and the uncertainty in predicting local impacts of OA in Scotland. Industry interest in OA adaptation was noted as low since direct effects are uncertain and companies are focussed on more immediate issues. For the wider public, awareness of OA may be influenced by well-publicised impacts on coral reef, rather than issues facing Scotland. Greater outreach was thought to be needed (RO14) and the role of non-state actors was highlighted as relevant, for example ENGOs in supporting public communication and participation (Brooker et al. 2019).

#### 5.4.2 Document analysis

Analysis of relevant Scottish legislation, policy and planning documents was undertaken to identify provisions which support identified adaptation responses and legal adaptive capacity, i.e. substantive and procedural mechanisms for institutionalizing adaptive governance for responding to OA, using the analytical framework provided in Chapter 3 (Table 3.4). Legislation and policy addressing climate change adaptation, the marine planning process and aquaculture planning and management present a range of provisions relevant to the adaptation of aquaculture. Specific goals addressing the adaptation of aquaculture to OA are evident in the CCAP and in a regional marine assessment, with

no specific reference in national or regional marine plans. However, in these, other goals and policies address adaptation to OA or adaptation in general and can support responses at the operational level. Structural and procedural capacity is evident in provisions and promoted changes, and which indicate adaptive capacity in relation to the dimensions of adaptive governance, i.e. distributed decision-making, participation and collaboration, learning-based and adaptive approaches, with supporting activities including leadership. Some adaptive capacity is evident across the levels of governance but is more prevalent in new policy and legislation (particularly the CCAP and the Scottish Crown Estate Act 2019). A summary of this analysis is presented in Table 5.3 and the outputs included in the discussion (Section 5.5) which addresses the extent to which policy, planning and management arrangements in Scotland constrain or enable adaptation responses to OA.

Table 5.3 Summary of adaptive capacity in policy and planning to support adaptation of aquaculture to OA in Scotland

ADAPTIVE CAPACITY IN POLICY AND PLANNING FOR ADAPTATION OF AQUACULTURE IN SCOTLAND	
Specific provisions for adapting to OA	Structural and procedural adaptive capacity
<p><b>Climate Change Adaptation</b> (Key documents: Second Scottish Climate Change Adaptation Programme 2019-2024<sup>97</sup>; Climate Change (Emissions Reduction Targets) (Scotland) Act 2019; Climate Change (Scotland) Act 2009; UK Climate Change Act 2008).</p>	
<ul style="list-style-type: none"> <li>• OA identified as a risk to “nature-based industries” and as a risk to ecosystems which supports protection, resilience and enhancement.</li> <li>• Potential for diversification of aquaculture to other species or seaweed indicated.</li> <li>• Spatial planning and RBMP highlighted in relation to management of water quality.</li> <li>• Collaboration supported by a new Climate Change and Ocean Acidification subgroup.</li> <li>• National Forum proposed to support local adaptation efforts.</li> </ul>	<ul style="list-style-type: none"> <li>• “Place-based”, locally-led adaptation efforts emphasized.</li> <li>• Promotes systemic behaviour change and includes raising awareness through climate literacy.</li> <li>• On-going research, monitoring and evidence gathering, and iterative production of the CCAP based on annual progress monitoring.</li> <li>• Vertical integration between local and national adaptation responses.</li> </ul>
<p><b>Marine Planning</b> (Key documents: Scotland’s National Marine Plan<sup>98</sup>, Clyde Regional Marine Plan – Pre-consultation Draft<sup>99</sup> and Clyde Marine Region Assessment<sup>100</sup>, Shetland Marine Spatial Plan – Consultation Draft<sup>101</sup>, Marine (Scotland) Act 2010).</p>	
<ul style="list-style-type: none"> <li>• National policy addressing growth of aquaculture sector, climate change adaptation and ecosystem protection and enhancement.</li> </ul>	<ul style="list-style-type: none"> <li>• Two-tier process includes a devolved, partnership-led approach to marine planning.</li> </ul>

<sup>97</sup> Scottish Government, 2019a

<sup>98</sup> Scottish Government, 2015

<sup>99</sup> Clyde Marine Planning Partnership (CMPP), 2019. Clyde Marine Plan –Pre-consultation draft, 2019. <https://www.clydemarineplan.scot/wp-content/uploads/2019/06/Pre-consultation-draft-Clyde-Regional-Marine-Plan-18-March-2019.pdf> (accessed 11 September 2019)

<sup>100</sup> CMPP 2017. Clyde Marine Region Assessment. <https://www.clydemarineplan.scot/wp-content/uploads/2018/02/Clyde-Marine-Region-Assessment-2017.pdf> (accessed 11 September 2019)

<sup>101</sup> NAFC 2019

<ul style="list-style-type: none"> <li>• OA identified as a threat to shellfish fisheries, as an additional risk to release from carbon sinks, and as a factor to be considered in the designation of future Marine Protected Areas in the Clyde Marine Region.</li> <li>• Regional policies support diversification; siting of aquaculture further offshore to mitigate inshore risks; and co-existence of marine uses.</li> <li>• Shetland Marine Plan also encourages area-wide Aquaculture Development Management Plans to support an holistic approach to developing aquaculture in the region.</li> </ul>	<ul style="list-style-type: none"> <li>• Regional marine planning developing through a phased, learning-based approach with flexibility at the regional level.</li> <li>• Marine planning is an iterative process, with reporting and review of national and regional marine planning required.</li> <li>• Collaboration and co-operation supported at regional level, between operators and between sectors.</li> </ul>
<p><b>Aquaculture Planning</b> (Key documents: Crown Estate Scotland draft 2020-23 Corporate Plan<sup>102</sup>; Scottish Crown Estate Act 2019).</p>	
<ul style="list-style-type: none"> <li>• Crown Estate Scotland strategic objectives support growth of the aquaculture industry, through research and innovation.</li> <li>• Provisions for further devolution of certain Crown Estate Scotland assets to be managed by local authorities, island councils, public bodies and community organisations, including through a Local Asset Management Pilot Scheme.</li> <li>• Crown Estate Scotland plan to review aquaculture leasing and terms by 2022.</li> <li>• Government-led process of on-going improvement of spatial guidance for aquaculture development.</li> <li>• Designations of shellfish growing areas are reviewed every 6 years.</li> </ul>	<ul style="list-style-type: none"> <li>• Promotes changing ownership models and new, locally-led and collaborative arrangements.</li> <li>• Approaches to the leasing of aquaculture could adapt following future reviews.</li> <li>• Crown Estate Scotland capacity to act in a leadership role, with resources and ability to integrate between levels.</li> <li>• Science-led efforts to reduce uncertainty and improve siting options.</li> </ul>
<p><b>Aquaculture Licensing</b> (Key documents: Town and Country Planning (Scotland) Act 1997 (planning permission in respect of operation of marine fish farm) (and amendments); Aquaculture and Fisheries (Scotland) Act 1997 (and amendments)).</p>	
<ul style="list-style-type: none"> <li>• Changes in use, location and type of equipment at an existing site accommodated through Permitted Development Rights up to a certain scale, or requiring further development application under the terrestrial planning system.</li> <li>• Management Areas promoted for coordinating management in relation to key issues, primarily fish health but could be expanded.</li> </ul>	<ul style="list-style-type: none"> <li>• Some flexibility for adaptation accommodated within existing regulatory process.</li> <li>• Strategic co-operation in management areas promotes collaboration and adaptive capacity over a wider spatial scale.</li> </ul>

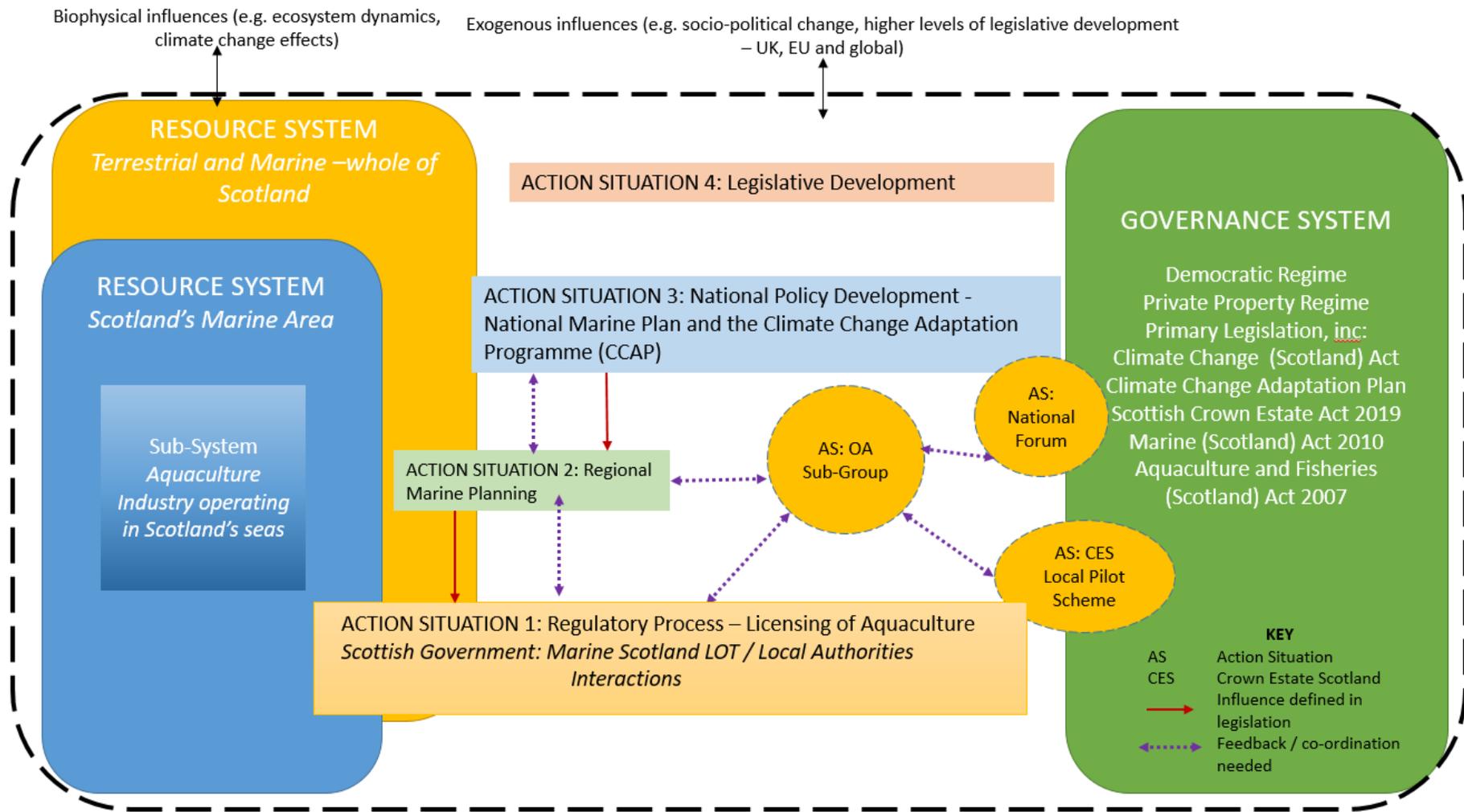
<sup>102</sup> Crown Estate Scotland, 2019

## 5.5 Discussion

The effects of climate change present a major challenge facing Scotland's marine governance system with aquaculture highlighted as a vulnerable sector. Analysis of the multi-level governance system in Scotland described enables understanding of adaptive capacity across scales of governance, in particular to support adaptation of aquaculture to OA. The analysis was used to define a system model which supports analysis of adaptation interventions across the marine governance system (Fig. 5.1). The functioning of this system was determined through analysis of adaptation response options raised in the workshop and the legislative and policy analysis. Adaptation interventions derived through the stakeholder workshop included a wide range of initial responses across scales including national policy action by government, regional integrated planning and management by respective authorities and adapting activities at the operational level. Particular relevance of recent developments at the legislative and policy level<sup>103</sup> (AS4 and AS3) was identified in steering action on adaptation across the activities of government and at lower scales; the role of other mechanisms including national policy, regional marine planning (AS2) and sector-specific planning and licensing (AS1). New and emerging AS, including the CES Local Pilot Scheme, the OA Sub-Group and a proposed National Forum under the CCAP were identified as further arenas for the development of adaptation responses and supporting multi-level arrangements and adaptive capacity at system scale (AS0).

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<sup>103</sup> Scotland's Second Climate Change Adaptation Plan (CCAP) was published on 23<sup>rd</sup> September 2019.



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Figure 5.1 Model of OA adaptation and marine governance in Scotland based on the SES Framework

The legal adaptive capacity of these mechanisms is discussed next to consider how adaptation interventions are supported or constrained.

### 5.5.1 Legal adaptive capacity in policy and legislation in Scotland

Adaptive capacity in the prevailing policy and management regime was identified as important in the materialisation of adaptive governance through analysis of regional marine planning in Case Study 1, and legal adaptive capacity is a precursor to features of adaptive governance (Cosens et al. 2017). In SES framework terms, this includes the legal and policy framework defining the governance system (GS) addressing climate change adaptation, and which defines (or changes) the rules defining the functioning of action situations at different levels. Document analysis indicates substantive and procedural provisions within national legislation and policy which promote collective action and power-sharing at local scales, nested within a national framework, and a basis for iterative, learning-based approaches to adaptation.

#### *Climate change adaptation as an enabling policy framework*

Participants emphasized the importance of policy changes at the national level, particularly the national climate change adaptation policy agenda. While not mentioned in earlier versions, Scotland's second CCAP published in September 2019 indicates a strengthening statutory basis for progressing response options and adaptation of aquaculture to OA, responding to increasing global emphasis and legislative requirements. The new CCAP specifies OA as a threat to Scotland's aquaculture industry under Outcome 3, which aims to ensure a sustainable and adaptable economy by addressing the risks posed to "nature-based industries" from climate change (Sub-outcome 3.1<sup>104</sup>). Opportunity for farming of other species and seaweed in changing conditions is also identified and requires further research. OA is also considered from an ecosystem perspective in Outcome 6 which aims to ensure the protection, enhancement and resilience of the marine and coastal environment<sup>105</sup> and can support adaptation responses addressing ecosystem resilience. Under these outcomes, the CCAP lists specific policies, proposals and research activities to enable their delivery. These include the Climate Change and Ocean Acidification subgroup which was established in May 2018 under Scotland's 10 Year Farmed Fish Health Framework<sup>106</sup> and which presents an opportunity for collaborative, polycentric development of strategies to support adaptation of the aquaculture industry. This was

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<sup>104</sup> Sub-Outcome 3.1: "Scotland's businesses based on natural resources are informed and adaptable to climate change" (Scottish Government 2019a, p.92)

<sup>105</sup> Outcome 6: "Our coastal and marine environment is valued, enjoyed, protected and enhanced and has increased resilience to climate change" (Scottish Government 2019a, p.178)

<sup>106</sup> <https://www.gov.scot/publications/scotlands-10-year-farmed-fish-health-framework/>

identified as valuable and contributing to adaptation responses in Puget Sound (Craig 2019). Comprised of industry, government, scientists and regulatory agencies the subgroup aims to support fish aquaculture business to adapt by monitoring, reviewing and assessing the impact of climate change and ocean acidification on Scottish waters<sup>107</sup>. Collaborative effort can also be enabled through existing groups supporting public and private co-operation in Scotland<sup>108</sup>. Other important commitments in the CCAP include on-going contribution of Scottish Government to the evidence-gathering activities of the MCCIP to enhance preparedness and a further action could consider which other monitoring activities could provide information on OA trends at a smaller scale. In terms of the WFD, the CCAP refers to RBMPs as relevant to adaptation through management of water quality including land-based sources of pollution, and could support addressing OA in the coastal zone, as identified by participants.

Beyond provisions specific to OA, procedural and structural mechanisms supporting adaptive governance are seen throughout the CCAP. Firstly, the CCAP is fundamentally learning-based and adaptive based on a monitoring framework to support continuing progress. This includes annual progress reporting and updating of the CCAP every 5 years (required under the Climate Change (Scotland) Act 2009) and allows for new understanding to inform future adaptation. The CCAP, under the Climate Change (Scotland) Act 2009, therefore indicates substantive adaptive capacity based on goals of adaptation as well as procedural adaptive capacity by enabling adjustment to new information (Camacho and Glicksman 2016). This national framework can provide the basis for on-going evaluation of interventions across different policies and sectors (Huntjens et al. 2012).

Secondly, the CCAP emphasises the importance of locally-led efforts in adapting to climate change with action and decisions taken at a scale which reflects local geographies and demographics. A “place-based” approach is a key theme of the CCAP, aligned with the ‘Place Principle’ being adopted across Scottish Government in response to new legislation requiring increased community engagement and local governance in Scotland. This reflects potential for distributed decision-making and could promote the development of self-organisation in adaptation efforts at smaller scales (Cosens et al. 2018). Further, the development of a National Forum proposed in the CCAP to support local adaptation initiatives could support vertical interplay across national, regional and local levels in developing responses. Marine planning is referred to in the 2019 CCAP as an implementation mechanism for adaptation, although a lack of integration is indicated since it refers to the NMP only

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<sup>107</sup> <https://www2.gov.scot/Topics/marine/Fish-Shellfish/Strategic-Framework/Subgroup4> (accessed 14 October 2019)

<sup>108</sup> For example Scotland’s Aquaculture Innovation Centre (SAIC), <https://www.scottishaquaculture.com/> and the Scottish Aquaculture Research Forum (SARF), <http://www.sarf.org.uk/>

and not the MPPs, and detailing more specifically the role of regional marine planning in adaptation efforts (discussed below) in future iterations of the CCAP would support adaptation.

Adaptive capacity is also enhanced by initiatives proposed under the CCAP to improve ‘climate literacy’ to aid public awareness and through promotion of systemic behaviour change<sup>109</sup>. This directly supports awareness-raising identified as a barrier in Scotland and sustained effort in learning and capacity building to enable co-production of knowledge to respond to OA (Dannevig et al. 2019). More broadly, an explicit adaptation agenda as set out in the CCAP supports developing a “culture of tolerance for change and uncertainty” which is essential for developing adaptive approaches (De Caro et al. 2017, p.5). As a new programme further analysis will be needed to ascertain the extent to which adaptive governance is supported by the CCAP but overall it represents an advanced framework which supports adaptive governance and a basis for developing adaptation responses across scales.

More broadly, climate change adaptation presents an interesting case for analysis of adaptive governance, as it places explicit emphasis on *adaptation* in policy goals which promote developing adaptive capacity to ensure resilience in the face of uncertainty. Rather than a *principle* (such as ‘adaptive management’ in the Ecosystem Approach<sup>110</sup>, descriptions of marine planning and specifically in the NMP, which remain poorly defined and generally poorly implemented (Soininen & Platjouw 2018; Gissi et al. 2019), as a policy *goal* this is indicated as providing a specific driver and substantive provisions for the institutionalisation of adaptive governance at system scale.

### 5.5.2 Role of marine planning in climate change adaptation

This case study provided further opportunity to consider the role of marine planning in supporting adaptive governance, from the perspective of adaptation of the aquaculture sector to climate change-related OA. Marine planning is intended to improve ocean governance and management, however, as yet few studies consider marine planning in relation to climate change, attributed to the uncertainties in predicting its effects (Gissi et al. 2019). As a concept it does not automatically account for the dynamic change in marine ecosystems due to climate change, and work is needed to understand its role in addressing adaptation (Craig 2012). In Scotland the marine planning process is indicated through this analysis as supporting adaptive governance in responding to OA through a combination of substantive, structural and procedural characteristics. At the national level, Scotland’s NMP includes policy objectives for the sustainable growth of the aquaculture industry along with a

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<sup>109</sup> Scottish Government 2019a, p.25

<sup>110</sup> Convention on Biological Diversity (CBD) Guidelines: The Ecosystem Approach (CBD, 2004).  
<https://www.cbd.int/doc/publications/ea-text-en.pdf>

range of climate change adaptation policies, including the need for spatial planning, an ecosystem approach and adaptive management<sup>111</sup>. The current iteration of the NMP does not specifically consider OA and adaptation is instead framed in relation to flooding, sea level rise and the resilience of coastal infrastructure. However, it is supportive of measures to strengthen resilience through policies to protect and enhance the marine environment as well as promoting appropriate siting of aquaculture facilities in relation to ecological constraints and colocation or diversification of activities where appropriate<sup>112</sup>. Policy related to OA is likely to be included in future iterations of the NMP and would enhance focus on adaptation responses<sup>113</sup>.

Underpinned by these general provisions in the NMP, the Marine Planning Partnerships must address national policy objectives and develop regional policies in their marine plans which apply to activities developed within their regions<sup>114</sup>. In their assessment of the region required to inform marine planning, the Clyde Marine Planning Partnership identified OA as a threat to shellfish fisheries, as an additional risk to release from carbon sinks and as a factor to be considered in the designation of future Marine Protected Areas in the Clyde Marine Region<sup>115</sup>. While not specific to OA, policies in the current versions of the Clyde and Shetland marine plans can support adaptation of aquaculture in line with the identified responses. These include diversification to other species or seaweed cultivation, promoting siting of aquaculture facilities in areas further offshore to mitigate inshore risks and policies which promote co-existence of aquaculture with other marine uses which may increase siting options<sup>116</sup>. Combined with policies to address ecosystem resilience based on the regional approach to gathering of data at regional scale, these promote the viability of the sector considering a range of constraints and factors which supports adaptation to OA (Craig 2019). Spatial constraints on relocation noted by stakeholders are evident in emerging marine plans, particularly in Shetland where aquaculture activity is extensive and limited new space exists without technological innovation to develop activities further offshore<sup>117</sup>. In Shetland, the constraints-based approach to indicating preferred areas for e.g. aquaculture development is more flexible than static ‘zoning’ and presents a way for marine planning to be ‘adaptable’ unlike other models which focus on static spatial allocation and which conflict with the need for flexibility (Craig 2012).

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<sup>111</sup> Scottish Government 2015, p.182

<sup>112</sup> E.g. “AQUACULTURE 13: Proposals that contribute to the diversification of farmed species will be supported, subject to other objectives and policies being satisfied.” (Scottish Government 2015, p.51)

<sup>113</sup> The National Marine Plan is reviewed every 3 years with the next review due in 2021.

<sup>114</sup> The Marine (Scotland) Act 2010 also requires that any regional marine plan must set out “objectives relating to the mitigation of, and adaptation to, climate change” (Art. 5(4)(a)).

<sup>115</sup> CMPP 2017

<sup>116</sup> NAFC 2018

<sup>117</sup> Ibid.

As an iterative process requiring review of regional assessments and marine plans, marine planning is able to respond to changing circumstances and new knowledge including the impacts of OA on aquaculture. Marine planning provides a valuable repository of data and information and provides the basis for refining adaptation action over time in response to regional trends and predicted effects. OA could receive greater emphasis in later iterations of regional marine plans and, as an on-going forum for public participation and collaboration, adaptation responses could be considered alongside changing priorities and ecological changes.

Structurally, the partially decentralised approach to regional marine planning in Scotland indicates polycentricity which could support adaptive governance as described in Chapter 4. In this nested arrangement, national government provides legal legitimacy, economic incentives and policy oversight while the partnerships support learning and collaboration at the regional level, based on strong leadership and participation. The MPPs also provide a forum for awareness raising (identified as lacking and essential) and on-going public negotiation on adaptation responses alongside changing priorities and ecological conditions (Craig 2019). As an iterative process requiring review of regional assessments and marine plans, the marine planning process can respond to changing circumstances and new knowledge including the impacts of OA on aquaculture. It also provides a valuable repository of data and information as a basis for refining adaptation action over time in response to regional trends and predicted effects. OA could receive greater emphasis in later iterations of regional marine plans particularly if scenario analysis was used to consider adaptation options across a range of predicted outcomes and address uncertainty by looking at ‘possible futures’ (rather than ‘probable futures’ as in statistical analysis) (Huntjens et al. 2012).

There are limits to the role of marine planning in enabling adaptation which relate to the challenges identified in Chapter 4, particularly the disconnect between marine planning and management, which limits the “experimentation with accountability” promoted by Craig (2019, p.1) and the ability of MPPs to enact management measures. Marine planning in Scotland is not equivalent to “a legally sanctioned process for allocating marine space” (Craig 2019, p.3) and the siting of aquaculture facilities is primarily steered by sector-specific policy and planning by national government and local authorities. Further, marine planning is not equivalent to *management* and the extent to which Marine Planning Partnerships can facilitate adaptive responses depends on their influence on regulatory and permitting decisions for aquaculture taken by local authorities and national regulatory bodies in accordance with legislative requirements. The role of marine planning in *implementing* adaptation responses at the scale of human livelihoods is limited given the challenges identified in Case Study 1, where management authority and accountability remain in other decision-making

structures. Different models of marine planning would be needed in order to more directly develop and implement adaptation responses at regional scale. In Scotland, implementation of adaptation responses consequently depends on the accommodation of adaptation through flexibility in the wider aquaculture planning and management framework (discussed next).

### *Flexibility in licensing and management*

Analysis of policy and planning indicate provisions which can support addressing adaptation interventions at the level of *institutions and management* and in *resilience and risk reduction* (FAO 2018), and which are pre-emptive and wide ranging. However, *livelihood adaptation* responses require flexibility, not just in planning and leasing arrangements, but in the regulatory processes it seeks to guide. This requires translation of the adaptability set out in planning and policy into flexibility in the regulatory process to allow adjustments at the level of operational activities. This includes flexibility in new license agreements, and, given the scale of existing aquaculture activity, it requires considering flexibility within licenses which are already agreed (to enact responses such as diversification or relocation). This latter aspect is shown to be of low adaptive capacity and decision-making processes through AS1 leads to outcomes which are not readily adaptable after being agreed, particularly in spatial terms. In Scotland, some change can be accommodated within the licensing regime through ‘permitted development rights’ of existing consents, up to a certain scale<sup>118</sup>, however, given the cost of planning application fees for aquaculture, industry is incentivised to apply for the smallest initial development area, restricting flexibility for future changes<sup>119</sup>. Depending on the scale of proposed measures, ‘changes in use’ (for example to other species or activity), location and type of equipment may require repeating some of the permitting process, including public consultation, particularly if beyond the existing planning boundary of a site<sup>120</sup>. However, the need for spatial specificity must also be acknowledged, for example in relation to navigational safety of fish farm moorings and equipment and there are necessary limits to ‘flexible’ management options. Future review of aquaculture licensing may need to consider the need for flexibility and appropriate mechanisms to enable implementation of the livelihood adaptation measures identified, including diversification and spatial relocation, and may also need to enable experiments and trials of adaptation measures at aquaculture site level. Co-ordinating such activity with marine planning to

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<sup>118</sup> Regulated by the Town and Country Planning (General Permitted Development) (Fish Farming) (Scotland) Amendment Order 2012

<sup>119</sup> Scottish Aquaculture Research Forum (SARF), 2016. SARF110 - Strategic Considerations for Locational Regulation of Shellfish Aquaculture in Scotland. <http://www.sarf.org.uk/cms-assets/documents/245878-18407.sarf110.pdf> (accessed 12 November 2019)

<sup>120</sup> Regulated by the Town and Country Planning Marine Fish Farming (Scotland) Order 2007 which applies to the placement of equipment in the sea, on the seabed or on the foreshore out to 12 nautical miles.

better understand spatial constraints and integrate the requirements for adaptation of aquaculture (and other activities) would support adaptation efforts.

### *Other mechanisms relevant to adaptation*

Given their role in leasing the seabed for aquaculture development, Crown Estate Scotland could play an important role in aquaculture adaptation, underpinned by the new Scottish Crown Estate Act 2019 which provides for the long-term management of Crown Estate assets devolved to Scotland. Although they do not have a role in regulatory compliance, as manager of the seabed they have a strategic interest in supporting the industry to ensure growth and enhanced revenue generation. For example, Crown Estate Scotland propose a review of aquaculture leasing and terms to “safeguard aquaculture businesses”<sup>121</sup>, which could include the need to accommodate adaptation measures in leasing arrangements. The Scottish Crown Estate Act 2019 also includes provisions for further devolution of certain assets to be managed by local authorities, island councils, public bodies and community organisations within a national governance framework. Increased decision-making and ownership at the local level is being promoted including through a Local Pilot Scheme<sup>122</sup> which may support adaptive governance based on shared management rights (Greenhill et al. 2020) and could provide another mechanism for collaborative development of locally-relevant adaptation responses. In Shetland, the Sullom Voe Masterplan<sup>123</sup> is being progressed under this scheme and focusses on re-opening areas for aquaculture development previously closed for navigational purposes.

A further sector-specific mechanism was identified with a basis in law and which can support adaptation at local scale, in line with adaptive governance. Aquaculture Management Areas (AMAs) are promoted by the FAO as fundamental in implementing an ecosystem approach to aquaculture and enable collective farm management at a more appropriate scale for managing the risks to and from aquaculture, building on the likelihood that facility operators self-organise around areas which are suitable for development<sup>124</sup>. Monitoring of environmental change can be collaboratively and strategically undertaken to understand vulnerability and address threats such as eutrophication (and OA). Governments play a key role and the AMA provides an entity which can support community engagement<sup>125</sup>. Management areas existing in Scotland have been developed specifically to address the need to strategically address challenges of disease in fish farms (Disease Management Areas<sup>126</sup>)

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<sup>121</sup> Crown Estate Scotland 2019, p.13

<sup>122</sup> <https://www.crownestatescotland.com/what-we-do/local-pilot-scheme>

<sup>123</sup> <https://www.nafc.uhi.ac.uk/research/marine-spatial-planning/sullom-voe-master-plan-project/>

<sup>124</sup> FAO 2017. Aquaculture zoning, site selection and area management under the ecosystem approach to aquaculture: A handbook, p.37, <http://www.fao.org/3/a-i6834e.pdf> (accessed 5 December 2019)

<sup>125</sup> FAO 2017, p.38

<sup>126</sup> <https://www2.gov.scot/Topics/marine/Fish-Shellfish/FHI/managementagreement>

and management agreements between multiple operators in a farm management area are supported by the Aquaculture and Fisheries (Scotland) Act 2013 (S.1 (2)). Strategic co-operation in management areas supports collaboration and provides adaptive capacity over a wider spatial scale and could be expanded to consider climate change adaptation needs. It is more difficult to establish new AMAs where industry is already well established (as in Scotland) but there is potential for gradual strategic co-ordination and management based on collective action by industry<sup>127</sup>. Regional marine planning in Shetland encourages area-wide Aquaculture Development Management Plans to support an holistic approach to developing aquaculture proposals in the region<sup>128</sup> and could facilitate the benefits of an AMA approach.

### 5.5.3 Summary of implications for adaptive governance in adapting to OA

Legal and institutional arrangements are critical in defining the capacity for adaptive governance in existing regulatory systems (Cosens et al. 2018). In this analysis findings indicate convergence in developing legislation and policy in Scotland on institutional change towards adaptive governance, with substantive, structural and procedural adaptive capacity enhanced through emerging instruments. New climate change adaptation policy provides a cross-policy, iterative basis for advancing adaptation interventions at different governance levels and an explicit, substantive impetus to implementing adaptive approaches. Alongside this, institutional change in coastal and marine governance including a new, two-tier marine planning process and the adoption of the Scottish Crown Estate Act 2019 seek to advance new models of devolved and learning-based planning and management. These mechanisms intersect in the coastal zone and present opportunity for adaptive governance in the adaptation of aquaculture to OA.

Collaborative and polycentric activity is fundamental to adaptive governance and climate change adaptation and the case study indicates that this is supported by emerging structural capacity across the governance system. This includes multiple centres of influence through government led public – private initiatives, the regional Marine Planning Partnerships, organisations and groups proposing to take on local management of Crown Estate Scotland assets, and potential co-operation supported through Aquaculture Management Areas. In this supportive institutional context, actors operating at different levels can support awareness raising, advance collective action and enhance adaptive capacity.

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<sup>127</sup> FAO 2017, p.17

<sup>128</sup> NAFC 2018

Development of multi-level responses is indicated with policy and strategy development at the national and at the regional level through marine planning. Chapter 4 indicates that developing policy and planning arrangements are supportive of adaptive governance (Greenhill et al. 2020), with a combination of 'top-down' measures and new structural arrangements which can support locally-derived adaptation solutions. Marine planning can encourage and facilitate consideration of potential adaptation options alongside other priorities, but the process is still developing and challenges are evident in its implementation and in understanding its influence on the management of marine activities. Greater connectivity between marine planning, national policy development and regulatory decision-making regarding aquaculture would increase capacity to develop and implement adaptation responses for the sector. For example, strengthening the legal procedures connecting marine planning and aquaculture sector planning and management by government, Crown Estate Scotland's leasing process and local authority licensing in Scotland could enhance the role of marine planning in adaptation, including increasing its capacity to facilitate legitimate debate on adaptation options (Craig2019). Formal adoption which will provide a statutory basis to RMP has not yet taken place and further analysis will be needed to evaluate the effectiveness of interventions at this scale, and which can be supported through the iterative review cycles defined for the CCAP and marine planning.

While opportunities exist for advancing adaptation responses at different scales there is a need for effective integration, including horizontal and vertical institutional linkages, to support adaptive governance (Folke et al. 2005; Berkes 2010). Coherence in governance is required to enhance adaptive capacity, especially in geographical contexts where several regulatory and / or governance arrangements overlap (Soininen & Platjouw 2018). Procedural adaptive capacity could be supported by co-ordination between cycles of monitoring and evaluation of marine planning, policy implementation and effectiveness of adaptation responses, in addition to monitoring of ecosystem change. Making the information from review processes easily accessible would increase accountability and transparency in adaptive governance (Craig & Ruhl 2014). Additionally, since the institutional changes identified here are at early stages of implementation, further investigating the complementarity and potential for integration in enabling adaptation would be an important next step.

Communication regarding OA remains a challenge given the interlinkages with climate change processes, local variability and uncertain effects, compounding the difficulties in engaging stakeholders to determine pre-emptive response options. While low saliency of OA remains a broad challenge (Tiller et al. 2019) progress can be supported through measures to enhance climate literacy

and increasing facilitation of multi-stakeholder groups at multiple levels. Attention to the issue of OA is increasing and Extinction Rebellion, a popular response to the climate emergency, has expressed interest in what is known about OA and its impacts in the coastal waters of Western Scotland (P. Tett 2019, personal communication 30 December).

Despite increasing adaptive capacity in policy and planning, the adaptive capacity of existing regulation of aquaculture may still constrain adaptation responses. The licensing process remains the main arena for considering the specific details of proposed aquaculture operations and their social and ecological implications and requires specificity to enable fixed agreements and permissions. It also includes processes for public objections and appeal against applications and decisions which influence what is possible for aquaculture development (Billing 2018). In addition to promoting more streamlined licensing procedures to support sector growth, future reviews of aquaculture management need to consider the need for flexibility to accommodate adaptation responses. Future research could also consider how legal provisions supporting strategic and collaborative approaches could be more widely implemented, including how Aquaculture Management Areas (with community involvement) could be utilised to support adaptation responses at the operational level.

## 5.6 Conclusion

There is consensus that OA will alter ecosystems, affect human activities and governance needs to respond (Billé et al. 2013). Adaptation of the aquaculture industry is essential to protect an important economic sector and provide food security for an expanding global population. Climate change adaptation requires adaptive governance to enable robust decision-making in the context of uncertainty and is enabled through a governance system consisting of polycentric arrangements and a versatile choice of policy instruments to foster adaptive and innovative responses (Arnold & Gunderson 2013). Scotland provides a pertinent case for analysis given the increasing importance of the aquaculture sector with national policy to double its economic contribution by 2030, combined with increasingly ambitious climate change policy, and this case study supports understanding of implementation of adaptive governance in response to OA.

Findings indicate a range of response options across the themes of institutions and management, livelihood adaptation and resilience and risk reduction, supporting the need for nested arrangements (and providing a basis for framing adaptation responses in relation to new FAO guidance). The dynamic policy context presented by the rapidly developing climate change adaptation agenda, combined with new legislation and policy which is steering reform and increasingly polycentric marine governance in Scotland, provides substantial adaptive capacity which can support the development

of adaptation interventions at different scales. Responses are at an early stage and challenges such as uncertainty in predicting specific effects in coastal areas limits the engagement of industry and constrains the development of specific operational responses. Specific responses addressing OA have so far focused on scientific monitoring, developing an enabling policy framework and awareness raising. Collaboration with industry is essential to raise awareness and understand the feasibility of adaptation responses at sector and project level.

To advance adaptation responses, marine planning presents important opportunities and plays a key role in the cross-sectoral integration of adaptation requirements for individual sectors and resilience building within specific coastal and marine regions. This is complemented by other mechanisms such as the AMAs recommended by the FAO which support collaboration and self-organisation specifically within the aquaculture sector, national initiatives including public / private forums and new forms of ownership and management (such as the CES Local Pilot Scheme). Within the broad and ambitious requirements of climate change adaptation policy, this represents a strengthening basis for adaptation responses at national scale in line with features of adaptive governance including polycentricity, collaboration and learning-based approaches. However, challenges remain, in particular a need for co-ordination and integration between institutional arenas at different scales, vertically and horizontally, to promote learning across scales and enhance adaptive capacity. Further, existing regulatory regimes are of low adaptive capacity and management approaches may need to be adjusted to provide flexibility and accommodate adaptation interventions at the operational level.

## Chapter 6: Adaptive Governance of Commercial Seaweed Harvesting in Scotland (Case Study 3)

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### 6.1 Introduction

In this case study, governance in relation to a new activity and human pressure on ecosystem services, of which the social and ecological effects are highly uncertain, was analysed to further consider adaptive governance in Scotland's marine governance system. Small-scale harvesting of seaweed has taken place in Scotland for many years but increasing interest in large-scale, mechanical harvesting of kelp is requiring governments, authorities and wider stakeholders to focus on developing approaches to its management. Until recently, no legislation or policy specifically referred to the commercial harvesting of kelp and increasing interest in large-scale, vessel-based harvesting means that authorities need to consider and articulate the rules and procedures for managing the activity. While still in development, analysis of the process to date provided insights into the functioning of marine governance at different levels in Scotland, the extent to which adaptive capacity is indicated across the system, and apparent constraints.

Kelp habitats play an important role in coastal ecosystems, including providing nurseries for commercial fish species and higher predators, carbon storage and coastal protection from erosion and flooding (Smale et al. 2013; Burrows & Smeaton 2017) and for local livelihoods. Approximately 20 countries are involved in harvesting large brown seaweeds (kelp) worldwide totalling over 620,000 tonnes per year and increasing<sup>1</sup>. Global seaweed production has more than doubled between 2000 and 2014, from 10.5 to 28.4 million tonnes, including expansion of cultivation of seaweed in Asia<sup>129</sup> and harvesting of Chilean and Norwegian kelp accounts for 60% of production. In Europe, commercial harvesting of wild (uncultivated) kelp at large scale is well established in Norway and France<sup>130</sup> and at a smaller scale<sup>131</sup> but with expanding interest in Ireland (Monagail & Morrison 2020). Large-scale harvesting is undertaken from floating vessels and the primary targets are the large brown subtidal kelps *Laminaria digitata* and *L. hyperborea* which form extended monospecific kelp beds and have a high alginate content (Burrows et al. 2018). In Scotland, kelp forests are particularly abundant on the west coast and around the major islands of the Outer Hebrides, Orkney and Shetland (Burrows et al. 2018).

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<sup>129</sup> Ibid.

<sup>130</sup> For example, in 2012 production in Brittany, France of *L. digitata* reached 57,000 tonnes and 14,000 tonnes of *L. hyperborea* (Frangoudes and Garineaud 2011).

<sup>131</sup> 1400 wet tonnes of *L. hyperborea* were harvested from wild stocks in 2016 (FAO 2018; in (Monagail and Morrison 2020).

Management of kelp harvesting is not straightforward and it is developing differently across countries in response to the growth of the industry and scale of mechanised extraction techniques. In Norway, regional regulations determine zonation and timing of harvesting based on monitoring, and which are revised through a participatory process on a 5-year basis at county-level (Vea & Ask 2011). In Brittany, France, arrangements and rules have changed over decades since the introduction of mechanised harvesting in the 1960s, with different forms of collaboration between private and public actors responding to the increasing scale of harvesting activities (Frangoudes & Garineaud 2011). Collaborative effort has been supported by a common goal of achieving sustainable management of kelp harvesting and avoiding conflicts, however, challenges have also been faced in how to define harvesting quotas including those which are fair to boats of different sizes, perceived unequal power of the processing industry in setting the rules of management and adjusting to the establishment of a national park and management authority leading on conservation of the area (Frangoudes & Garineaud 2011). Despite these problems, collaborative arrangements are considered a success since after 50 years of harvesting the resource remains abundant and not over-exploited, with collaboration and negotiation thus seen as key to achieving sustainable management of kelp (Ibid.). In other countries, kelp harvesting is contentious – beyond Scotland, it remains a topic of debate in Ireland, where criticism has been made of the process since no Environmental Impact Assessment (EIA) and associated public consultation took place prior to a licence being granted for harvesting in Bantry Bay, Cork in 2014 (and a legal challenge is on-going<sup>132</sup>).

In Scotland, small-scale harvesting of seaweeds has taken place for hundreds of years, addressing traditional uses such as fertiliser, animal feeds and alginates, with increasing interest in cosmetics and nutraceutical industries (e.g. dietary supplements) (Angus 2017)<sup>133</sup>. Raw materials are collected by hand or by using small specialized cutting and collecting boats. Kelp harvesting at industrial scale using vessel-based trawling methods is another means of obtaining raw material and involves large-scale collection of seaweed through the use of vessel-based equipment to trawl kelp from the seabed (Steen et al. 2016)<sup>134</sup>. Interest is growing given the increasing demand and opportunity for use of alginates in a wide range of products. The industry “has potential to thrive” and socio-economic benefits, particularly for rural communities, may be associated with an expanding wild seaweed harvesting sector in Scotland, including as a diversification opportunity for fishermen (Burrows et al. 2018, p.1). Cultivation of seaweed is also being developed, with research progressing and reported

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<sup>132</sup> <https://greennews.ie/kelp-harvest-high-court/>

<sup>133</sup> The licensing process for small-scale harvesting is described in detail in Angus (2017).

<sup>134</sup> This technique is also referred to by some as ‘dredging’. We use ‘industrial’ or ‘mechanical’ seaweed harvesting to refer to this method of large-scale, vessel-based seaweed removal for commercial gain.

interest in community-owned seaweed farms which could “revitalise rural west coast areas”<sup>135</sup>. However, projects are likely to be small-scale and cultivation “cannot at present be regarded as an alternative replacement to wild harvesting with respect to providing stocks of kelp to support large scale industry” (Burrows et al. 2018, p.1).

Since 2016, there has been a significant increase in small-scale license applications for seaweed harvesting in Scotland which are licensed through a process defined by Crown Estate Scotland (CES) or relevant owner of the foreshore where most small-scale harvesting takes place. No licenses have so far been issued by the regulatory authority, Marine Scotland, for large-scale commercial harvesting and there is no specific licensing regime which defines how it should be managed (Angus 2017). The most advanced application in 2018 led to submission of a scoping document by Marine Biopolymers Ltd (MBL) to Marine Scotland for a proposed harvesting operation of 30,000 tonnes per annum on the west coast, but this has not progressed. However, concurrently with consideration of the proposal through the regulatory system, the Scottish Crown Estate Bill was progressing through Scottish Parliament. An active ENGO-led campaign led to an amendment to this bill being debated and accepted in Scottish Parliament in November 2018, which now details strict controls on kelp removal and is seen as an effective ban on large-scale mechanical kelp harvesting in Scotland.

Harvesting temporarily removes the kelp habitat and results in measurable reductions in associated biota, and loss of or damage to the meristem prohibits regrowth of the plant. The effects of kelp removal on the functioning of kelp forests and their capacity to restore biodiversity after harvesting activities, particularly considering other impacts on the ecosystems, is uncertain (Burrows et al. 2018). The kelp itself recolonises and regrows within a few years but research indicates that it takes a minimum of eight years for the epiphyte communities - the organisms that grow directly on the kelp plants - to recolonise and be fully re-established (Steen et al. 2015). Wider ecosystem implications, including effects on commercial fish populations, are anticipated but difficult to evaluate. Science suggests that there is a level of harvesting of kelp which may be sustainable, however, establishing this threshold is exceedingly difficult and is compounded by the complexity and uncertainty inherent in social-ecological systems (Burrows et al. 2018). The uncertainty regarding consequent effects of large-scale kelp removal complicates management efforts and requires an adaptive, collaborative and learning-based approach to its governance. Recognising its theoretical potential and expanding application to environmental governance, an analytical framework based on adaptive governance is used here to analyse the development of kelp governance in Scotland.

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<sup>135</sup> <https://www.heraldscotland.com/news/18228801.power-seaweed-explored-scotlands-industry-expands/>

### 6.1.1 Theoretical Framework

As in the other case studies presented in this thesis, adaptive governance was used as a framework for understanding governance arrangements and functioning which can enable responding to complexity and change under uncertain conditions (described in detail in Chapter 2). To summarise, analysis of adaptive governance requires consideration of attributes of the social system which can enable the ability (capacity and flexibility) to adapt, through learning-based approaches (Craig & Ruhl 2014). Such attributes include polycentricity and multi-level institutional arrangements which distribute decision-making power across multiple scales (Ostrom 2010) and these arrangements enable participation and collaboration, involving a wide range of stakeholders to share responsibilities, support learning and innovation and enhance decision-making in resource management (Wyborn 2015). Institutions must be designed to allow for adaptation, through analytical deliberation, nesting and institutional variety (Dietz et al. 2003) and the capacity for resource users and managers to experiment with adaptive policies (Ostrom 2007). On-going reflexivity, social learning and the collaborative or mutual development and sharing of knowledge by individuals and organizations through learning by doing is enabled (Berkes 2010) and improves the capacity of governance to adapt to changing circumstances and to perform well and remain resilient over time (Young et al. 2010).

In addition to flexibility to adjust policies and institutional behaviour, adaptive governance is an essential basis for adaptive *management* in order to consider uncertainty in socio-ecological systems (Folke et al. 2005; Hurlbert & Gupta 2016), where management refers to direct control over human activities (Hatfield-Dodds et al. 2007). Adaptive management is seen as a specific tool to approach uncertainty through intentional and planned experimentation with human activities to promote learning about the nature and dynamics of the system<sup>136</sup> (Craig & Ruhl 2014; Cosens et al. 2018). Adaptive management involves cycles of 'set-up' and 'iterative' phases, ideally consisting of engagement with stakeholders, the development of management goals and actions, and monitoring plans, as well as feedback processes and possible adjustments of these goals or actions. This approach is appropriate when goals are set, uncertainty is high, and the ability to control experimentation is also high (Craig & Ruhl 2014).

Understanding the emergence of adaptive governance and how adaptive approaches, including adaptive management, can coexist with contemporary institutional arrangements remains a key challenge (Brunner 2010; Chaffin 2014). The challenges of enabling adaptive governance in highly

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<sup>136</sup> Also referred to as *active* adaptive management by some authors (e.g. Craig & Ruhl 2014; Hasselman 2017).

regulated systems of governing is a topic of recent scholarly focus, particularly adaptive governance researchers in the U.S. who identify the rule of law as a key component of facilitating (or hindering) adaptive governance (e.g. Camacho & Glicksman 2016; Craig et al. 2017; Cosens et al. 2018). Barriers are identified including the rigidity and inertia of existing institutions but also the difficulties of finding a balance between stability and adaptability in governance (Craig et al. 2017). This tension was identified in Chapters 4 and 5, where the rigidity and lower flexibility of existing policy, planning and management arrangements present a constraint to adaptive governance through marine planning and in implementing adaptation responses to OA.

A model of marine governance in Scotland is developed in this case study based on the SES framework which enables conceptualisation of actor-system dynamics for analytical purposes (described in Chapter 2, Section 2.2.2). The model includes a *resource system*; the biophysical system (in this case kelp ecosystems) from which resource units (kelp) are extracted, and within which users operate according to incentives and rules developed through the *governance system* which define the authority of actors and shape their interactions and outcomes over time (Ostrom 2007). The characteristics of the system in Scotland indicate multi-level governance and the existence of multiple action situations with interaction between levels. This provides a need and opportunity to explore adaptive capacity at system scale.

Two concurrent action situations at different levels were identified and analysed, resulting in different outcomes in terms of adaptive governance for the mechanical harvesting of wild seaweed, where kelp represents a common-pool resource. This included the functioning of Action Situation 1 (AS1) - the regulatory process in response to the initial stages of application for a license for proposed harvesting activities on the west coast by a company, and a concurrent Action Situation 4 (AS4)<sup>137</sup> - the development of primary legislation (the Scottish Crown Estate Act 2019) through the parliamentary process. Using the SES framework and a theoretical perspective based on adaptive governance, a model of the specific situation of kelp governance in Scotland was developed to identify how opportunities for adaptive governance, including adaptive management, are supported or hindered in the developing regime. This provides insights into the broader marine governance system investigated through this thesis.

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<sup>137</sup> This action situation is numbered AS4 (rather than AS2) to enable coherence in this thesis with the expanded model of governance in Scotland addressing the system, presented in Chapter 7, Figure 7.1.

## 6.2 Methods

A case study approach was taken, focussing on the development of governance of commercial seaweed harvesting in Scotland and which is described below. As set out in Chapter 3, the analysis draws on document analysis of: policy and legislation addressing kelp management, marine resource extraction and kelp conservation to understand the governance system; and publicly available documents relating to the application since submission of the scoping document by MBL in July 2018, including consultation responses and parliamentary proceedings, and associated material (online meeting minutes and verbatim records) during the deliberation of the Scottish Crown Estate Bill as it progressed through Parliament (from January to November 2018). Official communications made publicly available through Freedom of Information (FOI) requests were also reviewed. All available documents published online were analysed to inform the description of the model of kelp governance including the governance system, the functioning of respective AS and the interactions within and between them, and the implications for adaptive governance. Table 6.1 details the data used and the SES framework component to which it relates. The *process* of the development of kelp governance was firstly considered in light of adaptive governance; i.e. evidence of a) polycentric approaches; b) participation and collaboration; c) learning-based approaches and d) self-organisation. This was followed by consideration of the *outcomes* of the process and the implications for adaptive governance for future kelp management.

Table 6.1 Summary of documents analysed to inform the analysis of the development of kelp governance in Scotland

Documents	SES Framework Component
Wild Seaweed Harvesting SEA 2016 Marine (Scotland) Act 2010 Scottish Crown Estate Act 2019 Scotland's National Marine Plan 2015 NMP 3 Year Review Report Scottish Parliament Research Briefing: The Scottish Crown Estate Bill Scottish Parliament Research Briefing: Seaweed Harvesting Publicly available reports, research briefings and written submitted evidence of the Environment, Climate Change and Land Reform (ECCLR) Committee through Stage 1, 2 and 3 of the Scottish Crown Estate Act 2019) <sup>138</sup>	Resource system, governance system
Individual consultation responses from SNH <sup>139</sup> ( <i>cited as SNH 2018</i> )	AS1 Interactions

<sup>138</sup> <https://www.parliament.scot/parliamentarybusiness/Bills/107415.aspx>

<sup>139</sup> [https://www.nature.scot/sites/default/files/2018-08/Consultation%20-%20MBL%20-%20kelp%20harvesting%20-%20west%20coast%20of%20Scotland%20-%20scoping%20-%20SNH%20response\\_0.pdf](https://www.nature.scot/sites/default/files/2018-08/Consultation%20-%20MBL%20-%20kelp%20harvesting%20-%20west%20coast%20of%20Scotland%20-%20scoping%20-%20SNH%20response_0.pdf)

Scoping Report submitted to Marine Scotland on July 2018 <sup>140</sup> ( <i>cited as MBL, 2018</i> ) Scoping Advice provided to MBL by MS-LOT, including 21 appended consultation responses and summary of representations received in response to MBL's submission, 3 <sup>rd</sup> October 2018 <sup>141</sup> ( <i>cited as MS-LO, 2018</i> )	AS1 Interactions and Outcomes
Marine Scotland Science correspondence between Fergus Ewing, Marine Scotland, and Crown Estate, released in response to a Freedom of Information request (FOI) lodged in July 2019 <sup>142</sup> ( <i>cited as FOI 2019</i> )	AS1 Interactions and Outcomes
Written evidence received by the Committee in response to their Call for Evidence on the inquiry between 9 February and 23 March 2018 (70 documents) and supporting reports including a financial memorandum <sup>143</sup>	AS2 Interactions
Stage 2: ECCLR Committee Meeting Minutes, 25th Meeting, 2018 (Session 5), Tuesday 18 September 2018 <sup>144</sup> ( <i>cited in results as [initials of MSP] 18/09/18</i> )	AS2 interactions and outcomes
Stage 3: Video and written record <sup>145</sup> of ECCLR committee meeting (Debate of Stage 3 Proceedings: Scottish Crown Estate Bill) during the Meeting of the Parliament 21 November 2018 ( <i>cited in results as [initials of MSP] 21/11/18</i> )	AS2 interactions and outcomes
Minutes of the Seaweed Review Group meetings 16th May and 26th Sept 2019 and associated reports <sup>20</sup> Statement from Marine Scotland in response to recent media commentary around mechanical dredging trials 13 <sup>th</sup> Jan 2020 <sup>146</sup>	AS2 and AS1 Outcomes
Petitions and associated correspondence <sup>147</sup>	AS2 interactions

### 6.3 Results

In applying the SES framework two primary action situations were observed in influencing the governance of kelp harvesting, one at the regulatory / operational level through the licensing process in response to the submission by MBL (AS1), and another in the development of primary legislation in the form of the Scottish Crown Estate Act 2019 (AS4). In addition to these AS, the framework includes a governance system, resource system, resource units and actors, and this system is described below and shown in Fig. 6.1. This section focusses firstly on the description of the resource system and governance system followed by more detailed analysis of the functioning of the AS and the implications for adaptive governance.

<sup>140</sup>

[http://marine.gov.scot/sites/default/files/r3007\\_wild\\_seaweed\\_harvesting\\_scoping\\_report\\_17july2018lr\\_0.pdf](http://marine.gov.scot/sites/default/files/r3007_wild_seaweed_harvesting_scoping_report_17july2018lr_0.pdf)

<sup>141</sup> [http://marine.gov.scot/sites/default/files/mbl\\_scoping\\_advice\\_-\\_signed\\_-\\_03\\_oct\\_2018\\_redacted\\_0.pdf](http://marine.gov.scot/sites/default/files/mbl_scoping_advice_-_signed_-_03_oct_2018_redacted_0.pdf)

<sup>142</sup> <https://www.gov.scot/publications/foi-18-03511-appeal/>

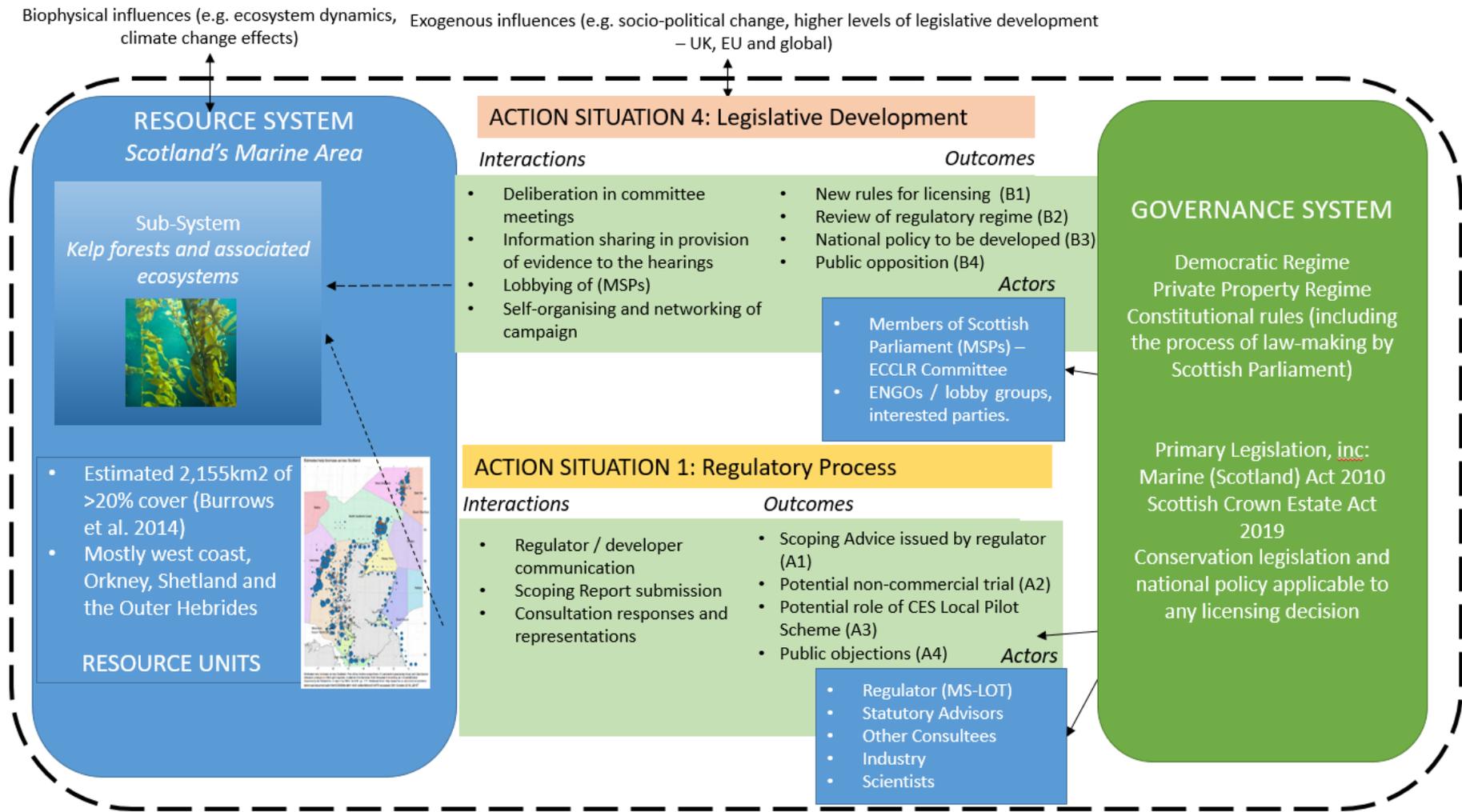
<sup>143</sup> [https://www.parliament.scot/S5\\_Bills/Scottish%20Crown%20Estate%20Bill/SPBill24FMS052018.pdf](https://www.parliament.scot/S5_Bills/Scottish%20Crown%20Estate%20Bill/SPBill24FMS052018.pdf)

<sup>144</sup> <http://www.parliament.scot/parliamentarybusiness/report.aspx?r=11672&mode=pdf>

<sup>145</sup> [http://www.parliament.scot/parliamentarybusiness/report.aspx?r=11794&mode=html#iob\\_106698](http://www.parliament.scot/parliamentarybusiness/report.aspx?r=11794&mode=html#iob_106698)

<sup>146</sup> <https://www2.gov.scot/Topics/marine/seamanagement/seaweedrev>

<sup>147</sup> <https://www.change.org/p/scottish-parliament-ensure-that-mechanical-kelp-dredging-does-not-happen-in-scotland>



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2 Figure 6.1 Model of kelp harvesting governance in Scotland based on the SES framework.

### 6.3.1 Resource System and Units

The resource system is composed of the kelp forests and associated ecosystems which are found predominantly on the west coast and the major Scottish islands. A report commissioned in 2018 by Highlands and Islands Enterprise (HIE) to investigate the potential for medium to large-scale harvesting of wild kelp in Scotland using mechanical techniques estimated the harvestable biomass of the key kelp species of interest (*L. hyperborea*) in Scotland is 20 million tonnes of which 6.5 million tonnes are in harvestable densities (Burrows et al. 2018). Regarding the potential economic value of seaweed harvesting in Scotland, this report highlights the low value of the raw material, but potential high value further down the chain for example if used in the high value manufacturing and pharmaceutical industry. Lower value products may not balance the costs of developing a harvesting project (particularly compliance, monitoring and management), particularly as a 'first mover' in Scotland (Burrows et al. 2018). There are currently no definitive estimates of the total ecosystem value of kelp in Scotland's seas, considering its value in terms of other important ecosystem services.

### 6.3.2 Governance System for Mechanical Kelp Harvesting

The governance system for kelp harvesting defines the conditions for the action situations in the regulation of kelp harvesting activity, including the rules defining the procedures to be followed including which actors can engage and how decisions are made. This forms the main focus of the analysis and is described in detail below.

At the time of consideration of the scoping report, no legislation specifically addressed wild seaweed harvesting in Scotland. Under Section 21 (6) of the Marine (Scotland) Act 2010<sup>148</sup>, mechanical harvesting by trawl, sledge or dredge is deemed to require a licence since it constitutes the "*use of a vehicle, vessel, aircraft, marine structure or floating container to remove any substance or object from the seabed within the Scottish marine area*". The responsible authority for granting licenses under the Marine (Scotland) Act 2010 is Marine Scotland's License and Operation Team (MS-LOT). In determining an application, MS-LOT must have regard to the need to protect the environment and they have a general duty to "*act in the way best calculated to further the achievement of sustainable development*" (S3(b)), in addition to relevant policies in Scotland's National Marine Plan. Wild seaweed harvesting activities are not specifically listed as to be addressed through EIA within the EIA

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<sup>148</sup> The Marine (Scotland) Act 2010 establishes the legislative framework addressing the licensing of marine activities by Scottish Government's Marine Scotland License and Operation Team (MS-LOT), the statutory marine planning system along with requirements for marine conservation and enforcement powers.

Regulations<sup>149</sup>, however to address the Marine (Scotland) Act<sup>150</sup> MS-LOT has set out<sup>151</sup> that applications for a licence to harvest seaweed should be accompanied by an Environmental Appraisal (EA) which follows the same process as EIA. A developer must present an assessment of anticipated environmental effects, along with comments from public and statutory organisations obtained through consultation on proposed activities, to inform the decision-making process. This is preceded by a scoping report which details the developers' intentions and their approach to environmental assessment, as was submitted by MBL to MS-LOT in July 2018 and was the main source of information on the proposed activities available to actors in AS1. Public consultation is recommended involving non-statutory consultees and any stakeholders with a potential interest in kelp harvesting, in line with the EC public participation requirements and the Aarhus Convention<sup>152</sup>.

Kelp is a protected feature under environmental legislation in Scotland recognising its value as a highly productive and dynamic ecosystem and is described as "the Scottish equivalent of tropical coral reefs" (Fuller 1999, p.5). Kelp habitats<sup>153</sup> are Priority Marine Features (PMFs) and of conservation importance in Scottish seas protected under the Marine (Scotland) Act 2010 and Policy 9(b) of Scotland's National Marine Plan<sup>154</sup>. Four of Scotland's nature conservation Marine Protected Areas (MPAs) contain kelp as a protected feature designated under the Act, meaning management measures must be implemented to conserve them. To enable a license to be granted, a Habitats Regulations Appraisal (HRA) would be required where there is potential for proposed activity to affect sites and species protected under the EU Habitats Directive.

A Strategic Environmental Assessment (SEA) for wild seaweed harvesting<sup>155</sup> was undertaken in 2016 to assess the potential effects of large-scale seaweed harvesting in Scotland. This reported that the current level of small scale collection of wild seaweed in Scotland is unlikely to result in significant adverse environmental impacts (although the cumulative impacts of expansion of these activities is a concern); but that significant adverse effects could occur as a result of large scale mechanised

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<sup>149</sup> Schedules 1 and 2 of the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017

<sup>150</sup> Section 25 (3) of the Marine (Scotland) Act 2010 states that "an applicant for a marine licence must supply such information as required to enable the Licensing Authority to determine the application in line with its duty to consider the need to "protect the environment, human health and legitimate use of the sea".

<sup>151</sup> [http://marine.gov.scot/sites/default/files/mbi\\_scoping\\_advice\\_-\\_signed\\_-\\_03\\_oct\\_2018\\_redacted\\_0.pdf](http://marine.gov.scot/sites/default/files/mbi_scoping_advice_-_signed_-_03_oct_2018_redacted_0.pdf)

<sup>152</sup> The UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) <https://ec.europa.eu/environment/aarhus/>

<sup>153</sup> 'Kelp beds' and 'Kelp and seaweed communities on sublittoral sediment'

<sup>154</sup> Policy 9b states that "development and use of the marine environment must not result in significant impact on the national status of Priority Marine Features".

<sup>155</sup> This was accompanied by a draft Seaweed Policy Statement published in 2013 addressing cultivation only: <https://www.gov.scot/publications/draft-seaweed-policy-statement-consultation-paper/pages/2/>

harvesting, through impacts on habitats and the ecosystem services that they provide (Scottish Government 2016b).

Wild kelp harvesting is not specifically addressed in national policy in Scotland, however any activities at sea must be undertaken in accordance with wider policies relevant to the marine area. These are set out in Scotland's National Marine Plan (NMP) which sets out general and sectoral policies affecting the marine area and which must be considered in decision making. In the NMP, general policies apply including that Scottish Ministers are supportive of use of the marine environment where such use can be demonstrated to be sustainable and bring economic and social benefit. Decision makers must also consider climate change adaptation, including "safeguarding ecosystem services such as natural coastal protection and natural carbon sinks (e.g. seagrass beds, kelp and saltmarsh)" ('GEN 5'; Scottish Government 2015, p.18) and, in addressing coastal protection, recognise the protective role of "kelp beds, biogenic reefs and sandbanks" ('GEN 8'; Scottish Government 2015, p.22). Kelp harvesting was identified as an emerging activity in the review of the NMP in 2018 and policies relating to this are anticipated in the next iteration of the NMP (Scottish Government 2018). The next review of the NMP will take place in 2021. Opportunities to grow Scottish seaweed production through cultivation are supported by policy in the NMP.

Scotland's NMP will be supplemented by Regional Marine Plans (RMPs) addressing the eleven Scottish Marine Regions of territorial waters (to 12nm)<sup>156</sup> with responsibility for delivering regional marine planning delegated by national government to Marine Planning Partnerships (MPPs). These MPPs may consist of regional public authorities (or a single authority in the case of Scottish islands<sup>157</sup>) and stakeholders who reflect marine interests in the region<sup>158</sup>. The Shetland Islands Regional Marine Plan (SIRMP) is currently presented for consultation and is anticipated to be adopted in 2020 and the Clyde marine plan is at 'pre-consultation draft' stage. Reference is made in the Clyde draft Marine Plan to harvesting activities, with a policy included requiring that applications for the harvesting of wild seaweed demonstrate that appropriate legislative requirements are addressed (Policy NH3) and commercial cultivation is not occurring in the Clyde (CMPP 2019). "Sustainable development of seaweed cultivation and harvesting" is supported in principle in the SIRMP, but greater emphasis is placed on encouraging seaweed cultivation, including co-location with other activities, and is being developed collaboratively in two locations (NAFC 2018, p.115). Other regional policies addressing adaptation and coastal defence are relevant to the protection of kelp and future marine plans will

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<sup>156</sup> As defined under the Scottish Marine Regions Order 2013

<sup>157</sup> Islands (Scotland) Act 2018, s27

<sup>158</sup> <https://www2.gov.scot/Topics/marine/seamanagement/regional/partnerships>

need to consider the potential for kelp harvesting, alongside other industries and socio-ecological issues, and set regional policies which address how this industry could develop (or not) in each region.

In addition to the regulatory process outlined above, the governance system includes a property rights system enshrined in constitutional law which is relevant to kelp harvesting in Scotland. Crown Estate Scotland is the owner and manager of a range of rural, coastal and marine assets including nearly all the seabed in Scotland and approximately half of the foreshore<sup>159</sup>. As kelp is attached to the seabed, property rights belong to the Crown and thus are part of the public good, for their private profit (apart from where other landowners own and manage foreshore areas). Harvesting seaweed below the low tide mark therefore also requires a licence from CES which is issued through a Harvesting Licence<sup>160</sup> Options (HLO) process.

The recently adopted Scottish Crown Estate Act 2019 ('the SCE Act') now plays a defining role in kelp management. Devolution of the management and revenues of the UK's Crown Estate assets in Scotland to CES was detailed under the Scotland Act 2016 and new legislation was required to define the management of CES assets and the role of CES. The Scottish Crown Estate Bill progressed through the stages of bill<sup>161</sup> development based on a process defined in constitutional law which sets the context for Action Situation 2. A new bill is scrutinised by Parliament, usually through committees – in this case the Environment, Climate Change and Land Reform (ECCLR) Committee. This involves three stages: 1) the general principles of the bill; 2) proposed amendments to the bill and 3) further amendments and decision to pass or reject the bill. Once passed, it becomes part of the law of Scotland as an Act of the Scottish Parliament once it has received Royal Assent (approval from the Queen). The Scottish Crown Estate Bill was introduced to parliament on 24<sup>th</sup> January, 2018 with the Stage 1 debate in June, 2018; the Bill was considered at Stage 2 on 18<sup>th</sup> September 2018 and debated at Stage 3 on 21<sup>st</sup> November 2018, at which point amendments were voted upon, and the Bill received Royal Assent (becoming the Scottish Crown Estate Act 2019) on 15<sup>th</sup> January 2019. Through this process, actors may make representations via written evidence which are considered in the debates. Under the SCE Act, mechanical kelp harvesting is effectively banned in Scotland, where "(a) removal of the kelp would inhibit the regrowth of the individual plant, and (b) the kelp removed is intended for commercial use" (Art. 15). While this is definitive, the development of secondary legislation via an Order laid before Scottish Parliament is required prior to commencement of its provisions and could include, for example, clarifications regarding interpretation of key terms such as 'removal',

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<sup>159</sup> The land between (spring tide) high and low water marks.

<sup>160</sup> This is a 'licence' but is different to the 'licence' granted by MS-LOT under the Marine (Scotland) Act 2010.

<sup>161</sup> A 'bill' is a proposal to change the law, including amending existing law or creating a new law.

‘harvesting’ and ‘commercial’. During the parliamentary scrutiny, a review of the regulatory process was also announced, and which is on-going<sup>162</sup>.

### 6.3.3 Action Situation 1: Regulatory process

The regulatory Action Situation (AS1) takes place at the ‘operational’ level, since the outcomes of the process are decisions influencing a proposed change in the practical world, i.e. the specific harvesting operations proposed by the applicant and future licensing applications. The actors interacting in the AS1 defined by the governance system were public agencies, including MS-LOT and advisors, whose actions primarily determine the outcomes, in response to information provided by industry, responses and opinions provided by consultees (statutory and non-statutory), and available information. In determining the response to licensing applications, the available scientific evidence was used by MS-LOT, advisors and by industry in the development of their scoping report.

#### *Interactions*

Following discussions with the regulator and advisors over a number of years (shown in the response to FOI to date back to at least 2015), MBL submitted a Scoping Report to MS-LOT in July 2018 detailing proposals to obtain five-year marine licences to harvest from a range of locations around the west coast of Scotland, by removing entire seaweed plants. They proposed a rotational harvesting plan across five areas, harvesting one of these areas at a time for a one-year period, allowing a “*four/five-year period to recover*” (MBL 2018). By year 5, they anticipated having the capacity to harvest up to 30,000 tonnes of kelp per year. The Scoping Report proposed an ‘Adaptive Management Plan’ where monitoring would inform adjustment of harvesting activity as deemed necessary by an Environmental Steering Group (Ibid., p.7).

Prior to the submission, MS-LOT had advised the developer that a number of applications for smaller areas is advisable rather than one application covering a large area, to enable considering the environmental implications and “*ensure the licensing process is manageable*” (FOI 2019). MS-LOT also advised the developer to engage with local stakeholders / interested parties as early in the process as possible however, in 2015, MS-LOT also noted that “*although [the company] are committed to sustainability, they are underestimating the challenges of securing a licence for very large quantities of extraction and the level of scrutiny they are likely to encounter*” (FOI 2019, p.2).

Public consultation by MS-LOT on the submission was held during July and August 2018 involving invited consultation responses and public advertising of the report. Overall, MS-LOT received 21

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<sup>162</sup> <https://www2.gov.scot/Topics/marine/seamanagement/seaweedrev>

consultation responses from those directly consulted and over 2350 representations from the general public in relation to the proposal from Scotland, UK and abroad. Most respondents objected outright to the proposed activity and would strongly oppose any future planned activity of this type. The major themes of the responses detailed concerns regarding:

- Impacts on ecology and the environment including climate change
- Impacts on coastal processes including loss of shoreline protection
- Impact on livelihoods including fishing and tourism; concerns regarding navigation; visual impacts
- Lack of benefits for local economies
- Monopoly by one large company
- Cultivation as a better alternative

Ten respondents out of 21 raised concerns but provided views on the need for an adaptive approach and 151 representations (which are not available for analysis) mentioned the need for ‘scaling up’ of operations (as summarised by MS-LOT in their scoping response). A number of consultees referred to the need for a precautionary approach to be in accordance with the UK High Level Marine Objectives, and the NMP, which states that: “Where evidence is inconclusive and impacts of development or use on marine resources are uncertain, reasonable efforts should be made to fill evidence gaps and decision makers should apply precaution within an overall risk-based approach” (para. 4.81). From this perspective, a small-scale, non-commercial preliminary pilot / experimental study was deemed necessary before any ‘adaptive management’ of a large-scale harvesting operation. This was proposed as best undertaken collaboratively, involving community, inshore fishermen and environmental stakeholders and other relevant parties and to test a range of harvesting methods. Some indicated that this would require an appropriate length of time for study, i.e. 5 years or at least 2 harvesting cycles. One respondent considered that such testing should still be done *“at the expense of those seeking to use a public good for private gain”*<sup>163</sup>.

Others supported a learning-based approach but considered that this should be managed strategically by government, with opportunity for small scale projects identified according to understanding of the resource at national scale. Adaptive management could be appropriate, but must be achieved through the licensing process, i.e. a phased approach where a license is granted, monitoring undertaken to inform harvesting expansion (as proposed by MBL). This would be based on reporting and review of monitoring which demonstrates the sustainability of the agreed harvesting regime, as proposed by MBL, and based on independent review of monitoring outcomes by a multi-agency

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<sup>163</sup> Response by Save Seil Sound, appended to MS-LOT 2018.

environmental steering group), prior to progressing, with mitigation applied if required. Difficulties were raised by respondents with this approach, including the insufficient knowledge of impacts to provide a baseline for measuring effects, the feasibility of monitoring and detecting change, the lack of ability to define thresholds of kelp extraction and “*lack of any intervention criteria*”<sup>164</sup>, or what the intervention (in terms of mitigation or restoration) would consist of. ENGOs considered that given the scientific uncertainty it is currently not possible to determine ‘national status’ of kelp as PMF and it is therefore impossible to determine whether the proposed activity will have a significant impact in order to grant a license<sup>165</sup>. Costs and responsibility for paying for the monitoring were also raised as issues particularly considering the need for an independent process of evaluation and decision-making.

Many respondents considered the importance of justifying how local benefits will be ensured and assessed and the importance of local ownership. Others noted that the opportunities through the changes in CES management of the seabed, including their Local Pilot Scheme, could address this, with the possibility of devolving responsibility of management and leasing (of the seabed for harvesting activities) to community groups. This would increase local benefits, and could support enforcement in relation to kelp harvesting activities and the principle of subsidiarity was promoted by CES in their response to the proposal<sup>166</sup>. Regional marine planning was also raised as a framework which should enable debate and negotiation at regional scale but was considered “*yet to materialise in any meaningful way*”<sup>167</sup>.

### **Outcomes of AS1**

Based on the interactions analysed above, the main outcomes of the AS are summarised below (corresponding to Fig. 6.1), representing rules or decisions which influence subsequent behaviour and decision-making.

**Outcome A1:** The main outcome was the formal response provided by Marine Scotland to MBL in October 2018, which recommended development of a new proposal based on smaller areas which can be assessed in detail. This outcome defined the requirements of future applications, based on a phased approach of a smaller scale activity which is monitored and scaled-up if impacts are deemed acceptable.

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<sup>164</sup> Response by SEPA, appended to MS-LOT 2018.

<sup>165</sup> Response by Scottish Environment LINK, appended to MS-LOT 2018.

<sup>166</sup> “[CES] believes that the principle of subsidiarity should be at the heart of policy development giving local communities the opportunity and responsibility of developing initiatives and strategies which meet the needs of the area and ensure sustainable economic growth.” Response by CES, appended to MS-LOT 2018.

<sup>167</sup> Response from Fisheries Management Scotland, appended to MS-LOT 2018.

**Outcome A2:** Different types of adaptive management were considered including a non-commercial, experimental-based option, led by public agencies or community group to gather evidence on impacts before advancing the industry through further applications.

**Outcome A3:** Other management opportunities through the changes in CES management of the seabed with the possibility of community-based management.

**Outcome A4:** Strongly negative responses, including many stating their outright objection, indicate that while new applications or adaptive approaches are not ruled out, this is highly unlikely to be acceptable to many consultees. Although informal, this public opinion represents ‘rules’ which might steer the future behaviour of the industry.

#### 6.3.4 Action Situation 4: Deliberation of the Scottish Crown Estate Act 2019

The Scottish Crown Estate Bill was being considered by Parliament (AS4) concurrently to the consideration of the applicant’s proposal through the regulatory system (AS1) as described in section 6.3.3. Through analysis of the Stage 2 and 3 debate by the ECCLR Committee on proposed amendments to the SCE Bill and associated documents (submitted evidence and correspondence), the following description of the parliamentary process (AS4) is made. The main actors were the Members of Scottish Parliament (MSPs) represented on the ECCLR Committee, with information provided through correspondence to the calls for evidence provided by a wide range of actors. The publicly available information from AS1 would also have been available to actors in AS4.

#### *Interactions*

Kelp was not mentioned during Stage 1 of the consideration of the bill but at Stage 2, an amendment was proposed that harvesting of wild kelp should be restricted “where such harvesting would inhibit the regrowth of the individual plant”<sup>168</sup>. Following debate, the amendment was adopted at Stage 3 of the review of the Bill in November 2018, based on voting in which the division was: For - 3, Against - 0, Abstentions - 6<sup>169</sup> and rules out the activity proposed by MBL in AS1.

During parliamentary scrutiny submissions were made by fishermen’s organisations such as the 400-member Scottish Creel Fishermen’s Association, hand divers for scallops and trawlermen, shellfish and whitefish sectors, hand gatherers of kelp for artisan use, marine tourism companies, community

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<sup>168</sup> Marshalled List of Amendments for Stage 2 for the Scottish Crown Estate Bill. Online at: [https://www.parliament.scot/S5\\_Bills/Scottish%20Crown%20Estate%20Bill/SPBill24MLS052018.pdf](https://www.parliament.scot/S5_Bills/Scottish%20Crown%20Estate%20Bill/SPBill24MLS052018.pdf) p.5

<sup>169</sup> ECCLR Committee Meeting Minutes, 25th Meeting, 2018 (Session 5), Tuesday 18 September 2018. Online at: [http://www.parliament.scot/S5\\_Environment/Minutes/20180918\\_Minutes.pdf](http://www.parliament.scot/S5_Environment/Minutes/20180918_Minutes.pdf)

councils, academics, primary school children (forming groups such as the Ullapool Sea Savers and the Sunnyside Ocean Defenders to address the campaign) and individuals. These included letters and open petitions, one of which was signed by 14,000 people based on a campaign led by an oyster farmer from Ullapool and founder of the ‘No Kelp Dredging’ campaign group. Lobbying effort was directed at specific MSPs and the cause was advanced principally by the Green Party MSP who tabled the amendment, but was supported by others across the parties. A letter from 65 businesses was also submitted to the ECCLR process supporting the ban<sup>170</sup>.

Concerns raised echoed those articulated in AS1, and included ecological effects, indirect effects on commercial fisheries and hand harvesters, and the importance of kelp in climate change, both as a “blue carbon habitat”, a carbon sink and protection from coastal erosion and sea-level rise. This latter concern was promoted as relevant given the new Climate Change (Emissions Reduction Targets) (Scotland) Bill (now Act) which was also progressing through Parliament. Other views were presented regarding the potential benefits of economic activities in remote and rural communities, and that a wider consideration of ‘sustainable’ in this context, of balancing socio-economic and ecological concerns would be appropriate<sup>171,172</sup>. On the basis of the information supplied by MBL the possible wider financial benefits of the proposal in gross terms could be in the region of £1 million per annum<sup>173</sup> and include over 40 jobs in a biorefinery and the wider supply chain from using mechanical harvesting techniques. A financial analysis undertaken for the ECCLR estimated that gross revenues to Crown Estate Scotland could be in the region of £26,400 for a development harvesting 33,000 tonnes wet weight per annum if relevant requirements are satisfied<sup>174</sup>. However, MSPs also emphasised the potential of seaweed cultivation as “*a vibrant sector that can create jobs for generations to come*”<sup>175</sup> with socioeconomic benefits for remote and vulnerable communities in the north-west.

The campaign was considered scientifically informed<sup>176</sup> although the emotive nature and lack of balanced consideration of evidence was problematic:

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<sup>170</sup> [https://docs.google.com/document/d/1d7VB25yuBjN7KrduJ8XDM6sKYeSL08bzGsg7cSbdqfQ/edit\\_a](https://docs.google.com/document/d/1d7VB25yuBjN7KrduJ8XDM6sKYeSL08bzGsg7cSbdqfQ/edit_a) further 21 businesses signed after the letter had been sent.

<sup>171</sup> “*The proposal would have brought—and still might bring—40 jobs to Mallaig*” (JS, 21/11/18)

<sup>172</sup> “*Perhaps we should all have a mature conversation about what “sustainable” means and what developments we are prepared to accept in our remote and rural communities.*” (JL, 21/11/18)

<sup>173</sup> Supplementary Financial Memorandum:

[https://www.parliament.scot/S5\\_Bills/Scottish%20Crown%20Estate%20Bill/SPBill24FMS052018.pdf](https://www.parliament.scot/S5_Bills/Scottish%20Crown%20Estate%20Bill/SPBill24FMS052018.pdf)

<sup>174</sup> Ibid.

<sup>175</sup> MR, 21/11/18

<sup>176</sup> “*We have remarkable people: scientists who have galvanised their arguments intelligently and articulately, and we thank them for that.*”, and: “*Some submissions are scientific and well referenced, and others are about the right to our kelp forests as a public good.*” (JS, 21/11/18)

*“Getting hundreds of Twitter messages or 38 Degrees emails on the issue demonstrates public engagement and passion, but that is no substitute for evidence gathering from scientists and stakeholders who know the subject intimately.”<sup>177</sup>*

A lack of evidence, and time to consider it, was also highlighted by MSPs, for example the Cabinet Secretary<sup>178</sup> stated that:

*“thus far, there has been no evidence gathering that would adequately inform committee members one way or the other, and the proposal [to include Amendment 42] is being made in the absence of any proper process.”<sup>179</sup>*

Concern over the process and a lack of evidence on the impacts of harvesting on ecosystems, or facts regarding the potential benefits of such activities, was presented as the reason why the majority of MSPs abstained from voting on the amendment, and was based on the advice of the Cabinet Secretary, but as 3 voted for the amendment, it passed<sup>180</sup>. This raised serious concerns among MSPs, regarding the process itself due to the lack of evidence and opportunity to revise the decision:

*“The processes of Parliament are being called into question because they have not allowed the matter to be properly debated and aired, or for evidence to be taken in Parliament?”<sup>181</sup>, and: “The approach in question is an unusual one that has sometimes led us into difficulties when we have taken it in the past and a committee has not had the opportunity to take evidence from all interested parties,”<sup>182</sup> and further:*

*“I very much regret the way in which the prohibition of the harvesting of Laminaria hyperborea will be passed into law; indeed, it provokes real questions about the stage 2 process for considering amendments in any future bill. It now appears that significant announcements on, and alterations to, a bill can be considered and acted on by committees, Government and Parliament, without any formal evidence being heard by a bill committee.”<sup>183</sup>*

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<sup>177</sup> GM 21/11/18

<sup>178</sup> Roseanna Cunningham (RC) is the Cabinet Secretary for Environment, Climate Change and Land Reform and leader of the ECCLR Committee.

<sup>179</sup> RC 21/11/18

<sup>180</sup> “We abstained because the process causes us considerable difficulties” SS 21/11/18

<sup>181</sup> JS 21/11/18

<sup>182</sup> SS 21/11/18

<sup>183</sup> It was proposed as ‘back to front’, to “pass the law first, then look at the independent scientific advice.” SS 21/11/18

Many were concerned that the amendment (and announced review of the regulatory framework) had undermined the regulatory process and the established licensing regime which was underway (AS1) which was deemed the appropriate process for considering evidence on potential activities based on a 'scientific' approach, e.g.:

*"It would be inappropriate to legislate on this matter [kelp harvesting] under the Crown Estate (Scotland) Bill. The issue would be more appropriately dealt with through the licensing system. If we get the opportunity to examine the matter, it should be viewed from a scientific perspective; we should also look at what the environmental and economic impact of kelp harvesting would be"*<sup>184</sup>.

It was acknowledged that the amendment in fact *"cuts across what the Scottish Parliament has already legislated for in the past decade, which is a statutory regime that requires licenses to be granted before such activity can be carried out."*<sup>185</sup>

The amendment to the SCE Act was presented as a *"hard backstop"* by Mark Ruskell in the debate, as it provides fundamental protection for the kelp resource, but still provides the opportunity for the industry to innovate around this restriction, since it does not rule out other methods of kelp extraction, if regrowth and recovery can be justified, or of harvesting other seaweed species<sup>186</sup>. However, emphasis in the amendment on *re-growth* of a 'single plant', and not allowing for recovery of kelp based on recolonisation of bare surfaces, would prevent any further industry. Consequent potential impacts on benefits and future revenue for local authorities and communities are also possible, including where they may have decided to lease an area of the seabed for seaweed harvesting under devolved asset management under the SCE Act<sup>187</sup>. The loss of potential for future revenue foregone from leasing the activity was noted, and it was also noted that:

*"Other science-based businesses might now be deterred from investing in Scotland, knowing that a regulatory developmental process for product development that is supported by Government agencies can be overturned, almost whimsically, by Parliament."*<sup>188</sup>

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<sup>184</sup> AM 18/9/18; who also stated *"I suggest that amendment 42 is out of kilter with the general duties under the bill."*

<sup>185</sup> RC 21/11/18, who also stated that: *"I remain of the view that the Scottish Crown Estate Bill is not the optimal place to control seaweed harvesting."*

<sup>186</sup> Kelp removal for the purposes of scientific research is allowed as well as in relation to power stations, ports and public infrastructure, and the rules do not apply to cultivated kelp or 'hand-cutting' where the plant can regrow.

<sup>187</sup> For example, the local authorities for the Shetland Islands, Orkney Islands and Western Isles have expressed interest in taking on management of seabed rights which could be restricted by this amendment.

<sup>188</sup> JS 21/11/18

During the debate at Stage 2, the Cabinet Secretary also announced a review of the regulatory regime addressing seaweed harvesting (not just kelp), to include small-scale hand harvesting, cultivation and further research. This outcome, which was attributed to the increasing interest in kelp and “*profile of this issue*” suggests potential for future changes to the regulatory regime. As part of the regulatory review, consideration of the potential need for a pilot project was raised “*on an appropriate scale and design and at an appropriate location, to collect evidence on the potential environmental impacts of seaweed harvesting and on regeneration potential*”<sup>189</sup>. A steering group has been established to lead the review, chaired by Marine Scotland and is active with 2 meetings held in 2019<sup>190</sup>. A pilot or field trial is included in their work plan for late 2020<sup>191</sup>. The announcement of the regulatory review was also considered by some to indicate the ineffectiveness of the licensing system<sup>192</sup> and that the influence of the public campaign on the Bill and the resulting amendment undermines the licensing process, leading to questions on whether it is “*fit for purpose*”. It was further suggested that the campaign which led to the amendment indicated that the public have “*no faith in our licensing system or in our regulatory bodies and development agencies.*”<sup>193</sup>

#### **Outcomes of AS4**

**Outcome B1:** The amendment rules out leasing of the seabed for the removal of entire plants, including the activities proposed by MBL in AS1. In future, licensing for harvesting might be sought by developers, if they can demonstrate methods that do not inhibit the regrowth of the individual plant, and satisfy requirements of the regulatory licensing process, but this is unlikely.

**Outcome B2:** The review of the regulatory regime addressing seaweed harvesting presents a further outcome which may alter the regulatory process (AS1) and initiate further research including a potential pilot project.

**Outcome B3:** “*Further policy action*”<sup>194</sup> was announced and national policy will be developed addressing seaweed harvest and cultivation in the next iteration of the National Marine Plan.

**Outcome B4:** Public objections and self-organisation in influencing AS4 also indicate the wide negative opinion of kelp harvesting and informal rules which will influence future activity.

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<sup>189</sup> RC 21/11/18

<sup>190</sup> <https://www2.gov.scot/Topics/marine/seamanagement/seaweedrev>

<sup>191</sup> <https://www2.gov.scot/Resource/0054/00549045.pdf>

<sup>192</sup> “The cabinet secretary suggested that the licensing regime is robust, but I argue that the reason why we are talking about kelp is that it is not.” (FC 21/11/18)

<sup>193</sup> JS 21/11/18

<sup>194</sup> Which “...will be subject to the usual policy and parliamentary processes including the respective consultations and various assessments that inform these.” RC 21/11/18

Table 6.2 summarises the outcomes from each of the action situations, in terms of formal and informal rules which steer subsequent policy action.

Table 6.2 Summary of outcomes of the action situations

AS 1 Licensing	AS 4 Parliamentary process
<p><b>Outcome A1:</b> Scoping Advice recommending a phased adaptive management (licensing) approach.</p> <p><b>Outcome A2:</b> Potential for a non-commercial pilot to trial techniques and gain evidence.</p> <p><b>Outcome A3:</b> Consideration of local management through CES changes</p> <p><b>Outcome A4:</b> Public objection to any future proposal of commercial harvesting.</p>	<p><b>Outcome B1:</b> Adoption of the SCE Act with amendment and <i>de facto</i> ban on large scale harvesting, but potential for other methods if impacts demonstrated as acceptable.</p> <p><b>Outcome B2:</b> Review of regulatory regime including new secondary legislation, research and a potential pilot scheme (underway).</p> <p><b>Outcome B3:</b> National policy to be developed and detailed in next National Marine Plan.</p> <p><b>Outcome B4:</b> Public and stakeholder opposition to future development.</p>

## 6.4 Discussion

In this case study, the demands placed on a system of governance by a novel activity and human pressure on marine ecosystem services, of which the social and ecological effects are highly uncertain, provided a further case for analysis of adaptive governance in Scotland. Although a highly regulated system, no specific process for the management of commercial harvesting exists meaning that the rules for operational decision-making needs to be interpreted based on existing policy and legislative requirements in response to a proposal from a commercial company for large-scale harvesting. The characteristics of the system indicate multi-level governance with multiple action situations operating and interaction between levels. Formal and informal institutions interacted to produce rules which resulted in an *ad hoc* change of the governance system responding to a proposed activity with highly uncertain social and ecological effects. Though parallel action situations proceeded simultaneously, the parliamentary process at AS4 produced the strongest outcome in the shape of a specific legal rule addressing (and ultimately restricting) kelp harvesting activities. Through this legislative process, the governance system was thus redesigned in response to social feedback. The timing of the progress of the bill alongside the regulatory process provided a ‘window of opportunity’ for societal influence via political processes of lobbying elected MSPs and elicited a governance response at the highest level.

#### 6.4.1 Adaptive governance during regime development

The power of individuals and networks they form in influencing governance, particularly where a gap is apparent, is indicated in this case. The highest collective-choice level (AS4) was dominated by political processes shaping the parliamentary process of law-making. The ENGO and social media campaign was highly influential on democratically elected MSPs, the debate and in determining the outcome in the shape of legislative amendment. Significant self-organisation was evident, supported by individual leadership which built trust and mobilised networks, including national and international support. Shadow networks (Österblom & Folke 2013) were observed as operating, including campaign groups, who supported each other's message and campaign efforts, in engaging with AS1 and particularly, AS2. Using social media, actors connected with like-minded individuals which led to the emergence of an informal social network and, building a powerful narrative around impacts of kelp harvesting, exerted social and political pressure to prevent kelp dredging. These groups gained formal legitimacy by influencing legislative development and policy change (Ibid.) and lobbying from 'grass roots' and citizens directly into elected MSPs. This created an outcome which redefined the governance system and may subsequently change the regulatory process based on the on-going review. The 'success' of influence on the highest collective choice level in the development of the SCE Act (AS4) of lobby groups and particular interests, together with an increase in the development of new legislative instruments, suggests that this activity might increase in the future.

AS4 demonstrated processes of interaction between the *formal* and *informal* political sphere, as distinguished by Habermas (1996), where the 'chaotic' and spontaneous civil society, operating through networks, voluntary organisations and the media, is directly influential on the formal institutional arenas of communication and interaction, which are designed to take decisions. The parliamentary process was shown to be 'porous' to the input of civil society, via established channels and opportunities for influence, indicative of a well-functioning political system where policies and laws are informed by civil society and public opinion (and hence deemed legitimate) (Ibid.).

However, while the process and debate in parliament indicated a wide variety of values and norms and demonstrated a governance response to societal concerns, the adoption of the amendment can be criticised for not taking a *balanced* view of available evidence (including science and of socio-economic effects, negative and positive), and with insufficient opportunity to debate the amendment. Mechanisms weren't available to consider knowledge and evidence in a balanced way and to debate and negotiate the risks and benefits, and sharing of knowledge and analytical deliberation to enable adaptive governance was limited in the process.

Further, considering the outcomes in terms of a learning-based approach, while a ‘hard back-stop’ the amendment is difficult to address and is potentially *maladaptive*, as it cannot be revisited in light of new circumstances or knowledge. The amendment precludes a future adaptive approach which could enable consideration of risks and benefits on a small, context-specific scale, as was considered by some actors (and could be supported by other provisions in the SCE Act supporting community-scale management of leasing of assets). This conflicts with the wider aims of the SCE Act which supports such an approach and concerns are documented regarding the potential for socio-economic benefits which may have been missed, and as conflicting with the objectives of CES to enhance value of CES assets, as well as with national policy in the NMP detailing a ‘presumption’ in favour of sustainable development. The outcomes of AS4 prevents decisions being made, including at local scale, based on the relative merits / disadvantages in particular settings. This could be pertinent since distribution of kelp is predicted to increase in oceans of higher acidity (Chung et al. 2013) as associated with climate change in Scotland and might lead to a larger resource and socio-economic opportunities (Chapter 5). Further, the deterring of further ‘science-based’ industries suggests a negative outcome for on-going adaptive governance and learning-based approaches.

The regulatory process (AS1) focussed on the availability of scientific evidence of ecological effects and indicated a learning-based approach to reducing uncertainty through an established managerial approach, rather than banning the activity or indicating a need for regime change. Although wide-ranging concerns were articulated in consultation responses these were not ‘material’ to the response provided by the regulator, which articulated recommendations for a phased approach to development through the existing licensing regime in order to comply with conservation legislation in future applications (a regulatory position which fundamentally remained the same as articulated to MBL in 2015). No change is indicated in the regulatory approach over time and a scientific, rational approach based on ecological protection and reduction of uncertainty is maintained. The regulatory process did not directly prevent future development at this stage but addressing legal requirements would be difficult (discussed further in Section 6.4.2).

While indicating some attributes of adaptive governance at system scale, including self-organisation operating in response to multiple decision-making arenas and broad participation, there is poor co-ordination between them, as also indicated by the concern of MSPs regarding the process, and complexity is indicated in overlapping legislation including the SCE Act 2019 and the Marine (Scotland) Act 2010. The recent developments suggest a lack of integration and potential conflict between the private property management regime and the regulatory process in kelp management, as was stated

during parliamentary debates. The design of kelp management based on the government-led review will be important in determining the coherence of the regime in the future.

#### 6.4.2 Feasibility of adaptive management for future kelp management

Through AS1 and AS4, the need for adaptive, learning-based approaches was raised in line with a precautionary approach to high uncertainty regarding ecosystem impacts. The outcome of AS4 dominates the future of kelp management and largely precludes such approaches (along with significant public opposition), however the potential for adaptive management of different forms within marine governance in Scotland is illuminating. Based on analysis of the development of the regime for governance of seaweed harvesting, different methods of operationalizing adaptive governance can be distinguished from the debate, representing different approaches to uncertainty, risk and accountability. These include: licensed adaptive management (phasing up of commercial development); strategic learning at national scale, experimental, non-commercial pilots and adaptive co-management based on community-based models. These are shown to have different levels of feasibility and constraints, as outlined in Table 6.4. These are described below and the feasibility of each is considered in light of new and existing legislation and the outcomes of the action situations.

Table 6.4 Feasibility and constraints on different types of adaptive management raised during AS1 and AS4

Type of adaptive management	Main features	Feasibility and constraints on implementation
<p><b>AM1: Adaptive management – phasing up of commercial development</b></p> <p>Lead actor / owner: Industry / Government</p>	<p>Phased approach where a license is granted, monitoring undertaken to inform harvesting expansion (through further licensing), e.g. Meygen tidal energy array.</p>	<p><b>Feasibility</b></p> <ul style="list-style-type: none"> <li>• Possible through regulatory process as no flexibility in decision-making required.</li> <li>• Risk / costs borne by industry and public authorities respond as required</li> </ul> <p><b>Constraints</b></p> <ul style="list-style-type: none"> <li>• Scientific uncertainty in establishing baseline, establishing thresholds and predicting impacts to gain initial license.</li> <li>• Costly (risky) for industry as no guarantee of future expansion of activities</li> <li>• Difficult in monitoring to detect change at ecosystem scale and in defining intervention criteria</li> <li>• Public support unlikely given lack of government policy support</li> <li>• Costs of independent group for evaluating monitoring reports</li> <li>• Commercial development precluded by Amendment</li> <li>• Negative public opinion</li> </ul>
<p><b>AM2: Adaptive management within license (by industry)</b></p>	<p>License is granted for a large operation, with an Adaptive Management Plan agreed as part of mitigation with monitoring</p>	<p><b>Feasibility</b></p> <ul style="list-style-type: none"> <li>• Possible through regulatory process as no flexibility in decision-making required (regulatory process proceeding as currently with sequential licensing decision processes).</li> </ul>

<p>Lead actor / owner: Industry</p>	<p>of harvesting activities to ensure approach is 'sustainable' based on independent review of monitoring results, for example by a multi-agency Environmental Steering Group.</p>	<p><b>Constraints</b></p> <ul style="list-style-type: none"> <li>• Scientific uncertainty in establishing baseline and predicting impacts to satisfy regulatory requirements for initial harvesting license.</li> <li>• Feasibility (and cost) of monitoring and detecting change at ecosystem scale.</li> <li>• Lack of any intervention criteria, or what the intervention (in terms of mitigation or restoration) would consist of.</li> <li>• Costs of monitoring and independent review.</li> <li>• Negative public opinion</li> </ul>
<p><b>AM3: Strategic adaptive management</b> (learning-based approach co-ordinated at national scale)</p> <p>Lead actor / owner: Government</p>	<p>Co-ordinated by government, opportunities for small-scale commercial development identified based on improved understanding of national resource.</p>	<p><b>Feasibility</b></p> <ul style="list-style-type: none"> <li>• Less risk / cost to industry</li> <li>• Effective strategic innovation models supported by government e.g. Offshore Renewable Energy Catapult enabling collaborative research funding.</li> <li>• Capacity for strategic planning and understanding resource at national scale</li> </ul> <p><b>Constraints</b></p> <ul style="list-style-type: none"> <li>• Unclear government policy in relation to the sector making strategic investment unlikely</li> <li>• Likely negative public reaction</li> <li>• Scientific uncertainty</li> </ul>
<p><b>AM4: Experimental, pilot, trial, demonstration project.</b></p> <p>Lead actor / owner: Public / community</p>	<p>Non-commercial; aim to reduce uncertainty; collaborative / community-based; costs either industry or collaborative to pool resources; to precede any industrial development; purpose: to test a range of techniques and understand impacts.</p>	<p><b>Feasibility</b></p> <ul style="list-style-type: none"> <li>• Learning-based approach</li> <li>• Community scale would engage local stakeholders</li> <li>• Legally possible under amendment as a 'non-commercial' harvesting activity and for research purposes</li> </ul> <p><b>Constraints</b></p> <ul style="list-style-type: none"> <li>• Costs – of project and monitoring</li> <li>• Long lead-in time for commercial development (and commercial harvesting which removes plants remains precluded by Amendment.</li> <li>• Negative public reaction already indicated to pilot study</li> </ul>
<p><b>ACM5: Adaptive co-management</b></p> <p>Lead actor / owner: Community / CES</p>	<p>Community-based management of leasing of CES assets to develop a project at small scale. Similar to above but also includes devolution of management rights to make decisions (e.g. on leasing seabed for seaweed harvesting) at local scale.</p>	<p><b>Feasibility</b></p> <ul style="list-style-type: none"> <li>• Understand risks and benefits at local scale</li> <li>• Reduce monopoly by large companies and increase local benefits and revenue</li> </ul> <p><b>Constraints</b></p> <ul style="list-style-type: none"> <li>• Likely negative public reaction</li> <li>• If 'commercial' and removing plants then precluded by Amendment</li> </ul>

**Adaptive management (of commercial development – AM1, AM2, AM3)**

The regulatory process analysed in AS1 predominantly framed the issue of developing kelp governance as an adaptive management problem, based on scientific uncertainty regarding ecological effects. This maintains the view that based on current science, there is likely to be some harvesting

activity that is sustainable, and that increasing scientific knowledge on ecological effects would inform this threshold and support the decision-making process. A phased approach is recommended by the regulator, where knowledge is gained regarding ecological effects from harvesting smaller areas, before scaling up to operations in other areas. A harvesting plan would be required, supplemented by monitoring to report on recovery and justify on-going activities based on scientific assessment.

However, a license would still be required for any commercial activity, with consultees satisfied that the strict conservation requirements and other regulations or policy are not contravened. This would in effect be a situation of sequential licensing, with each application and decision (a separate legal event) informed by the monitoring undertaken at earlier sites with sufficient time and investment to enable this learning. In this way, no flexibility is indicated in the licensing regime itself, with learning built upon previous applications in the way that any new application builds on prior. Although an 'Adaptive Management Plan' is discussed in AS1, justification would still be needed from the developer that the risk of negative impacts is at an acceptable level to obtain a licence, and the problem of high certainty at the point of decision-making remains.

In the regulatory process, 'adaptive management' is therefore somewhat misleading since it does not represent flexibility in the decision-making process for the purpose of learning (so-called "a/m lite" - a watered-down form of adaptive management agencies use to play it safe" (Craig & Ruhl 2014, p.10). Such an approach represents the *status quo* and is compatible with the Marine Scotland Act 2010, which does not contain provisions for adaptive management, but defines a licensing process (which can be undertaken repeatedly). Therefore 'adaptive management', although supported by policy in Scotland's NMP to take account of changing demands and new information, is indicated here as being incompatible with legislative requirements at the level of management. This includes in particular the highly stringent requirements of conservation legislation and a precautionary approach means that licensing decisions cannot acknowledge (scientific) uncertainty in relation to ecological effects, in order to be legally sound. As set out above, under the Habitats Regulations, a competent authority must not license kelp harvesting unless it can be demonstrated beyond reasonable scientific doubt (using appropriate assessment) that the plan or project will not adversely affect the integrity of a Natura site, a target it is unlikely to be able to satisfy. A key barrier to adaptive management therefore remains the uncertainty in predicting ecological effects to a level which will satisfy licensing requirements, and the amendment to the SCE Act which introduces further stringent measures since demonstrating re-growth of individual plants is very difficult. Accommodating uncertainty for the purpose of learning is incompatible with conservation legislative requirements and the use of adaptive management is limited in legal regimes which require a high level of certainty during

decision-making and which has constrained its use as a management tool in other countries (Craig & Ruhl 2014). By limiting adaptive approaches in the face of uncertainty, the stability of such regimes over time is in question particularly in light of climate change effects (as explored in Case Study 2). Policy addressing goals of preservation and conservation are of limited substantive legal adaptive capacity and are less able to adapt to changing conditions (Camacho & Glicksman 2016) with some suggesting that climate change is likely to increasingly require the overhaul of overall management goals for particular species and ecosystems (Craig & Ruhl 2014).

#### *Experimental approach (AM4)*

In much adaptive governance literature, adaptive management takes the form of experimentation, including pilot projects or trial initiatives which were later ‘up-scaled’ or adapted following early results (Sharma-Wallace et al. 2018). A non-commercial, experimental-based approach led by public agencies to gather evidence on impacts of seaweed harvesting at a small scale before advancing the industry with further applications was raised by actors in responses to AS1 and AS2. This represents a different form of adaptive management reflective of “planned experiments” (Craig 2019) but led collaboratively between public/private actors. Such a pilot was also indicated as appropriate in some consultee responses / representations (including CES), although was not included in the formal advice from the regulator. This project would also require licensing but may satisfy the SCE Act by not being for commercial gain and could provide an opportunity for collaborative engagement in the design of the project.

However, scaling up from an experimental approach to commercial development would still be prohibited under the SCE Act, given the amendment. Further, while it was suggested that the industry could innovate and address the amendment through other techniques which demonstrate regrowth and recovery, the process and debate was indicated as a deterrent to the industry, particularly considering the increased costs for ‘early movers’ in a new industry and the difficult situation of being able to secure investment for a suitably large project, but with significant costs and uncertainty on how the initial test will proceed, and expansion (if any) thereafter (Burrows et al. 2018). The implications of the amendment and the little flexibility it offers was also considered likely to deter the industry from investing in Scotland. Therefore, while a learning-based approach is indicated, placing primary emphasis on the derivation of further scientific evidence on the ecological effects of kelp harvesting, the feasibility of this in practice is limited by the new SCE Act.

### *Adaptive Co-Management (AM5)*

Mechanisms for enabling community-based management of kelp harvesting, including trials, was raised in consultation responses to AS1 and the debate in AS4 and there was indication in the debate that involving stakeholders in the design of an adaptive management plan would have been preferable. Community-based management is enabled in principle through the SCE Act which provides potential for devolution of management<sup>195</sup> of assets and changing ownership models based on principles of subsidiarity. This provides the basis for future devolved, community-based management arrangements for CES assets, including kelp, and which may be more adaptive to local conditions and concerns. Such a model is in line with adaptive co-management: flexible, localised community-based systems of resource management (Folke et al. 2005). The scale of the proposed harvesting was evidently significant and the debate might have proceeded differently if taken forward as a local scale, collaborative project, where learning can take place, according to specific context, where what is meant by ‘sustainability’ and the balancing of different interests, conflicts, impacts, etc. can be evaluated and negotiated on a site-specific basis. However, the amendment as an outcome of AS4 means that opportunities for small-scale, locally-led (commercial) initiatives, based on the relative merits / disadvantages in particular settings, which could lead to different outcomes are ruled out. This conflicts with the wider aims of the SCE Act which supports such an approach and concerns are documented regarding the potential for socio-economic benefits which may have been missed and as conflicting with the SCE policy to enhance value of CE assets and national policy in favour of sustainable development outlined in the NMP.

Any application, of any size, is also likely to face significant public objection (and the proposal for a pilot / trials is already facing strong opposition<sup>196</sup>). The narrative around kelp harvesting developed through the campaigns will likely sustain and affect perceptions of the activity, regardless of scale (and is suggested by problems with indicated trials) and the mobilised debate and a motivated public and evident self-organisation creates informal rules and norms which will influence industry and future development applications.

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<sup>195</sup> Note difference between *leasing* and *management* in terms of Crown Estate Scotland assets.

<sup>196</sup> A work plan released by the Marine Scotland says that “field trials” assessing the “sustainability of mechanical harvest of seaweed” are scheduled to begin in July 2020, however in response to public reaction, now state that: “No trials have been commissioned or are planned to mechanically harvest kelp” although they are not ruled out based on desk studies.  
<https://www2.gov.scot/Topics/marine/seamanagement/seaweedrev>

## 6.5 Conclusion

Focussing on kelp as a new sector and the significant debate associated with a controversial application which led to changes to the governance system, provided insight into dynamics at system scale, the mobilisation of different actors, and how these interacted in AS at different levels of governance. The process of development of governance proceeded rapidly and indicates regime change in response to societal concerns and self-organisation of actors in response to a 'window of opportunity' (Olsson et al. 2006). This governance system is developing within a 'policy vacuum' with a lack of policy to guide the law-making process or regulatory decision-making. Co-operation between organisations and mobilisation of informal networks is evident in shaping outcomes and influencing governance system design at the highest level of collective choice during legislative development. However, while widely considered a success and providing ecological protection of an important habitat, analysis of the process indicates a system which is of low adaptive capacity and systemic problems remain which suggest limited potential for adaptive governance.

The debate was varied and indicated a wide range of concerns and opinions, however, the amendment in the SCE Act presents a legal barrier to future adaptive governance of kelp harvesting and a legislative decision which cannot be amended in light of changing circumstances if new evidence or ecosystem changes were to occur and potentially 'maladaptive' (Soinnen & Platjouw 2018). The process and outcome also prevented reflection on the system itself with no change in underlying norms or "altering of assumptions underlying a particular system, including values and logics" in institutionalisation of adaptive governance (Eshuis & Gerrits 2019, p.5). A tension is indicated between a new Act which seeks to increase the consideration of a wider range of outcomes in decision-making and promote different forms of governance including community-based models of ownership, and a governance process which was shown to be resistant to this type of thinking, maintaining a highly managerial approach and preventing further negotiation that can be adjusted in changing circumstances. This sustains a 'command and control' narrative based on reduction of (ecological) uncertainty with provisions based on a scientific approach, excluding social values or adaptive approaches with limited room for interpretation, negotiation or learning regarding values, priorities or understandings of risk (Jentoft & Chuenpagdee 2009; Hurlbert & Gupta 2016). Dominant positivist approaches are "philosophically 'backward looking'" and misaligned with adaptive planning and 'forward-looking' approaches which are necessary to handle new and unexpected future conditions (Nagel 2005, in Nelson et al. 2008, p.590).

A range of adaptive management approaches were considered within respective action situations to address uncertainty in the expansion of a new industry, however, the adopted amendment precludes

future development through adaptive management. Any potential model of adaptive management would also remain contingent on the regulatory process which as analysed is indicated to be of low adaptive capacity. While provisions for adaptive governance exist, these are in conflict with the dominant regime which remains inflexible for learning purposes, particularly in relation to conservation legislation. The potential for co-existence between hierarchical, centralised approaches and the smaller-scale modes of adaptive governance (Berkes 2002; Ostrom 2010) is shown to be limited in this context. The overlapping processes indicated a lack of coherence in the system which further contributes to low adaptive capacity in governance.

## Chapter 7. Discussion: Adaptive governance in Scotland's system of marine governance

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### 7.1 Introduction

In this overarching discussion, findings from the case studies are brought together to provide insights into the adaptive capacity of marine governance in Scotland and to situate marine planning in relation to the broader governance regime. The initial case study (Chapter 4) focussed in-depth on the regional marine planning (RMP) process in Scotland, noting that RMP is developing within an existing governance system which it is influenced by and seeks to influence. This juncture emerged as important in understanding the outcomes of marine planning in terms of its integration with, and influence on, other decision-making domains. The subsequent case studies (Chapters 5 and 6) provided opportunity to examine the same marine governance system from different perspectives and interventions, bringing focus to wider institutional dynamics. This chapter does not seek to repeat the detailed findings described in the preceding chapters and instead discusses the learning from across the cases in terms of adaptive governance in Scotland's system of marine governance, and considers the implications of the findings for marine governance more widely. This discussion is comprised of the following sections:

**7.2 A model of marine governance in Scotland:** A system model is presented based on the SES framework, to locate the case studies within the Scottish governance system and understand how they interrelate.

**7.3 Adaptive capacity in marine governance in Scotland:** Section 7.3 presents an overview of the results of the cases in relation to the four-dimension analytical framework for adaptive governance. This was used to evaluate the case studies and is considered further to understand the implications for adaptive capacity at several scales of governance.

**7.4 Challenges and opportunities in the institutionalisation of adaptive governance in Scotland:** This section focusses on the observed tensions in institutional change towards adaptive governance and makes recommendations on how these may be addressed.

### 7.2 A model of marine governance in Scotland

Governance was defined in Chapter 2 (Section 2.2.1) as consisting of the structures and processes by which people in societies make decisions and share power (Folke et al. 2005), recognising the role of formal and informal institutions, governmental and non-government actors in producing policy and

management outcomes. Marine governance represents a subset of environmental governance, i.e. the part of the social system that mediates societal interaction with the sea and use of marine resources. These social systems are subject to shifts, including ecological change, economic and financial crises, or political and policy changes, to which governance requires flexibility to respond, i.e. adaptive governance.

In this thesis, focus is brought to marine governance in Scotland and its response to:

1. A new governance instrument (marine planning), intended to improve management of marine resource use within the context of social-ecological uncertainty and change (*Case Study 1 - Chapter 4*).
2. The effects of climate change on a particular sector, i.e. aquaculture, and the need to enable adaptation to support ambitious national policy for growth (*Case Study 2 – Chapter 5*).
3. A new industrial activity (seaweed harvesting) with highly uncertain social and ecological effects and for which there is no procedure or precedent (*Case Study 3 – Chapter 6*).

The social ecological systems (SES) framework (introduced in Chapter 2, Section 2.2.2) enabled construction of a model for understanding and analysing Scottish marine governance as a mixture of institutional arrangements across different scales and the interplay between them. These arrangements are observed through the interaction between actors in Action Situations (AS) at different levels (Fig. 7.1). The model that is presented uses common terminology and definitions in interpretation (e.g. of outcomes, processes, interactions and actors) in line with McGinnis (2011) and McGinnis and Ostrom (2014) and supports synthesis of the learning from across the cases within the overall system. In Scotland, the governance system is defined by a democratic regime, composed of a constitutional level which defines rules (and the processes by which they can be changed), a system of primary and secondary legislation, and private property arrangements (for example through private landowners and Crown Estate Scotland). This governance system defines the rules and setting of the AS, including the information used and who can participate in them. Different levels of governance are represented by AS at both the operational level and higher levels where the development of collective-choice rules take place, including the debating of new legislation in Scottish Parliament, the MPPs, and the licensing of specific activities which leads to operational outcomes in the physical world. These AS exist and operate simultaneously within a broader system, interact dynamically and are subject to exogenous forces. The AS described in this system in Fig. 7.1 represent different levels of collective-choice arenas relevant to the study of marine governance, which inform each other and to which the case studies relate, i.e.:

- AS4 - The development of primary legislation through Scottish Parliament, and the analysis focused specifically on the development of the Scottish Crown Estate Act 2019.
- AS3 - The development of national policy, primarily undertaken by Scottish Government and based on government priorities, e.g. Scotland’s National Marine Plan and Scotland’s Second Climate Change Adaptation Programme.
- AS2 - Strategic planning processes including regional marine planning.
- AS1 - The licensing of marine activities through the regulatory process appropriate to specific activities.

Fig. 7.1 presents the conceptual model of the Scottish system and how the AS investigated interrelate within a system of polycentric marine governance. An additional AS (AS0) was identified through the analysis and represents the community-based CES Local Pilot Scheme which emerged as relevant to the study of adaptive governance in the system.

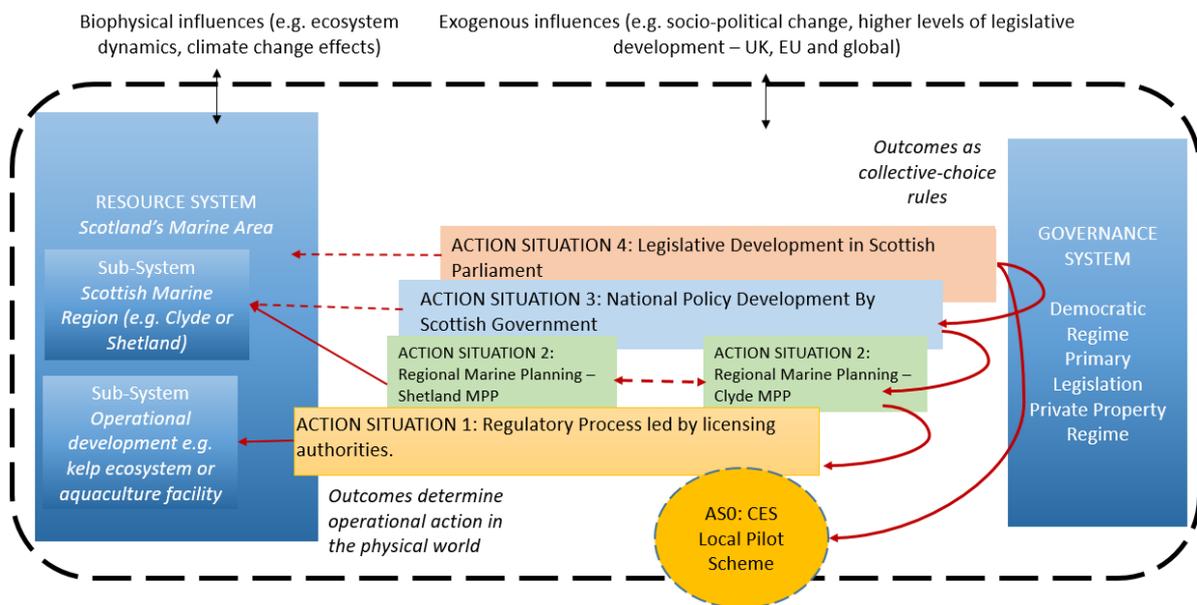


Figure 7.1 Overarching model of marine governance in Scotland based on the SES Framework.

The cases are highly related and interact within a single system of marine governance, shaped by a single set of constitutional rules, policy and legislation and responding to external factors such as climate change and constitutional uncertainty. There is a general ‘downward’ hierarchical influence (defined in law) from the development of legislation, for example the Marine (Scotland) Act 2010, which defines the requirements for the development of Scotland’s National Marine Plan (AS3) and the regional marine planning process (AS2), along with the procedures for licensing marine activities (AS1), which are to be guided by marine planning. There are also, however, complex interactions between levels as explored in the case studies. As an integrated and holistic governance instrument,

marine planning must respond and address emerging challenges including changing ecological conditions and new activities (Halpern et al. 2012). Regional marine planning (Case Study 1) in Scotland is thus required to play a role in climate change adaptation including of marine activities (Case Study 2) and to steer the development of new activities (Case Study 3), alongside existing uses, priorities and concerns at regional scale. Applying the SES framework shows how interactions and outcomes at different levels of analysis are connected to each other, influenced by the rules defined through previous and concurrent collective choice processes (McGinnis & Ostrom 2014). While each study primarily focussed on one or more AS, each provided information on policy processes across the system.

In line with an adaptive governance approach, developing a model based on the SES framework supported focus on the different dimensions of governance, including: the role of actors and interaction processes; the structural side of governance - the 'rules of the game' that shape the interactions of actors; and policy formulation and implementation, including the instruments used and political steering towards outputs (Lange et al. 2013). As the interventions and responses identified are at an early stage, the aim was to investigate the processes of governance rather than the extent to which the outcomes address social justice or ecological criteria (and which requires important future analysis – see Chapter 8, Section 8.3.1). As explored in Chapter 2, adaptive governance at system scale requires “the legal and administrative arrangements to enable flexibility and responsiveness; institutions need to learn, problem-solve and connect across diverse stakeholders and knowledge bases; and the politics need to be managed to ensure transparency, legitimacy and accountability for decision-making” (Hasselman 2017, p.42). Importantly, this relies on cross-scale linkages alongside flexibility and diversity, to integrate government-led and self-organised governance (Côte & Nightingale 2011). Considering multiple AS at different scales supports understanding these qualities in a system of marine governance, the challenges that are faced and how these may be addressed.

The model is a construct that simplifies the highly complex patterns of interactions within and between structure and agency in marine governance, but it has proven able to accommodate important interactions and supports analysis of adaptation and adaptive capacity at several levels of governance. A novel contribution is made in taking a broad view across a marine governance system and supports understanding responses to specific drivers and the role of specific interventions, including a new marine planning process. Such investigations are particularly useful in informing policy choices, understanding enabling conditions and the design of environmental governance (Plummer et al. 2017).

### 7.3 Adaptive capacity in marine governance in Scotland

The case studies were analysed using a framework based on the four key dimensions of adaptive governance as described in Chapter 2, Section 2.3. A dynamic social context is creating ‘windows of opportunity’ (Olsson et al. 2006), supporting institutional innovation and new governance practices in Scotland at different scales. These circumstances directly and indirectly support change towards adaptive governance and this research provided opportunity to consider how they intersect across the system of marine governance. Conditions favourable to adaptive governance are found in existing and emerging institutional arrangements and Table 7.1 summarises how each case provided insights into the occurrence of these dimensions in Scotland’s marine governance system. A number of challenges were identified (identified in grey in Table 7.1) and are considered further in Section 7.5, as important constraints and tensions in the development of adaptive governance in response to these opportunities.

1 Table 7.1 Summary of results in relation to the analytical framework based on the four key dimensions of adaptive governance (D1 – D4)

Dimension	System	Case Study 1: Regional Marine Planning	Case Study 2: Adaptation to OA	Case Study 3: Management of Kelp Harvesting
D1: Polycentric and multi-layered institutions	<p>Increase in collective choice arrangements. Polycentric governance deliberately introduced through legislative changes<sup>197</sup>, promoting nested arrangements across scales. Dynamic policy context acting across system creating 'windows of opportunity' (and increasing).</p> <p><i>Cross-scale linkages not yet effective. Barriers identified to wider institutionalisation of adaptive governance.</i></p>	<p>MPPs present a new collective choice level at regional scale with delegated powers for marine planning. Nested arrangements with legal legitimacy, economic incentives and policy oversight by national government. CES Local Pilot Scheme identified as a potentially new ownership model with management powers for asset/s in a particular location.</p> <p><i>Lack of specificity in national policy. Vertical interplay between national government and MPPs complicated. Collaborative inertia in collective policy-making in the complex region of the Clyde. Increased complexity and bureaucracy. Limited role in regulatory decision-making.</i></p>	<p>CCAP emphasising 'locally-led' approaches to adaptation in line with government's 'Place Principle'. National Forum defined in CCAP to support local adaptation efforts. NMP details requirements of MPPs in addressing adaptation. Legal basis for AMAs which could be used to consider adaptation.</p> <p><i>Regional marine planning not referred to as a delivery mechanism for adaptation in national adaptation policy (CCAP).</i></p>	<p>Highlighted importance of collective-choice level interactions during the development of primary legislation. Window of opportunity for regime change presented by legislative development.</p> <p><i>Multiple levels but poor coherence between the parliamentary process of legislative development (AS4) and regulatory process (AS1).</i></p>
D2: Participation and collaboration	<p>Policy changes / reform focussing on community empowerment and local governance. New arrangements supporting increased participation / collaboration between different actors.</p> <p><i>Proliferation leading to stakeholder confusion, increased transaction costs and capacity concerns. Democratic functioning at local level complicated.</i></p>	<p>Extensive participation and collaboration enabled through MPPs. Evidence of trust-building and learning in marine planning. Specific effort on civil society engagement including public dialogue.</p> <p><i>Very context-specific with higher social capital in Shetland while 'adversarial' in the Clyde. Difficulty in engaging 'community' in the large complex region of the Clyde. Underlying conflicts not necessarily addressed</i></p>	<p>New OA Sub-group supporting collaboration between a range of actors. Measures set out to support climate literacy and enhance participation. MPPs providing a collaborative process for considering adaptation options at regional scale. Stakeholder workshop supported science / policy interaction.</p> <p><i>Difficulty engaging industry due to other pressing issues and uncertain local effects.</i></p>	<p>High participation in both regulatory and legislative arenas. Strong influence of civil society leading to the amendment in the Scottish Crown Estate Act 2019 restricting harvesting activity.</p> <p><i>Concern that the campaign was emotive and insufficiently informed including regarding socioeconomic effects.</i></p>

<sup>197</sup> Including the Scottish Crown Estate Act 2019, Planning (Scotland) Act 2019, Islands (Scotland) Act 2018, Marine (Scotland) Act 2010, Community Empowerment (Scotland) Act 2015 among others.

	<i>Different attitudes to change and adaptability among participants.</i>			
D3: Learning, innovation and ability to adapt	<p>Innovation, pilots and experiments in governance explicitly promoted. Multiple iterative review processes.</p> <p><i>Disconnect between innovative practices and wider regime. Greater reflexivity on process needed. Underlying low adaptive capacity of legislative instruments constrains new approaches. Balancing flexibility / stability difficult.</i></p>	<p>Phased, learning-based approach to marine planning based on initial pilot projects. Formal review procedures to review the NMP every 3 years and RMP at least every 5 years. Social learning indicated through engagement in MPPs. Learning between MPPs and stakeholders at national scale.</p> <p><i>Greater reflexivity deemed necessary. Review procedures as yet not defined, infrequent and links to NMP review not clear. Uncertain funding for review and adapting. Diversity in approaches across the regions potentially a problem. Existing regulations constraining adaptive approaches to regional issues through marine planning.</i></p>	<p>Substantive goals explicitly addressing adaptation. CCAP: Iterative process, annual progress reporting and revision every 5 years. NMP reviewed every 3 years and RMP reviewed at least every 5 years. Contribution to seawater chemistry monitoring through the MCCIP</p> <p><i>Currently poor integration between learning-based mechanisms at different scales. Limited flexibility in regulatory processes for adaptation responses at the level of livelihood adaptation.</i></p>	<p>Highly dynamic process with governance evolving rapidly in response to proposed activity and societal concerns. Different types of adaptive management raised in debate including non-commercial experiment, community-based project, industry-led phased development, strategic (national) government-led process.</p> <p><i>Dominant regime constrains adaptive approaches, with experimenting fundamentally incompatible with conservation legislation. Adopted amendment precludes any commercial development. Public opinion likely to deter any project.</i></p>
D4: Self-organisation and supporting activities	<p>Highly active individuals and networks across the system. Leadership evident.</p>	<p>Strong leadership of the MPPs including sourcing of funding for marine planning activities beyond formal mandate. Self-organisation evident with 'spin-off' collaborative projects e.g. addressing marine litter in the Clyde.</p> <p><i>Some networking of environmental interests perceived as affecting democratic functioning.</i></p>	<p>Establishing new groups supports development of leadership and self-organisation in adaptation. AMA explicitly defined by FAO as supporting self-organisation between industry stakeholders. CES identified as an actor of high adaptive capacity.</p>	<p>Public campaign evidence of significant leadership and networking between individuals and groups operating across scales to influence governance.</p>

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In Scotland, governance is shown to be evolving from a strongly hierarchical and ‘top-down’ approach to a more diverse mixture of arrangements, including through marine planning and changing ownership models under the Scottish Crown Estate Act 2019, both of which specifically address marine resource management. This is happening alongside cross-government promotion of localisation, community empowerment and flexibility based on wider policy and legislative drivers including the Community Empowerment Act 2015, Climate Change Adaptation Programme<sup>198</sup>, the Planning (Scotland) Act 2019<sup>199</sup> and the Islands (Scotland) Act 2018, informed by other government-led initiatives such as Scottish Government’s Local Governance Review<sup>200</sup>. Institutional reform in natural resource management is therefore indicated through greater emphasis on new models of management and ownership, enabling development of locally developed ‘rules’ to govern resource users and represents a shift towards adaptive governance, supported by new legislation and public policy.

As demonstrated through the case studies, the resulting changes in management of coastal and marine resources are promoting increased polycentricity through multiple and overlapping centres of decision-making with potential for adaptive governance. Different degrees of polycentricity are evident, with ‘weak’ polycentricity indicated through the formation of networks which seek to influence a particular issue - as in relation to the governance of kelp harvesting - and stronger forms of polycentric order such as the MPPs and CES Local Pilot Scheme which involve formal ties between key actors as well as joint projects and the evolution of rules (Galaz et al. 2012).

Changing structural arrangements are providing opportunities for participation and collaboration across AS at different levels of marine governance, including through the MPPs in developing marine planning (AS3), the CES Local Pilot Scheme (AS0), in addition to ongoing engagement opportunities through consultation processes and regulatory procedures (AS1), and public influence on legislative development (AS4). At AS4, the creation of new legislation and policy, in addition to increasing substantive and participatory adaptive capacity (as explored in both Case Study 2 and 3), provides an opportunity for influence and interaction at the highest level of governance during the consideration

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<sup>198</sup> Under the Climate Change (Scotland) Act 2009.

<sup>199</sup> During the research, the Planning (Scotland) Act 2019 was also proceeding through Parliament and also promotes a more flexible approach to planning, with a regional partnership to consider strategic planning issues, in delivery of the new City Region and Growth Deals  
<https://www.deliveringforscotland.gov.uk/investment-projects/city-region-deals/>.

<sup>200</sup> This Review is not explored in detail in this research but the emphasis on change is made explicit by Scottish Government within it: “We want to devolve more power to more local levels.” Details of the Review can be found at: <https://www.gov.scot/policies/improving-public-services/local-governance-review/>

of Bills in Scottish Parliament. High responsiveness is shown at this level (AS4), where the timing of deliberation of the Scottish Crown Estate Bill presented a specific opportunity for the development of kelp governance, as described in Case Study 3.

The cases show increasing capacity for adaptive governance, where new arrangements support local engagement and the development of rules which incorporate different perspectives and knowledge. These arrangements support analytical deliberation at different scales, nesting and institutional variety which are strategies for adaptive governance (Dietz et al. 2003) and are indicated as relevant in addressing multi-scale problems of marine governance. Proliferation of multi-layered institutions and diversity in structural attributes and processes in Scotland is suggested as beneficial for adaptive governance, where it is possible to integrate the best characteristics of government and locally evolved resource governance systems (Côte & Nightingale 2011).

Beyond emphasis on devolution to smaller scales, Scottish Government is explicitly promoting *innovation* in marine governance, with the phased approach to marine planning and the CES Local Pilot Scheme representing experimental approaches based on 'pilot' projects, to allow flexibility in design and learning from implementation in different locations and settings. While at an early stage, this indicates government intention and political support for testing and development of alternative governance arrangements that would provide greater benefits for communities and societies. Learning is evident across the system between actors, through organisational and community networks connecting them, disseminating information and lessons learned, and co-ordinating governance activities. Such changes to governance structures offer new opportunities and strategies may arise from opening "cracks" in the "existing governance landscape" (Healey 2007, in Newman 2008, p.1379) and which actors in Scotland are demonstrating agency in addressing. In transition management terms, such community-based localised experiments in policy or practice present examples of innovative initiatives or 'niches' which might support wider scale transformation (Kelly et al. 2018).

In response to the structural changes and opportunities through new legislation in Scotland, self-organisation is evident, with individual actors, networks, and organisations seen here to demonstrate capacity to be proactive and flexible at different levels of governance. Each case provided an understanding of the behaviour of individual actors and propensity for self-organisation was observed in all cases, including mobilising informal networks and revealing heterogeneous social networks of relations which shape management practices (Côte & Nightingale 2011). The key tenets of self-organisation in support of adaptive governance were observed, including: leadership - strong and

proactive leadership in the MPPs; leadership of the public campaign in influencing kelp governance; networking – including shadow networks of environmental groups operating in the Clyde and in the public campaign influencing kelp governance and lobbying of MSPs; and spontaneous collaborative initiatives - including the ‘spin-off’ projects emerging through the marine planning process. New arrangements, including the MPPs and CES Scheme, are providing arenas for innovation and the development of new partnerships and networking. These can advance development of solutions to marine governance challenges (Kelly et al. 2018). Opportunities beyond marine planning are shown to be particularly promising, recognising its potentially limited role within the wider system of marine management (Greenhill et al. 2020), as discussed in Chapter 4. However, capacity constraints and competing demands on actors were indicated as a concern for many, and although not indicated to limit their engagement currently, it is suggested as a limiting factor to the extent of involvement and ability to self-organise in the future<sup>201</sup>.

The contingent nature and potential costs of ‘windows of opportunity’ renders them, on their own, an unreliable and potentially undesirable means to adaptive governance (Sharma-Wallace et al. 2018), however, on-going constitutional uncertainty suggests that these opportunities are increasing in Scotland, and further, are aligned with policy reform steering towards local empowerment and dimensions which are supportive of adaptive governance at different scales. Looking ahead, a number of factors are observed which align with ‘crises’ - the external shocks identified in relation to panarchy theory which can lead to change in trajectory towards adaptive governance (e.g. Chaffin & Gunderson 2016). Such crises include significant and disruptive political factors which are indicated in Scotland, where on-going development of arrangements following the UK’s exit from the EU and the political disturbance of a potential referendum on Scottish independence, is occurring within the context of on-going reform described above. The trend towards increasing numbers of democratically activated citizens, and on-going reform leading to self-organisation and mobilisation of social capital, might both explain and underlie some of the current regime change, and further change may be expected<sup>202</sup>.

#### 7.4 Adaptive governance, adaptive co-management and adaptive management

Applying a dimension-based adaptive governance framework to the analysis enabled detailed analysis of these features in marine governance from different perspectives. However, as explored in Chapter 2 (Section 2.3.2), adaptive governance at system scale is proposed to encompass application of

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<sup>201</sup> Particularly considering emerging crisis such as COVID-19 (see below).

<sup>202</sup> The coronavirus (COVID-19) pandemic currently underway also constitutes a crisis with significant effects anticipated on social systems.

adaptive co-management and adaptive management within the system (Hurlbert & Gupta 2016). Each of these concepts is widely used and based fundamentally on learning and adapting to experience, however authors use these terms interchangeably and indiscriminately which creates confusion in the literature and in practical application (Hurlbert & Gupta 2016; Hasselman 2017; Soininen and Platjouw 2018). Building on Table 2.1 introduced in Chapter 2 and the work by Hasselman (2017), who draws distinction between these concepts to promote their ‘additionality’, these are considered here in relation to the constructed model of Scottish governance. Differences were identified in the levels of flexibility, accountability and processes associated with the dimensions as they were found to occur in marine governance and characterising aspects of Scottish marine governance in relation to adaptive governance, adaptive co-management and adaptive management, is helpful to understand the implications for policy and institutional arrangements, feasibility and relevance in Scotland’s governance system. Articulating the differences between the concepts in relation to how they might be observed in marine governance also supports recommendations regarding future development of practice-relevant theory (see Chapter 8).

Table 7.2 summarises the theoretical definitions as described in Hasselman (2017) and others, and which vary according to participation, scale, objectives and epistemological position, with the results of the case studies used to describe where in marine governance these concepts are most relevant.

*Table 7.2 Definitions of AM, ACM and AG and interpreting results in relation to these (green shading)*

	Adaptive Management		Adaptive Co-Management	Adaptive Governance
	Active	Passive		
<b>Summary of theoretical description from Chapter 2.</b>	Structured decision making based on definitive and iterative experiments addressing a specific issue (Craig & Ruhl 2017).	‘Learn by doing’ at the level of governmental interactions which includes structured review and refining of management approaches (Craig & Ruhl 2014; Hasselman 2017)	Flexible, localised community-based systems of resource management (Folke et al. 2005). Experiential and experimental (Hasselman 2017).	A systems approach, describing institutional arrangements within which the other approaches can be included (Garmestani & Benson 2013; Hurlbert & Gupta 2016)
<b>Participants</b> (as described in Hasselman 2017).	Government responsibility involving regulatory authorities and scientific experts.	Government-led, involving policy-makers, experts and scientists. May also include resource users and community.	Local responsibility supported by government working with local resource managers, users and community who are central.	Shared responsibility between governments, policymakers, scientific experts, lobbyists, resource managers, resource users, community and politicians.

<b>Identified level of governance in SES model</b>	Operational choice arena / regulatory decision-making where control (of activity) is high and directed at specific physical activities (AS1)	Applicable at the higher level collective choice arena of policy making, where management itself, and other government activities, are the experiments to test policy (AS2 and AS3)	Collective-choice level but with direct influence on management including operational decision making. (AS0)	The governance system and functioning of action situations at all levels. Broad focus to consider adapting to crises and exogenous forces, but can be informed by systematic processes at other scales to enable monitoring, evaluation, and adjustment of governance.
<b>Governance process identified as relevant from case studies</b>	Marine licensing and consenting processes, e.g. the phased licensing process for aquaculture facilities or commercial kelp harvesting activities.	Government strategies and regional marine planning, where guiding policies are established through MPPs and adjusted to changing community preferences, social-ecological conditions, national priorities.	CES Local Pilot Scheme (and similar) where some level of management rights is transferred, with potential for collaborative / community-based trials.	Emergent (rather than mandated) and viewed as features of the entire governance system and implemented at smaller scales, e.g. emerging in response to changing legislative requirements such as climate change adaptation.
	A government-supported strategic approach to learning for seaweed harvesting would include both active and passive adaptive management.			

Adaptive *governance* represents the broadest level of application, which can be embodied in features of the entire governance system and which supports adaptive approaches at smaller scale. Marine planning was found to support adaptive governance in informing operational decision-making, based on a better understanding of local context and participation of stakeholders. It is supporting groups in articulating the range of values and assumptions that shape governance outcomes, as is a key feature of adaptive co-management (Armitage 2008), however, it is limited in its ability to enable consideration of alternative management arrangements. Since management decision-making (including licensing and permitting processes) remains in other domains, marine planning is situated here in relation to *passive* adaptive management, where the development and implementation of regional marine planning policies could be considered as (collectively agreed) hypotheses, for example the relative location of two interacting activities in space or time or the expansion or limit of a particular activity in a region. Where policies are specific, RMP could inform a *management* experiment tested through the influence on decision-making including through the licensing process and consequent change in behaviour of local actors. However, the limitations are also evident: development of collaboratively agreed, specific policies is context-dependent (and shown to be problematic in a large and complex region such as the Clyde), and the MPPs are limited in the extent to which they can directly influence material outcomes which remain determined through other planning and licensing mechanisms. Further, the cycles of regional marine plan review and iteration represents a slow process and limits ‘responsiveness’ to learning.

Models such as the CES Local Pilot Scheme are identified as representing characteristics of adaptive *co-management*, since there is potential for transfer of property rights and (some) management powers to local, collaborative groups. This can be observed in the SES model as a new AS (AS0) and with boundary rules which admit local stakeholders and a change to the ‘rules-in-use’ concerning what may be addressed within it. The greater power to influence specific marine uses through management of CES assets<sup>203</sup> through this Scheme may provide greater authority for trialling different management arrangements, which was shown to be limited for the MPPs where planning powers are delegated but authority and management rights are not changed. However, licensing decisions for certain activities still remain taken by regulatory authorities and any ‘adaptive’ approach would remain subject to the same strict tests and limited flexibility of the licensing process (see Section 7.5.1).

Bringing focus to the licensing process, analysis of emerging kelp harvesting management process in Case Study 3 raised different types of adaptive management and adaptive co-management (Table 6.2) which are relevant at the operational level of regulatory decision-making, where decisions directly control activities in the practical world. As discussed in Chapter 6, it provided an interesting opportunity to consider the feasibility of adaptive management approaches for licensing marine activities, as discussed by stakeholders themselves. Since effects of kelp harvesting are highly uncertain, adaptive management was proposed to enable an iterative approach based on monitoring of effects and changing management in response to observed changes, in order to reduce *uncertainty* and address *imperfect knowledge* through a scientific and positivist approach (Hasselman 2017). Suggestions were made for this to be considered at different scales, with different roles of government, industry and communities, and which represent different forms of adaptive management, including collaborative and community-based non-commercial trial in line with a model of ACM. Ultimately, these were effectively ruled out by the CES amendment and accompanying debate, along with wider legislative constraints which are explored further below.

This discussion points to the need for clarity in the use of terms such as adaptive management in practice given the different forms it takes and implications for governance. In Scotland adaptive management is a principle outlined in policy in the NMP, reflecting global policy such as the Ecosystem Approach<sup>204</sup>, where it broadly refers to responding to uncertainties through science-led ‘learning by

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<sup>203</sup> The SCE Act provides for different levels of devolved ownership: the delegation of management through the CES Local Pilot Scheme and the complete transfer of asset ownership. These are not examined in detail but are relevant to future studies of changing management and governance of assets in Scotland.

<sup>204</sup> <https://www.cbd.int/doc/publications/ea-text-en.pdf>

doing' in management (passive adaptive management), yet the phrase is also used for adaptive management under the regulatory process (as discussed for the highly controlled management of kelp harvesting). At the level of national planning, adaptive management can only mean the broad principles of adaptive governance which may include 'passive' adaptive management as an iterative approach to policy implementation based on experimental interventions such as marine planning. Different models are indicated at lower scales based on increasing definition of an 'experiment' and a pre-designed, systematic approach (Table 6.2). However, barriers and tensions were identified in the system to the incorporation of different forms of adaptive management, co-management and adaptive governance and these are explored next.

## 7.5 Challenges and opportunities in institutionalisation of adaptive governance

Section 7.3 explained how the emergence of adaptive governance is supported by a dynamic policy context in Scotland. However, the case studies presented in Chapters 4-6 also indicated a range of challenges which limit the extent to which the observed changes in marine governance might support long-term institutional change towards adaptive governance. This section presents an overarching perspective on these challenges and how they may be addressed. In general, the identified challenges appear consistent with literature addressing adaptive governance and the "significant barriers that preclude systemic, transformational change" (Healey 2006, in Eshuis & Gerret 2019, p.2). This thesis characterises these barriers for the first time within Scotland's system of marine governance and supports understanding these in other systems.

Theory suggests that dimensions of adaptive governance are better able to deal with uncertainty, change and surprise. Developing governance in Scotland aspires to the ideals of adaptive governance: flexible and responsive local-scale decision-making developed through experimental processes, and incidence of adaptive governance is indicated at different levels in Scotland, as described above. A proactive approach to institutional change with political support is necessary (Kelly et al. 2018) and is evident in Scotland with extensive and increasing legislative and policy changes which promote localisation, collaboration and adaptive approaches. The governance responses analysed through the case studies remain at an early stage, which limits understanding the 'depth' of these changes at this time. However, referring again to Eshuis & Gerrits (2019), challenges are indicated which suggest limits to 'transformational' change through institutionalisation and materialisation of adaptive governance, which includes the "altering of assumptions underlying a particular system, including values and logics" (Ibid., p.5). Constraints and opportunities originating at multiple scales throughout

the SES affect shifts towards adaptive governance (Chaffin & Gunderson 2016) and common challenges are presented by existing institutions and regulatory frameworks (Chaffin et al. 2014; Olsson et al. 2006; Wyborn 2015). The 'incumbent regime' of existing policy and institutional frameworks is noted as limiting change to systems and paradigms through marine planning in particular, as has been suggested by other authors (e.g. Halpern et al. 2012; Kelly et al. 2018).

Four themes identified through the cases are discussed below and interpreted in relation to adaptive governance theory to understand how these tensions are manifesting in Scotland's marine governance. This supports understanding the role that instruments such as marine planning and other new arrangements may play, how these challenges might be addressed and to provide a focus for further investigation. These themes are:

**7.4.1** Legal adaptive capacity of the existing regulatory regime and the dominant managerial paradigm

**7.4.2** Cross-scale linkages for adaptive marine governance

**7.4.3** An argument for reflexivity in marine governance

**7.4.4** Balancing stability and flexibility in marine governance

As a dynamic system based on complex interactions between structure and agency these themes are highly interrelated, but distinction enables different insights to be made along with practical recommendations.

#### 7.5.1 Legal adaptive capacity the existing regulatory regime and the dominant managerial paradigm

We have seen how adaptive governance requires policy which has provisions for change and flexibility (Hasselman 2017) with the concept of legal adaptive capacity emphasised as critical i.e. the extent to which adaptive governance is enabled or constrained by law (Craig et al. 2017; Cosens et al. 2018). Analysis in each case identifies how adaptive governance is enabled through changing provisions and where law and policy is advancing rapidly, promoting governance which indicates dimensions of adaptive governance (presented in Table 7.1). In Scotland, polycentricity is increasing and supporting collaborative development of formal and informal rules to steer decision-making based on participation, flexibility and learning. However, institutional innovations are often introduced by adding new layers to the management structure governing SES, rather than by reforming or replacing outdated departments or practices (Olsson 2006). In marine governance, decisions on human

activities at sea are primarily taken through regimes underpinned by multiple layers of legislation and policy, which are periodically added to but rarely adapted and is shown to be a critical factor constraining adaptive governance across the cases in the Scottish regime.

In Case Study 1 there is indication that the regional approach to marine planning is increasing democratic accountability in decision making at regional scale. However, tension was identified between marine planning, which intends to support collaborative and adaptive processes, and the rigidity and lower flexibility of existing policy, planning and management arrangements which marine planning seeks to guide. Implications of marine planning for adaptive governance include the positive benefits of supporting a locally-derived process supporting learning, collaboration and collective policy-making, but the outcomes of collective policy making on decision-making remains constrained by prescriptive regulations and rational planning through which decisions are taken. *Management* authority (the direct control of human activities) has not changed and remains with other authorities in overlapping decision-making processes at different scales. This means that the ability of MPPs to consider 'alternative management options' based on trade-offs at regional scale, and to experiment and respond to learning through different management choices is limited (particularly where MPPs are affected by collaborative inertia). While demonstrated to represent a new forum enabling context-specific collaboration and innovation, the "experimentation with accountability" through marine planning (Craig 2019, p.1), which is critical for meaningful collaboration and materialisation of adaptive governance, appears constrained.

As indicated, changes under the Scottish Crown Estate Act 2019 hold greater potential for greater adaptive governance of certain marine assets given the greater level of delegation of management power, however management is also ultimately dependent on a separate licensing regime for activities such as aquaculture, seaweed harvesting or renewable energy, where a consent is required. This has wider consequences in terms of lack of stakeholder commitment and frustration with the process (potentially leading to disengagement), particularly where there is confusion over what role marine planning plays and the 'power' it has in this evolving system. Case Study 1 finds support for Craig (2019) who promotes "regulatory innovation" in marine planning in the US, to provide legal authority through polycentric management arrangements to experiment and adapt, which is relevant to the MPPs and other ownership models which may be developed under the Act. 'Experimenting' with the location of large scale infrastructure is not appropriate, but it may be relevant to consider how MPPs can consider and influence in greater detail the scale and location of certain activities and multi-use scenarios, and adapt these as required to enable materialisation of adaptive governance.

At the regulatory level, more flexibility may be needed in planning and licensing processes to better manage uncertainty, particularly given the changes posed by climate change which are increasingly destabilising regulatory contexts (Cosens et al. 2014) (shown in Case Study 2).

In Case Study 2, analysis of policy and planning indicated provisions which can support adaptation interventions for aquaculture at the level of *institutions and management* and in *resilience and risk reduction* as categorised by FAO (2018), and which are pre-emptive and wide ranging. Climate change adaptation was found to be a strong policy driver of adaptive governance and provides a critical basis for development of adaptation interventions across a range of levels (Huntjens et al. 2012). Marine planning plays an important role in the development of policies and adaptation options for sectors such as aquaculture through collaborative processes at regional scale. However, addressing *livelihood adaptation* in aquaculture is shown to require translation of the adaptability set out in planning and policy into flexibility in the regulatory process to allow adjustments at the level of operational activities. The need for specificity in the planning and consenting processes to understand environmental effects and interactions with other marine users and to satisfy legal requirements is not compatible with flexibility for on-going adaptation and response to rapidly changing ecological variables. Adaptive governance is widely promoted as essential, particularly for climate change and including as a strategy for managing adaptation of marine aquaculture, to demonstrate flexibility in marine governance (Craig 2019). However, the low adaptive capacity of regulatory decision-making at operational level is shown here to represent a constraint and suggests that different models of management that include the licensing regime are required, to provide the authority and capacity to change underlying decisions and address uncertain and continual changes on aquaculture (and other vulnerable sectors). More focus is needed on specific challenges, for example as climate change effects such as OA becomes better understood and modelling can provide more specific predictions regarding impacts to the aquaculture sector (in Scotland and elsewhere), or a particular predicted conflict in a marine planning context, to understand what deviations are necessary and the implications of these in legal terms. This is not straightforward and a balance is needed between stability in planning and flexibility for adaptation, explored further in Section 7.5.4.

In Case Study 3, specific focus was brought on the feasibility of an adaptive management approach to managing a contentious industry with uncertain implications, with different models identified in stakeholder discourse (ranging from 'scaling-up' of commercial operations, sequential licensing to collaboratively-led non-commercial pilots). The governance system was found to be 'adaptive' at broad scale with significant influence through democratic processes on the development of primary

legislation providing a high-level collective choice arena and resulted in a rapidly adopted amendment which defined a new restriction on kelp harvesting in the Scottish Crown Estate Act 2019. The debate at AS1 was informative in considering the feasibility of different types of adaptive management identified by stakeholders, and support is found for the argument of Ruhl (2010, 2012) (in Hasselman 2017) that adaptive *management* is fundamentally incompatible with current legal systems and regulatory processes which “reifies a world where agency decisions are single isolated events, not continual experimentation and adaptation” (Craig & Ruhl 2014, p.36). The ‘front loading’ of decisions and details in legislation and plans to define the boundaries of future development is required in order to demonstrate compliance with legislative frameworks, including the highly stringent tests defined in conservation legislation<sup>205</sup> (observed by governments based on the threat of judicial review) which increases risk aversion through adaptive approaches (Craig & Ruhl 2014).

However, these also serve as legal barriers to trials and pilot approaches specifically for the purposes of learning and which require some risk and uncertainty to be acknowledged at the point of decision-making and which might be revised based on learning (Garmestani & Benson 2013). All options to adapt must be pre-empted at the point of decision-making (licensing in AS1) and changes can only be made within these boundaries, with this ‘front-end’ decision-making ending subsequent deliberation on decisions and management options (hence considered ‘adaptive management-lite’) (Craig & Ruhl, 2014). In Case Study 3, conservation legislation presents a particular challenge for implementing adaptive approaches and some authors suggest that reconciling adaptive management with biodiversity protection is a major institutional challenge in adaptive governance, with overhaul of overall management goals for particular species and ecosystems potentially required in light of climate change (Craig & Ruhl 2014).

The dominance of the existing regulatory regime based on scientific, expert-led paradigms also constrains change in underlying ‘logic’ and values in governance. While marine planning and the potential for new governance models, including the CES Local Pilot Scheme, seek to address normative goals, incorporate local knowledge and enable debate at local scale on desirable sustainable development scenarios (this is the important aspect to be ‘devolved’), management decisions are ultimately not normative and are based on a scientific rationalist epistemology and taken according to defined criteria (Côte and Nightingale 2011). Reliance on expert-led processes reduces flexibility for adaptive governance (participatory, multi-level or collaborative) particularly

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<sup>205</sup> Demonstrating ‘beyond reasonable scientific doubt’ that impacts, including cumulative impacts, will not adversely affect conservation features over the lifetime of the project.

since they focus on only one type of uncertainty (scientific) (Hasselmann 2017). It is acknowledged that there is a need to balance adaptive approaches with conventional institutional responses, including strictly enforced regulations (Armitage et al. 2009; Pierre & Peters 2005), however, where such a system is dominant, underlying ideas regarding governance remain unchanged and consequently the institutionalisation of adaptive governance may be neither enduring nor transformational (Eshuis & Gerret 2019).

This research shows that enabling institutionalisation of adaptive governance in practice, including through adaptive co-management and adaptive management, justifies greater focus on the rule of law in addressing deficiencies in governance. The arguments of Cosens et al. (2017) are found to be pertinent, that “law can and, in fact, must be made adaptive to facilitate and even trigger the emergence of adaptive governance and to aid in institutionalizing adaptive governance as it emerges” (p.2) and regulations may need to be changed to make specific provisions for adaptive approaches to reconcile them with substantive law and to empower authorities and collaborative arrangements. This section has presented insights into the legal gaps, obstacles, and opportunities across the system of governance from different perspectives. In-depth legal analysis would be needed to understand these in more detail particularly as new instruments are implemented under the new legislation listed above including secondary legislation to be developed under the Scottish Crown Estate Act 2019.

### 7.5.2 Cross-scale linkages for adaptive marine governance

Experience suggests that without functional linkages in a polycentric system, the capacity to support flexible and adaptive governance is compromised (Pahl-Wostl et al. 2012; Wyborn 2015). Institutional infrastructure is important, including research, social capital, and multilevel rules, to coordinate between local and larger levels of governance (Dietz et al. 2003) and to ensure the theorized benefits of collective action and learning at a network-wide scale (Wyborn 2015). Newly formed practices that form and stabilise institutionally must spread or ‘travel’ to enable institutionalisation of rules and norms developed through adaptive governance to impact the wider system (Eshuis & Gerrett 2019).

Observing the system as a whole, Table 7.1 indicates a proliferation of collaborative arrangements and focus on enhancing adaptive approaches to different aspects of marine governance, however there is also a level of disconnect between stakeholder involvement and the learning gained through local, context-specific initiatives such as marine planning (AS2), higher level processes of policy-making (AS3) and other management (AS1). In addition to considering legal adaptive capacity described in Section 7.5.1, a gap is indicated in the studies to enable feedback which includes in-depth

evaluation of performance and experience and leading to adjustment, beyond formal review processes. It isn't clear how or if knowledge gained through experience at local scale will make its way into policy decisions and management decisions taken at higher levels and in other domains. This limits the potential for 'niche breakthrough' into the wider regime necessary for transformation (Kelly et al. 2018).

In Case Study 1, vertical interaction between national government and the MPPs was indicated as needing improvement, to address confusion among participants on the role of marine planning, promote coherence with the wider marine governance regime and support institutionalisation of adaptive governance. As experiments in marine planning and as 'catalysts for change' (Ibid.) the MPPs need to be better integrated into formal institutional frameworks and co-ordination would enable feedback and ensure that national policy making is informed by the evolving understanding of regional level concerns, opportunities, priorities, trade-offs and innovation. This is critically important to ensure the learning gained and the benefits of enhanced local governance are transferred into decisions made in the wider regime.

Results of Case Study 2 show that significant adaptive capacity is supported by development of new climate change adaptation policy along with wider policy and legislative change which is promoting change across governance. However marine issues have only recently been incorporated into national climate change adaptation policy (in the 2019 CCAP), and in this, regional marine planning is not yet identified as a mechanism for addressing adaptation. Support for adaptation interventions was identified at multiple levels however the study indicated that better integration between governance levels would enhance adaptive capacity, including between climate change adaptation, marine planning, and aquaculture planning and management, including the evolving role of Crown Estate Scotland. Co-ordination of monitoring and review processes to promote learning across scales and establishing links between existing and proposed collaborative groups would enhance development of adaptation responses.

In Case Study 3, parallel processes addressing the management of kelp harvesting were identified at different levels of governance, including the development of legislation through parliamentary debate (AS4) and the development of management in response to a specific proposal through the licensing process (AS1) resulting in different outcomes and presenting different perspectives on adaptive governance. This suggested poor integration between the development of the Scottish Crown Estate Act 2019 and was indicated to have threatened the legitimacy of the licensing process.

As both processes continue to develop (and the review of kelp management is completed) the relationship between the processes will need to be established, including in legal terms.

The major obstacles to operationalisation of adaptive governance presented by difficulties in coordinating institutions are widely discussed in the literature (e.g. Schmidt et al. 2013; Wyborn et al. 2015 and reviewed in Sharma-Wallace et al. 2018). While polycentricity is desirable, an expanding number of groups addressing overlapping issues contributes to confusion and inefficiencies, as shown in relation to marine planning. Clarity is needed to understand how they relate and the developing contribution of each to governance, to manage stakeholder perceptions and ensure efficiency in use of financial and technical capacity. This includes greater clarity regarding the legal connections between different instruments, with better linkages between adaptive processes, property rights regime and regulatory management. Such co-ordination would support the development of robust feedback loops and mechanisms for learning across scales, support meaningful collaboration and capacity development to capitalise on learning and experimentation in addressing complexity and uncertainties in marine governance including climate change. Given the crucial role of learning to ensure commitment of stakeholders and advance adaptive governance, the need for greater reflexivity across scales is addressed specifically next, in Section 7.5.3.

### 7.5.3 An argument for reflexivity in marine governance

This research supports the call for more attention on facilitating systemic learning processes in order to institutionalise adaptive governance in complex, cross-boundary and large-scale resource systems, including ‘policy learning’ to demonstrate response to management experience at smaller scales (Huntjens et al. 2012). Adaptive governance requires flexible institutions where stakeholders iteratively evaluate the outcomes of management actions, reflect and learn from them, before implementing more-informed actions (e.g. Plummer & Armitage 2007; Plummer et al. 2017). Beyond *reflection* scholars also emphasise the need for *reflexivity* meaning capacity to engage with framings of ‘the system’ which are plural, contingent and conditioned by divergent values, interests and institutional commitments (Voß et al. 2006). In this way, reflexivity can enable moving beyond the limitations of conventional planning and address coastal and marine governance as a ‘wicked’ problem (Jentoft & Chuenpagdee 2009). Strategies that feature experimentation with monitoring and evaluation need to systematically work with new experiences, altered interpretations and changed circumstances, through feedback loops and flexibility to change approaches, including structural and agent behaviour and strategies (Voß et al. 2006).

Based on this research of a system of marine governance, adaptive strategies and iterative, participatory processes were identified, including in marine planning and climate change adaptation policy, but a lack of reflexivity in considering the system beyond the outcomes of specific initiatives and connecting the outcomes of AS with decision making at other levels is evident. Evaluation of governance interventions is found to be largely lacking across the system, echoing other researchers of co-management and collaborative planning who observe evaluation to be “a general void” (Plummer et al. 2017, p.790) and reflective of “the perennial insufficiency of reflexivity in the way governance processes engage with the complex systems in which they are partly embedded, but which they are trying to shape” (Smith & Stirling 2006, p.31).

Adaptive governance requires enabling “debate about the results of governance at the core of political decision-making” with institutional arrangements and norms to promote deliberation and learning (Hasselman 2017, p.40). This should be informed by system-scale understanding of cross-scale effects, emergent outcomes and self-organisation (e.g. Plummer & Armitage 2006) as investigated here. Based on analysis across a system of marine governance, a need for greater reflexivity is indicated, in order to:

- Reflect on underlying values, continually re-negotiate normative goals and governance outcomes. This includes expression and debate regarding expectations of marine planning, the outcomes of marine planning, how conflicts are being addressed and different attitudes to risk / change.
- Enable rapid, innovative responses to changing context - between iterative planning cycles (which are infrequent and limited to ‘narrow’ evaluation of progress) to respond to social-ecological change, including crises.
- Enable transfer of learning and innovation between levels of governance. This includes ensuring that experience at local scale in new initiatives such as RMP can directly influence management responses and is reflected upon in processes of national policy making.
- Reduce stakeholder confusion in proliferation of arrangements and ensure commitment, including where processes increasingly overlap such as marine planning and other community-based planning.
- Ensure efficient use of resources and reduce transaction costs of governance, which are indicated as concern for sustained engagement and participation in new marine governance arrangements.

In marine planning this leads to an argument for enhancing evaluation processes to expand beyond specific criteria and objectives-based performance to include normative questions which enable wider reflexivity, i.e. “Where are we going? What are we trying to achieve?”, and which can incorporate and deliberate different constructions of the outcomes by participants and inform the criteria used in assessments (Steins & Edwards 1999). In Scotland, RMP provides a process for understanding the existing status of a marine region which provides a baseline for considering the results of marine planning as a new governance initiative. Reflecting on the role of marine planning in relation to wider mechanisms is needed to develop collective understanding of what is possible through marine planning and what gaps it is intended to fill, and to ensure sustained commitment (Halpern et al. 2012). Enhanced reflexivity could be supported by the wider engagement of stakeholders in evaluating *processes* in addition to considering *outcomes*, as indicated in marine planning, and through the use of tools such as scenario analysis, which could play an important role in considering alternative policy and management options including adaptation interventions for responding to climate change. In this process, scientists play a role and provide feedback on the system which can support change.

The increasing complexity of overlapping initiatives, particularly those which support new deliberative and discursive arenas, demand greater reflexivity to enable change to occur and to understand the evolving role of individual initiatives in relation to each other within the broader system of governance. Such debate can also encourage change in cognitive models of actors, recognising that adaptive governance may require a paradigm shift in attitudes to risk and uncertainty (De Caro et al. 2017), to address governance which may be sustained by current perceptions, attitudes and values. However, reflexivity in governance faces challenges which reflect those faced in addressing the balance between adaptability and stability in governance (see Section 7.5.4.) where ‘opening-up’ is needed (to understand the system context and address the plural and contingent perspectives throughout governance) but ‘closing-down’ (through selecting relevant factors, weighting of conflicting values and convergence of interests) is also necessary to enable effective governance and achieve stable strategies for action (Voß et al. 2007). It is also affected by financial resources and capacity which are essential for sustained learning, formal and informal, and upon which greater reflexivity places significant demands.

#### 7.5.4 Balancing flexibility and stability in marine governance

Section 7.5.1 discussed barriers to change and the constraints of existing policy and legislative arrangements and institutions and the need to increase flexibility and responsiveness through cross-

scale linkages and systematic reflexivity. However, it is emphasised that adaptive governance requires balancing stability in governance with flexibility adapt to changing circumstances and emerging knowledge (Soininen & Platjouw 2018) and altering this balance has implications for legal and political systems (Cosens et al. 2014). While flexibility is required, there are practical, political, and normative constraints to adaptive approaches which must not undermine the key values and principles of law and the stabilising effects of institutions. Further, adaptive governance with ‘trial and error’ or planned experiments at the level of governance or management requires understanding different attitudes to change as well as interpretation of law (De Caro et al. 2017). Multi-actor coordination and experimentation can make polycentric order more effective, however it can also create tensions between actors with different mandates and logics of operating (Galaz et al. 2012).

In analysis of marine planning, participants have been committed to the explicitly ‘experimental’ process since it was first defined as a ‘pilot’ project and now as a phased expansion of the process across Scottish Marine Regions, with self-organising and proactive behaviour evident in relation to marine planning. However, there were conflicting views on the extent to which marine planning could or should lead to change in governance, as seen in Chapter 4, and which indicate underlying tensions at the level of agency affecting change. The differences were stark between participants who considered the inertia in prevailing governance as constraining what is possible through marine planning, including “*transformative change*”(C) while others value the predictability of the existing regime and consider that adapting should take place incrementally over time, within existing legal constraints. Further, the frustration expressed that progress made collectively by the MPP was undermined by later by government intervention in the Clyde suggests the dominance of a traditional and hierarchical managerial approach which may constrain *meaningful* innovation in governance. In adaptive governance, institutions need a willingness to take risks and an ‘ability to fail’ and there are evident challenges to this within government, with resistance to change comprised of structural (and potentially also agency<sup>206</sup>) components. Policy and legislation has been created which can support experimentation in other arenas through new models of management and ownership e.g. marine planning and the CES Local Pilot Scheme (Case Study 1) however the constraints of a highly regulated system of marine management, particularly in relation to conservation legislation, is shown to constrain ability of governments to ‘take risks’ for the purposes of learning. This risk aversion is

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<sup>206</sup> The mutually reinforcing processes of structure and agency within institutions was explored from an ontological perspective in Chapter 3 (Section 3.2) and suggests that determining the relative influence of these components on processes of change is highly complex and was not analysed in detail here. The legal and policy analysis enabled identified principally the structural constraints defining the formal institutional arrangements which may constrain government actors.

understandable given the need to avoid legal challenge, as well as the higher costs of adaptive governance which requires greater amount of data, institutional capacity and incurs greater transaction costs over time (Craig & Ruhl 2014). Adaptive management also depends on the nature of the problem and practical context and is not appropriate in all cases and, such as where long-term stability of decisions is important and where decisions simply can't easily be adjusted once implemented (Ibid.), for example the location of an offshore windfarm.

This is not to say that change in governance will not occur and some literature also suggests that incremental change can lead to major shifts in governance and potentially more quickly than rapid, radical change which risks loss of legitimacy (Eshuis & Gerrets 2019). However, others suggest that incremental change may be intentional and “accommodating alterations that suit elites”, which limits contesting the systems and paradigms that lead to the need for change in the first place (Kelly et al. 2018, p.25).

The role of Crown Estate Scotland (CES) as underpinned by the Scottish Crown Estate Act 2019 emerged in all studies as an important actor of high adaptive capacity. CES was established following the Smith Commission<sup>207</sup>'s recommendations for the devolution of the management of the Crown Estate in Scotland, described as providing “opportunities for democratic renewal” and representing “a historic event that represents a genuine opportunity to change the fabric of Scottish society<sup>208</sup>.” The Scottish Crown Estate Act 2019 has been shown to provide legal adaptive capacity through structural provisions for increased opportunities for local control, management or enhanced input to decision-making through opportunities for transfer, delegation or pilot projects. As described in Chapter 5, CES are a unique organisation and operate a system of property rights on behalf of the public. CES manages a diverse portfolio of property, rights and interests that influence many aspects of rural and coastal life. Even though CES are not a regulator and have no statutory function, Crown property rights are a major component of land ownership in Scotland including much of the seabed, and their role in management through lease agreements (for aquaculture or seaweed harvesting, for example) attributes them an important (and somewhat unique) role in marine governance.

Negotiating different perceptions and attitudes to change and the cognitive biases which may be at work is important to enable transitions to adaptive governance (De Caro et al. 2017). While not investigated in detail here, insight is provided into the adaptive capacity of specific actors and the

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<sup>207</sup> <https://www.parliament.uk/smith-commission-inquiry>

<sup>208</sup> <https://www.gov.scot/publications/crown-estate-consultation-long-term-management-crown-estate-scotland/>

underlying differences which can undermine proposed changes to environmental governance systems (such as through marine planning) (Ibid.). More in-depth investigation would be needed to evaluate the social cognitive processes underlying these including the interplay between structure and agency in determining or resisting change, and the influence of power imbalances on change through adaptive governance.

## Chapter 8: Conclusion

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### 8.1 Introduction

This thesis examined the occurrence of adaptive governance and barriers to its emergence within a national system of marine governance with specific attention given to the role of marine planning. Using the SES framework, a model was constructed which enabled analysis of Scotland's marine governance system as a mixture of institutional arrangements at multiple levels. An analytical framework was developed based on the four defining characteristics of adaptive governance theory: 1) polycentric and multi-layered institutions; 2) participation and collaboration; 3) learning and innovation; and 4) self-organisation and supporting activities. The research provides an empirical contribution to the study of adaptive governance which was applied for the first time to Scotland's marine governance system. Three case studies were undertaken: Chapter 4 analysed the regional marine planning process as a new governance instrument being implemented in Scotland; Chapter 5 focussed on developing adaptive governance to support adaptation of the aquaculture industry to climate change-related OA; and Chapter 6 analysed the development of a management regime for expansion of a novel sector, industrial seaweed harvesting. The findings from across the case studies were presented in the overarching discussion (Chapter 7) and four main tensions in the emergence of adaptive governance in marine systems were described. These findings are summarised in Section 8.2. The research process led to a number of theoretical insights and Section 8.3 provides critical reflections on the theory used and the methodological approach, with suggestions for further theoretical development for the study of marine governance. Finally, Section 8.4 provides additional recommendations for future research and practical implementation of marine governance.

### 8.2 Summary of the research findings

In Scotland, a novel approach to marine planning is being developed alongside a number of other approaches to governance reform emphasising innovation, local ownership and community empowerment, and which intersect in the coastal zone. Increasing polycentricity is evident, with potential for innovation in governance and management, with the MPPs and new arrangements to be developed through the CES Scheme providing potential "laboratories of democracy" (Arnold & Gunderson 2013). Political will is apparent and adaptive governance is being facilitated by government through legislation and policy requirements, providing evidence of the increased role of government as a "facilitator and co-operating partner" (and the 'shifting' rather than 'shrinking' role of the state) (Kooiman 2003, p.3). Diversification of arrangements is leading to new arenas of

collective action at different scales and involvement of non-state actors in multi-scale governance, including partnership-led marine planning. New policy and legislation thus provides 'windows of opportunity' for adaptive governance (Olson 2016) and high levels of self-organisation are evident in responding to opportunities to date through leadership, networking and lobbying to influence governance at multiple levels. The research reported in this thesis provided evidence of the contextual factors influencing such processes and results suggest that adaptive governance is more successful in particular regions, including islands where higher social capital (including geographical and cultural factors) is aligned with rights to self-governance based on devolved authority and future ambitions for greater local control.

A governance perspective highlighted the changing relationship between government and society, the role of non-state actors and mechanisms of influence on governance processes. However, while a supportive policy context was identified, results did not indicate that adaptive governance has materialised through these arrangements, particularly in terms of influence on the management of human activities at sea. My observations indicate that there remain important tensions to be addressed in the emergence of adaptive governance based on analysis of institutional processes in a system of marine governance.

Firstly, I found that the legislative regime remains crucially important in defining what is possible and what happens 'on the ground' in terms of adaptive governance. The work of the U.S. scholars addressing the role of law in adaptive governance and legal adaptive capacity (e.g. Camacho & Glicksman 2016; De Caro et al. 2017; Cosens et al. 2018) was found to be relevant to this thesis in framing analysis of law and policy and understanding its role in adaptive governance. As a 'double-edged sword' the law can provide both barriers and bridges to adaptive governance (Cosens et al. 2017). In this study it was shown to facilitate self-organisation and collective action across scales by: 1) providing the structural arrangements and legal legitimacy for the MPPs (and other models such as the CES Local Pilot Scheme); 2) defining legal provisions for specific interventions addressing climate change adaptation; and 3) the creation of new laws themselves (primary legislation) was shown to present an opportunity for collective action and governance response to societal influence. But the legacy of existing legislation upon which new approaches are overlaid is evident and the dominant regulatory regime was shown to ultimately constrain adaptive governance. This was indicated through my analysis of marine planning, as well as the feasibility of adaptation in aquaculture management to address climate change, and the challenges of implementing adaptive management for new marine industries. The licensing process for marine activities (and conservation legislation in

particular) was found to be highly stringent with no flexibility to accommodate adaptive approaches for the purposes of learning. In this study, conflict was identified between policies and legal regimes which promote adaptive approaches and existing modalities of governing which constrain these approaches in management. These findings support observations made by Cosens et al. (2017), Craig (2019) and others that there may be need for regulatory reform to enable adaptive governance, particularly given the need to adapt to climate change which is increasingly destabilising regulatory contexts (Cosens et al. 2014) (as analysed in Chapter 5 in relation to OA). This thesis provides an analysis of the legal adaptive capacity of new and existing legislation addressing marine and coastal use and further analysis is needed to determine how law can adapt and be reformed to enable adaptive governance.

This is not a straightforward task and the challenges of achieving balance between stability and flexibility in governance was shown in this research, as described in Chapter 7 and include: 1) conflicting perceptions and attitudes to change between participants in marine planning; 2) balancing the capacity to adapt to changing conditions with the need for specificity and stability in management of aquaculture; and 3) the complexity of ensuring a 'hard backstop' for ecological protection while enabling on-going learning-based adaptive management of new industries such as kelp harvesting.

Further, while there is a proliferation of collaborative arrangements a lack of co-ordination between levels was identified, which limits transfer of the learning and benefits of enhanced local governance into decision-making in the wider regime. This contributes to confusion and inefficiencies as shown in relation to marine planning, with future concerns regarding capacity to participate in multiple initiatives. Greater clarity is needed regarding the legal connections between different instruments, and the development of robust feedback loops and mechanisms for learning across scales.

Finally, as discussed in Chapter 7, Section 7.5.3, it is argued that reflexivity (as defined by Voß et al. 2006) is essential to support adaptive governance by enabling the on-going re-negotiation of normative goals and governance outcomes (including the outcomes of marine planning), and to consider the progress of such initiatives in relation to the broader evolving system of governance, including new cross-government policy such as climate change adaptation as well as changing socio-political and ecological context. In practice, such reflexivity would further support innovative responses to changing context and transfer of learning while reducing stakeholder confusion in proliferating arrangements and ensure sustained engagement and participation.

### 8.2.1 The role of marine planning

Although marine planning literature is increasing exponentially (Ehler et al. 2019) there is a lack of situated and detailed analysis of marine planning practice, a lack of focus on its role within broader systems of governance and how it can enable institutional change (Kelly et al. 2018). This research sought to address this gap and set out to consider whether regional marine planning induced institutional changes in line with a model of adaptive governance. Results help to conceptualise and understand marine planning in relation to broader governance along with its current and future contribution.

Marine planning was the original focus of the research since features of the developing process (in Scotland in particular, at least conceptually, relate to the dimensions described in the literature as fundamental to adaptive governance. Based on analysis of the process and experience of stakeholders, partnership-led marine planning was shown to facilitate adaptive governance through collaborative processes, collectively developed rules, policies and social norms, which provide some benefits to regional governance. However, barriers to institutionalisation of adaptive governance included existing planning and regulatory processes (and the associated limited change in *management* power and accountability), meaning that these long-established processes dominated, with marine planning interventions overlaid rather than replacing them. Responding to social change (such as new activities) and changing ecological conditions (such as climate change-related effects) through marine planning was shown to be contingent on other mechanisms including the regulatory process. Enabling local 'control' through RMP was also shown to be problematic in these arrangements because government remains a dominant actor, and unclear interaction between levels compromises effectiveness at the regional level. While innovation in marine planning practice was observed in this study, it was also apparent that marine planning is thus limited in its influence. This was further evidenced by the proposals of other regions to develop marine planning through other arrangements, including transfer of management rights under the Scottish Crown Estate Act 2019.

Collaborative partnership arrangements and functioning was shown to be highly context-specific, with positive and negative implications evident. This includes the benefits of an island situation in supporting adaptive governance (described above) and a risk of collaborative inertia in more complex regions where meaningful collaboration was hindered by underlying conflict even where participation is high. This documented heterogeneity between marine regions is informative for the implementation of marine planning in other regions. Challenges of experimental, locally-relevant

approaches are also indicated, with increasing costs of participation and engaging likely to present a problem to actors as more regional marine planning processes are initiated, and there were concerns that too much diversity in planning approaches might lead to uneven economic potential across the regions.

In presenting an in-depth case study focussing on the functioning of the MPPs including participation, collaboration and interactions between actors, the wider institutional arrangements were shown to be more important in influencing the role of marine planning on adaptive capacity in the marine governance system. Support is thus found for Halpern et al. (2012), Kelly et al. (2018) and others, that analysis of marine planning initiatives must be pursued using theoretical approaches which enable understanding its situation within the wider marine governance it is both defined by, and seeks to influence. This is essential to understand (and perhaps enhance) the contribution of marine planning towards more sustainable governance in marine systems. In addressing deficiencies in governance relating to participation, integration and adaptability, the research findings presented in this thesis indicate that focus is needed on prevailing policy making and management practice through analytical approaches which can consider multiple interacting governance systems.

Scholars are increasingly reflecting on whether marine planning is “worth the effort” (Ehler 2019, p.16) given its much lauded potential in addressing the failures of marine management to date<sup>209</sup>. This can only be answered through reliable empirical studies of specific marine planning programmes and findings here indicate that expectations are indeed higher than what can be delivered through marine planning, and this is problematic particularly since meaningful outcomes are needed to maintain commitment to the process, particularly given the extra costs involved. Marine planning is intertwined with existing policy, legislation and management practice and does not *replace* anything: as an additional layer within governance it can add value in steering decisions taken elsewhere but the ‘power’ remains held in other domains. As a planning tool, expectations must be moderated accordingly and in enhancing governance, my study shows that benefits are gained but that focus is needed on other parts of the system, such as underpinning legislation and processes to make changes to governance, for example in adapting to climate change, responding to new activities or changes in the SES.

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<sup>209</sup> There is a difference, however, between considering whether marine planning is achieving its objectives in a particular context, and whether it is living up to ‘the hype’ which may in part be driven by the academic interest in the topic.

### 8.2.2 Generalisability

Chapter 3 outlined the methodology and likely generalisability of the results and research outcomes. From a governance perspective, highly situated analyses are essential to address context, historical and political situation, and the numerous factors which influence a governance system. No “one-size-fits-all” in terms of governance and since problems are basically unique, governance solutions cannot be standardised (Jentoft & Chuenpagdee 2009, p.554). There is therefore some difficulty in extrapolating to other cases, given the highly complex, situation-specific functioning of governance, even if this is not often made explicit in governance research. Inferences can be made regarding the role of certain contextual characteristics in influencing adaptive governance (including for example the specific conditions in islands) and the analysis highlights certain relationships and factors which influence governance outcomes, particularly the role of law. In terms of marine planning, the same arguments are relevant - this research demonstrates how marine planning is intertwined with existing processes of governance in highly regulated systems. Focus was on a specific model of marine planning (as an experimental approach and an interface between ‘top-down’ and ‘bottom-up’ collaborative arrangements) which will be different in other planning contexts. There is therefore a need for situated studies of marine planning based on detailed analysis of governance systems in specific societal situations, to understand the role and functioning of marine planning. In this research the role of context and causality was identified which may be transferable to other applications of marine planning, and important insights are gained into the application of theory to marine planning and governance. Critical reflections on these aspects are presented next.

## 8.3 Critical reflections on theory and methodological approach

### 8.3.1 Adaptive governance

Adaptive governance theory is a highly dynamic and still-evolving literature. However, as it expands in application there is a lack of critical reflection (Whaley & Weatherhead 2014) and attention is needed to its conceptual and practical challenges to ensure its relevance and utility. This section considers how the conceptual framework supported analysis of the research problem and presents a number of critical insights which might support further development of adaptive governance theory and its application to the study of marine governance, including marine planning. These include: 1) Levels of institutionalisation of adaptive governance; 2) Evaluating outcomes of adaptive governance; 3) The relationship between adaptive governance and transformative governance; and 4) Definition of key terms in adaptive governance.

### 1) *Levels of institutionalisation of adaptive governance*

Applying an analytical framework based on four key dimensions<sup>210</sup> of adaptive governance enabled useful analysis of how these dimensions are reflected in a dynamic system of marine governance. However, I did not find the analysis straightforward since the dimensions are multi-faceted, interdependent and can be observed as occurring to differing degrees. This is compounded by a lack of consistency in definition of key concepts in the literature and it is suggested that greater specificity regarding dimensions and forms of adaptive governance is needed. Specific attention is needed in relation to polycentricity, indicated through this study to be the most important dimension in structuring interaction in action situations, through which the other dimensions of participation, learning and self-organisation proceed, but of which no common definition exists (Galaz et al. 2012). Better critical distinction is needed between arrangements where influence of non-governmental actors is increased through participatory arrangements at multiple levels, and ‘true’ polycentricity, where actors are empowered to manage, control and experiment with management approaches at local scale (with multiple levels between). These present different models of authority and accountability, including capacity to handle risk and make decisions, and where these are not devolved, *materialisation* of adaptive governance (through testing, reflecting and adjusting approaches based on physical outcomes) has proven limited. This was shown in relation to marine planning and the MPPs, where the constraints of an existing planning and management system is evident; the higher capacity for adaptive governance in Shetland where other management rights are also devolved to the regional level; and based on the greater potential for adaptive governance through transfer of management rights of CES assets under the SCE Act.

In this regard, the approach taken by Galaz et al. (2012) in an international analysis may be analytically useful where polycentric *order*, from ‘weak’ to ‘strong’, is evaluated based on different arrangements, communication and forms of collaboration, with “tangible joint projects/experiments between actors” in ‘stronger’ arrangements (Ibid., p.23). In this thesis, although a new arrangement was identified (the MPPs) as contributing to polycentricity, the authority to experiment with management through influence on marine activities was shown to be limited, indicating that understanding the level of autonomy between institutions and the ‘power’ balance in nested arrangements is of critical importance in determining governance outcomes. Terms such as “quasi-autonomous decision-making units” (Folke et al. 2005, p. 449), require clarity when analysed empirically, particularly where

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<sup>210</sup> 1) polycentric and multi-layered institutions; 2) participation and collaboration; 3) learning and innovation; and 4) self-organisation and supporting activities.

such arrangements are created within a wider (governmental) regime and ‘top-down’ control, with existing formal processes, planning procedures and hierarchical accountability<sup>211</sup>. Analysis of the subsequent dimensions describing the functioning of governance at smaller scales is important, for example the inclusiveness of participation and the effectiveness of learning processes, but the significance of these in terms of adaptive governance are shown to be dependent on the level of autonomy and ability of the collective process to meaningfully influence outcomes. This appears to be a problem of the ‘evolution’ of adaptive governance from analysis of small-scale co-management arrangements of specific common-pool resources (e.g. Dietz et al. 2003) to analysis of its emergence in highly complex existing governance regimes, at regional, national and international scales.

A further reflection related to polycentricity as a theoretical concept relates to *redundancy* which is often promoted as a benefit of multi-layered and overlapping institutions in supporting adaptive capacity (in the manner of ecological systems) (e.g. Armitage 2005; Huitema et al. 2009). In practice the multitude of new arrangements was shown here to contribute to confusion, inefficiencies and concerns regarding technical and financial capacity, which might outweigh the benefits of multiple arenas in considering governance responses. Alignment of new structures at smaller scale, with devolution of authority from the centre seems necessary to enable innovation, agility and responsiveness to continue at local scale, with the establishment of functioning of cross-scale linkages and reflexivity which considers these interconnections (discussed in Chapter 7, Section 7.5).

Applying the adaptive governance framework enabled identification of key factors supporting emergence of adaptive governance and framing the tensions in its institutionalisation within an existing governance system. Rather than simply ‘barriers’ to adaptive governance, focus on *tensions* is important and the need for balance is emphasised through this research: integration of ‘top-down’ and ‘bottom-up’ approaches; finding the balance between flexibility and stability in governance (and governing) and this perspective provides insight into how change can be facilitated in marine governance. Conceptualising this duality in adaptive governance and the interface between prevailing governance and new models, rather than progress ‘in the direction of’ adaptive governance is pertinent, particularly in understanding how it can emerge and function within highly complex existing marine governance regimes. Achieving balance between adaptive approaches and stability is

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<sup>211</sup> Related to this is a need for consideration of specific words and phrases which infer different conceptions of local influence e.g. local control; local governance; local decision-making, etc., which have potential to be interpreted differently and materialise in different forms.

an increasingly important topic in marine management as climate change and wider political changes increasingly demand new and rapid governance responses.

As explored in Chapter 4, the advances by Eshuis & Gerret (2019) were found to be useful, where distinction is drawn between levels of institutionalisation of adaptive governance and its *materialisation*, in exploring its 'transformational power'. These authors propose materialisation of adaptive governance as the relationship between the new approach and the built environment and the physical modification of the material world. Further work is needed to translate the theory of materialisation of adaptive governance into marine governance terms, including definition of criteria and desired outcomes, but parallels might be drawn between the physical materialisation of urban planning and marine planning, in observing the physical manifestation of adaptive governance arrangements, and its relationship to 'enduring / deep' change (Ibid.). Future analysis of marine planning from an adaptive governance perspective might benefit from incorporating these aspects into the analytical approach.

## 2) *Evaluating outcomes of adaptive governance*

Further to the above, while adaptive governance might be observed, relating this to outcomes in terms of change in the SES is difficult and the "implementation of concrete management" is rarely presented in adaptive governance research (Sharma-Wallace et al. 2018, p.175). Comprehensively discerning impacts on ecosystem and human wellbeing based on an intervention (and distinguishing these from those caused by contextual factors) is challenging and understanding the impacts of different resource management and environmental governance interventions is inherently difficult due to confounding factors, lag times, complex feedbacks and often incomplete data (Plummer et al. 2017). This thesis presents an initial attempt at conceptualising a marine governance system from the perspective of adaptive governance, focussing on the processes and outcomes in terms of rules which influence the governance system and which represent an adaptive response to change. This approach was appropriate given the early stage of implementation, for example of marine planning has yet to be formally adopted and OA is only recently being incorporated into policy. However, there is a need for future focus on outcomes of governance when the regime is more established, where outcomes includes 'effects' in terms of ecological and social (livelihoods) and including social justice aspects (Plummer et al. 2017). Further analysis will be needed, using a wide range of social and ecological data, to understand changes in the SES in response to governance interventions, including marine planning and others. Establishing direct causality between processes and outcomes may be difficult to achieve, but would be supported by focussing on relating the cross-scale linkages and reflexivity

highlighted in this research to long-term monitoring of ecological and social variables would provide important additional data related to other aspects of SES change, to support evaluation and inform policy adjustments.

### 3) *Adaptive governance and transformative environmental governance*

The challenges of understanding change attributable to adaptive governance provide some support for Chaffin et al. (2016) who promoted 'transformative environmental governance' as a distinct theoretical approach, distinguished from adaptive governance on the basis that it addresses governance which intends to "actively shift a SES to an alternative and inherently more desirable regime by altering the structures and processes that define the system" (Chaffin et al. 2016, p.400). The emphasis in transformative governance on deliberate, human-driven interventions and change in the dominant processes and structures supports moving away from the 'ecologically inspired' concept of adaptive governance (Chaffin et al. 2016), which could be helpful in addressing some of the limitations that raised above (such as the concept of redundancy). However, as discussed in Chapter 2, delineation between adaptive and transformative governance is unclear and there are differences between definitions of adaptive governance which describe it as simply *navigating* change (enhancing resilience) and others which refer additionally to *steering* change by facilitating adaptive responses. In a more recent paper, Chaffin et al. (2019) describe their focus as "transforming environmental governance of basin resources towards a more 'adaptive governance'" (p.160) which confounds these two fields.

In this thesis intentional change was considered a key element of adaptive governance and results showed that proactive steps are being taken to reform governance, in line with a transformative approach, in addition to supporting behaviours within action situations. The focus was on conditionalities which enable change, including active processes in addition to building resilience in the existing system. This was particularly evident in analysis of the climate change adaptation policy agenda which identifies proactive adaptation interventions including through legislative and policy requirements which explicitly promote change. Further, important aspects of governance were highlighted using an adaptive governance approach in this thesis including innovation and leadership, which demonstrated creativity and consideration of new 'ways of doing things', such as the public engagement processes developed at regional scale by the MPPs. There is therefore a need to be clear in definition of adaptive governance and the extent to which it is considered to address goals beyond resilience and sustaining current SES, and further clarity regarding its theoretical relationship to transformative governance is promoted based on this research.

Other studies indicate increasing focus on transformations in marine governance which emphasise the need for ‘systemic shifts’ in “deeply held values and beliefs, patterns of social behaviour, and multilevel governance and management regimes” (Westley et al. 2011, in Chaffin et al. 2016, p.409), and might be catalysed by emphasis on ‘transformation’ in developing policy action including the implementation of the UN 2030 Agenda and the SDGs. This is built upon in related subfields such as transition management, which has parallel concepts to adaptive and transformative governance but focusses explicitly on system change and new regimes (Chaffin et al. 2016) and has recently been promoted as an approach for conceptualising change in marine governance (Kelly et al. 2018).

Certain observations are presented here based on the analysis of a system of marine governance presented in this thesis. Firstly, while Olsson et al. (2006), Chaffin and Gunderson (2016), Kelly et al. (2018) and others conceptualise change in governance based on an adaptive cycle approach, with phases of preparation, transition and stabilisation of a new state, the implementation of change in governance (at regime-scale) is messy and complicated, given the nested overlapping issues of resource use and a discrete management or resource problem is rarely encountered. This ‘messiness’ and complexity of overlapping sector-specific regimes, with different needs, is suggested here to prevent system ‘shifts’ occurring in practice (unless through significant crises or catastrophe). This research further shows that change *is* occurring, through multiple interacting processes, and focussing on the factors which both facilitate and hinder such change, within a specific context, is important in order to understand the opportunities that exist for ‘rapid’ rather than ‘radical’ change to a new system state, as a practical and policy-relevant approach.

Secondly, the relevance of the rule of law was identified as critical, with weight given to the arguments for balance which considers the societal benefits of stability versus radical change in governance. Reform is shown to be occurring in Scotland and made explicit by government, particularly in relation to the Scottish Crown Estate Act 2019 which hails significant change to ownership and governance, while other aspects must remain definitive, particularly around licensing of activities at sea to ensure compliance, safety and navigation in relation to aquaculture development, for example. Chapter 6 showed how proponents of ecological protection resulted in a prohibitive legal clause which while a success in some terms might be considered maladaptive, since it precludes any on-going debate and learning, and ‘systemic shift’ in the way decisions are taken (i.e. ‘transformed’ governance) (see Section 3.8.1). Valid conclusions are drawn regarding the need for regulatory reform in this system (e.g. to enable adaptive management at the operational level), but this is presented as a ‘tension’ in

this thesis to recognise the balance needed. A legal perspective on how such shifts could be enabled without destabilising effects is thus indicated as essential.

Third, results showed that stakeholder perspectives on transformative change and incremental approaches varied among stakeholders, and while aligned with perspectives of ENGOs, other stakeholders were less amenable to “*wholesale change*” (S), without learning from and adapting the mechanisms already in place, as well as considering what is feasible within legal limits. It is therefore questionable whether radical change is feasible within current governance (including governing) structures, or will be considered legitimate by stakeholders. Adaptive governance requires negotiating different perceptions and attitudes to change, including underlying cognitive biases which may be at work (De Caro et al. 2017) and which may be missed in the presumption of the need for ‘transformative’ change.

An argument is therefore made that adaptive governance remains relevant with two factors emerging as significant: 1) the emphasis on addressing the tension of balancing stability and flexibility suggests that *rapid* rather than *radical* change is necessary in order to not undermine the stability of institutions and to maintain legitimacy; and 2) the large-scale shifts implied in transformation obscures the flexibility and on-going processes of change within governance, through different mechanisms at different levels (including the legislative regime). An adaptive governance approach enabled insights into these institutional dynamics including power-sharing and processes of learning across scales, with cross-scale linkages in multi-level arrangements (see Section 7.5.2) indicated as necessary to support change and the development of adaptive governance at system scale.

The research presented here suggests utility of a theoretical approach that addresses the middle ground between adaptive governance, where this risks narrow interpretation as ensuring capability to adapt in reaction to change (i.e. resilience), and the potentially destabilising effects of ‘transformation’ and shift to a new governance regime. Some divergence is therefore seen from calls for a “new type of marine governance research” which is “focussed on radical transformation” (Kelly et al. 2018, p.25), where this may obscure on-going processes of change in contemporary governance arrangements. Further, a ‘totalising theory’ of change is not possible and the value of insights gained through multiple fields, whether competing or evolutionary, are needed to develop pluralistic theoretical frameworks for marine governance research.

#### 4) *Definition of key concepts in adaptive governance and marine policy*

As identified by Plummer et al. (2017), the on-going lack of consistency in definitions and conceptual basis for adaptive governance make it problematic to apply, empirically test and relate to other research. Building on the above, observations can be made in relation to the definition of key terms and concepts with further insights for their definition which considers their specific institutional requirements and challenges and to support their application to marine governance. Attempt has already been made in Chapter 7, Section 7.4 to distinguish between adaptive governance, adaptive co-management and different types of adaptive management in relation to different mechanisms and initiatives in marine governance. This aligns with the perspective of Hurlbert and Gupta (2016) who consider adaptive governance relevance at the system scale, and which can include adaptive co-management and adaptive management, and the insights of Craig and Ruhl (2014) and Hasselman (2017) who delineate differences between passive and active adaptive management. Clarity is essential, particularly where such distinctions imply different concepts of accountability, responsibility and authority and with different implications for existing governance systems, as shown.

In marine governance (including marine planning), being specific in relation to these distinguishing features is necessary to enable consistent interpretation and application of theory to marine governance, and in particular support understanding the relationship between governance theory and the practice of policy and management<sup>212</sup>. Specific definition of terms such as management and governance is important, and the distinction used in this thesis was useful, i.e. management as direct control (and the level at which adaptive management is relevant), and governance as indirect control (based on planning and wider influences). This is at once a useful theoretical distinction and can also be considered in relation to planning mechanisms, particularly forms of marine planning as investigated here, which in many cases is operationally distinct from management and seek to guide such processes in other domains.

Similarly, in application of adaptive governance to marine planning, caution is needed when interpreting aspects of adaptive governance theory more applicable to *co-management* arrangements, as marine planning is a planning tool which is rarely endowed with powers of *management* which implies direct authority over resource use, which was shown to not be the case, either through permitting and licensing decisions or in policy or sectoral planning which is undertaken

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<sup>212</sup> And can support in defining the difference between terms as they appear in policy, e.g. adaptive management.

in other arenas. Marine planning is a new 'layer' within governance, but represents neither adaptive management or adaptive co-management, which implies capacity to experiment with management of marine activities and adjust in response to learning. For this reason, adaptive governance and not adaptive co-management was used as the theoretical framework in this research, and such distinction is important. Adaptive co-management may be a more useful model to apply in certain applications of marine planning where there is authority and capacity to design management measures and responses to specific interactions. It may also be a more relevant perspective for analysis of new models of ownership such as the opportunities identified through the CES Local Pilot Scheme.

In considering the practical application of adaptive governance, this study highlights difficulties of using 'adaptive governance' terminology and concepts, alongside existing terms used in policy, particularly 'adaptation', 'adaptive management' and 'adaptive capacity'. These have different meanings and implications particularly when considering the relevance of prevailing policy and institutional arrangements in implementing adaptive governance. While concepts such as 'adaptation' and 'adaptive management' are fundamentally based on responding to new understanding and ecosystem changes, these refer to quite different responses to those of adaptive governance and are implemented through existing institutional frameworks. Greater clarity in academic debate is needed for more concise application of the theory to practice of marine governance, and particularly when considering the institutionalisation of adaptive governance in relation to existing legislative frameworks which include similar terminology. Establishing common terminology may be difficult and unfeasible given the different usage across different contexts, but in each study at least, clarity in definition of terms used is needed particularly where such distinctions imply different concepts of accountability, responsibility and authority, and address different types of uncertainty.

Climate change adaptation presented an interesting case from an adaptive governance perspective, since adaptation makes adaptive capacity an explicit goal, based on definitions of the term in climate change policy, rather than a characteristic of institutional performance in adaptive governance, to respond to a wide range of social and ecological variables. Adaptive governance hasn't traditionally addressed climate change adaptation and the links remain poorly theorised (Munaretto et al. 2014). Adaptation is another concept which is differently defined in policy and governance theory and there is a need for specificity between goals of adaptation and adaptive capacity in adaptive governance (and applicable across the SES) and those specific to climate change. As indicated in analysis in Case Study 2, policy specifically addressing goals of adaptation can support flexibility while providing the

stability for collaborative and adaptive activities to emerge (Cosens et al. 2018). Climate change adaptation policy is also a highly dynamic and proactive policy agenda steering change in behaviour and innovation<sup>213</sup>, which demonstrates change in addition to maintaining resilience, which relates to the observations in 3), above. The specific implications of the policy goal of *adaptation* needs to be made more explicit in analysis of governance, with distinction drawn between definitions in policy and those in adaptive governance or other theoretical approaches.

### 8.3.2 The SES framework

The SES framework was found to be useful in framing the research and conceptualising a system of marine governance, and supported consistency in terminology and interpretation of results across the cases. It was a valid way to approach understanding institutional dynamics: highlighting structure, process and the influence on agency, including the influence of flows of information on power relations and political outcomes. It was found to be compatible with a critical realist philosophical approach including in identifying causal relationships in multiple and concurrent action situations, and between individuals in action situations within a dynamic system. Models cannot explain the full picture but this approach enabled development of useful insights, and supported understanding different aspects of governance and the relationship between them. It would also support other investigations within the same system, particularly since the SES framework is compatible with different theoretical approaches (McGinnis & Ostrom 2014). As identified in Section 8.3.1, my focus was on outcomes as rules which influence the governance system and longitudinal analysis would be needed to consider outcomes in terms of change in the SES over time. There is a noted limit to the level of detail in which it is possible to investigate particular processes within a single system-based study, such as social learning but it was informative in providing a contextualised study with complementary angles of analysis on a system of governance.

One challenge noted is the differentiation between operational / collective choice / constitutional levels in the framework. McGinnis & Ostrom (2014) note that these categories are overlapping, since “any policy tools or instruments can be decomposed into constitutional-, collective-, and operational-choice components” (Ibid., p.29). In this analysis, I found the distinction between operational choice and collective choice to be confusing at the AS1 level of regulatory decision-making. I referred to AS1 as ‘operational’ in this research as this influenced direct outcomes in the physical world (such as the

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<sup>213</sup> It also places emphasis on integration i.e. is applicable across the activities of government which is a departure from most policy.

permitting process for an aquaculture development) and also relates to other understanding of the term 'operation' (such as of an aquaculture facility). However, it was also conceptualised as an action situation and considered to represent a further 'collective-choice' arena, based on interaction of actors within the consultation processes (e.g. for seaweed harvesting) (albeit representing a different form of interaction and with different outcomes to 'higher' level collective-choice processes of legislative and policy development). This was useful in understanding the interaction of actors in these action situations at different levels within a system of governance, the interacting variables affecting their operation and the outcomes as rules which influence the SES.

### 8.3.3 Critical realism and adaptive governance

A critical realist stance enabled acknowledgement of subjective and constructivist processes at work in social systems, between researcher and participant, but also that it is possible to describe an external reality through a methodological approach which considers the researchers' principles and assumptions, and a process based on transparency, validity and integrity. It was not straightforward to arrive at the description set out in Chapter 3, which involved extensive self-reflection and learning, and was challenging since the field of social theory itself is expanding with overlap of ontological and epistemological assumptions between philosophical perspectives. However, the philosophical approach is considered to have enabled the researcher to develop plausible and coherent causal accounts.

Accepting constructionism alongside realism is concordant with an expanded view of governance, and its study requires adoption of a position which acknowledges 'real' institutional structures and processes, but which are responding to social construction, including through normative processes of discourse and deliberation within governance. As a 'middle ground', critical realism supports addressing examination of complex societies, including a "cross-modern" approach i.e. the 'juxtaposition' of modern and post-modern considered essential for governance research (Kooiman 2003, p.209). In this way, critical realism provides an important philosophical perspective for advancing adaptive (and transformative) governance, which in promoting fundamental shifts in values and beliefs requires a post-modern perspective, but must relate to contemporary systems. The relationship to context and emphasis on causality in realist research when evaluating mechanisms of change due to an intervention was found to be appropriate for empirical analysis of governance.

Critical realism was also demonstrated to be an appropriate philosophical perspective for the dynamic and co-evolving nature of social systems, including the interaction between structure and agency in

institutional dynamics, including through the SES Framework and the components and variables it includes. It recognises that social structures are constituted by behaviour of, and interactions between, agents which change over time based on capacity to learn and change behaviour, and was thus appropriate for studying collective action and the involvement of a broad range of stakeholders in the processes of governance (adaptive governance). The compatibility of ontological assumptions of critical realism with institutional analysis through the SES framework and adaptive governance justified this as a valid and useful approach for evaluation of complex social interventions and responses, i.e. governance, and supported critical reflection for theory development, as described in Section 8.3.1.

#### 8.3.4 Reflections on methods

Qualitative case studies are well established in governance literature and are a common way to approach adaptive governance research and this was shown here to be a valid way to generate empirical knowledge about the functioning of marine governance, including marine planning, and which factors contribute or hinder the emergence of adaptive governance. Focussing on intersecting cases addressing different aspects and processes within a single governance system supported a broader and more contextualised understanding of the functioning of a marine governance system than the individual cases would have enabled, or multiple cases in different governance systems. Numerous other cross-sectional cases could be identified in this system, whether analysis of a new intervention, policy requirement or changing socio-political context, and study of these could contribute further to understanding the dynamics and institutional interplay at system scale. The in-depth case study addressing marine planning (Chapter 4) was particularly informative given the need for highly contextualised empirical studies of marine planning in practice, a need which is supported here given the critical dependency of the functioning of marine planning on the setting and existing governance system.

The combination of interviews and document analysis in informing the case studies provided complementary data. Interviews provided detailed insight of the behaviour and response of actors to changing structural arrangements through the RMP process. As detailed in Chapter 3, the use of interviews in this research acknowledged 'intersubjectivity' where a range of factors influence the discourse between interviewee and researcher, and which contributed to the 'co-construction' of concepts, but this was a valid way to understand respondent's positions, experiences and arguments. Document analysis was useful in defining the structural and procedural changes and the functioning of the action situations in the SES Framework, and in particular to further investigate the tensions

identified which related to wider legislative and governance arrangements. Analysis of documents were critical in understanding the relationship between structure (of the governance system) and agency (behaviour of actors in relation to that system and the broader influences on this), which are essential to address these dual aspects in studies of governance and institutional dynamics. In Table 3.5 (Chapter 3), explanation was given regarding how the quality criteria of dependability, credibility, conformability and transferability were addressed in the methodology. This approach was deemed to have enabled a rigorous and transparent approach, ensuring credibility to the conclusions reached.

#### 8.4 Future research and practical recommendations

A single thesis is not sufficient to address an entire marine governance system (particularly since this would include the intersection with terrestrial policy, planning and management) however, it provides a cross-sectional analysis of the system to understand the dynamics of governance from different perspectives and how this relates to adaptive governance. As the first attempt to understand a marine governance system from an adaptive governance perspective, this broad approach is useful in characterising the system and understanding key potential and tensions to be addressed. This research raises points which are a high priority for future research, and which entail refined theoretical techniques which can analyse and support the system in becoming more equipped for management of coastal and marine resources in increasingly uncertain and complex times. Undertaking a system-scale analysis presents a starting point for considering the 'web' of Scotland's marine governance, which aspects are innovative and dynamic, and which aspects may need addressing to enable wider change. A number of avenues of future investigation were outlined above through the critical reflection presented in this conclusion, including:

- On-going analysis of initiatives including marine planning and other opportunities such as the CES Local Pilot Scheme, and how these relate.
- More in-depth legal analysis of adaptive capacity in marine governance including the relationship between new and existing instruments and the potential for regulatory reform and innovative approaches.
- Identify and establish processes for enhanced reflexivity in marine governance, including marine planning and related to other monitoring across the SES. Use these to establish cross-scale linkages between levels of governance and arenas and to consider the evolving relationship between them.

- Consider further the specific facilitating policy agenda of climate change adaptation in promoting adaptive governance and whether this provides greater potential for its emergence.

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## Appendix 1. Interview consent form



### CONSENT FORM

Title of Project: *“Does marine planning enable progress towards adaptive governance in marine systems? An in-depth case study of Scotland’s regional marine planning process.”*

Name of Researcher: Lucy Greenhill

Please

initial box

1. I confirm that I have read the participant information sheet dated.....for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

3. I consent to being interviewed being recorded (audio only) as part of the project .

4. I understand that any personal data will remain confidential and no information that identifies me will be made publicly available.

5. I consent to use of the data gathered through interview in research and publications as explained in the Participant Information Sheet.

I agree to take part in the above study.

\_\_\_\_\_

Name of Participant

\_\_\_\_\_

Date

\_\_\_\_\_

Signature

Lucy Greenhill

Name of Researcher  
taking consent

\_\_\_\_\_

Date

\_\_\_\_\_

Signature

## Appendix 2. Interview guide – January 2019

Marine planning is intended to improve the planning and management of marine activities. In Scotland, in particular, the development of marine planning through pilots and now the phased development of formal marine planning, is intended to enable innovation in management approaches. Using a framework based on adaptive governance, I am investigating how marine planning can improve governance including whether it supports ‘adaptive capacity’ of governance, i.e. ability to respond to changes and emerging concerns, and the barriers to this.

An overview of the questions to be asked during the 1hr interview are provided below, however the interview is semi-structured and will be adapted according to the participant and the conversation.

1. *What is your role in relation to marine issues [in the Clyde or Shetland]?*
2. *In your view, what are the main coastal and marine challenges in the region?*
3. *In general, what are the main changes that are happening in marine management in relation to your sector?*
4. *How have you been involved with marine planning to date and what is your current involvement?*
5. *In your view, what is the purpose and what are the benefits of marine planning?*
6. *Do you think the regional approach to marine planning in Scotland can lead to “more local ownership and decision making about specific issues”, as described by Scottish Government?*
7. *What is your view on how marine planning relates to licensing and management of marine activities?*
8. *Is it important to you to engage with marine planning?*
9. *Do you feel that the marine planning process adequately addresses your interests?*
10. *Have interactions or relationships with actors changed since marine planning is being developed?*
11. *After the regional marine plan is published, what happens next for marine planning [in the Clyde or Shetland]?*
12. *Are there processes for learning from experience in marine management?*
13. *What would you change about the way our society manages the use of marine resources, if you could?*
14. *Do you think that marine planning plays a role in this?*

## Appendix 3. Examples of coding of transcript data from interviews

<p><i>Researcher: So the Scottish Government describe marine planning as leading to more local ownership and decision-making on specific issues do you think that is the case?</i></p> <p><i>Participant: Not really, it depends what they mean by 'local'. So I think that Marine Scotland's role in this is worth thinking about because it does feel to me quite often but they are just absolved of responsibility in this process. They've handed the task of plan making to people who are not really that well equipped to do it, they don't necessarily come from that background, that wasn't actually the job for which they were appointed originally, they picked up this role. They're doing their best and I'm not suggesting they're doing a terrible job, but they're learning as they go and they're given minimal support from Marine Scotland, and then occasionally marine Scotland will step in and say they're not content with how things are going, in what I would say quite a obstructive way. So recently we've had people turning up to meetings and questioning an approach which had been taken, which I think we did agree, one of the few things we had agreed as a steering group.</i></p>	<p>[Coded at D1:5 - National and regional interaction including the role of government]</p>
<p><i>R: So Scottish government describe regional marine planning as being able to deliver local ownership and decision making on specific issues do you think it does, what's your views on that?</i></p> <p><i>P: I think that's a really good question because you've got a national marine plan which covers off a lot in terms of policy and direction of travel, and Scotland is not a big country it's got a big coastline but it's not a big country in terms of population activities and things. So we're divided into these marine regions, and when you look at a region you could divide some of them down a lot further and that's where decision-making happens is there at the scale of a proposal for a development. So you've got this issue where you've got the national marine plan, where it is quite general but covers off a lot, and then you've got us in the middle [between national and decision making] trying to add value, because we don't want to just repeat what's in the national plan and I would suggest that some of the plans that have gone before have done that, but then that's because the national marine plan wasn't there. So how do you add value? But if you're a region the size of the Clyde, unless you get very spatially specific about what developments can happen where and I'm talking very specific, it's difficult to see how you can actually bring in decision-making in the plan.</i></p> <p><i>R: So what's the interaction and oversight with Marine Scotland throughout the plan development process?</i></p> <p><i>P: I don't really want to say [laughs], so in doing the governance development they were making sure the constitution was in line with a partnership that they could give a direction to. And they provided funding and asked us to do various things. They didn't like the first proposal for the partnership so we did another one, so it was shaped iteratively, by the time it got to the second one which is the one we've got at the moment, the constitution is just based on the SCO standard template (Scottish charity voluntary organisations). So we had three meetings or something over a period of time with partners to talk through in detail the constitution but there weren't many changes that were made at the request of Marine Scotland to the constitution, that all went through fairly smoothly, once we'd got the general structure agreed they agreed to that. On the funding, we report to them.</i></p> <p><i>R: So when is [the plan] going to be published and what happens next?</i></p> <p><i>P: March 2020, then the partnership keeps meeting and it's responsible for reviewing and monitoring the plan.</i></p> <p><i>R: What does that look like?</i></p> <p><i>P: We don't know yet, we haven't thought that through. But I would think it would be something along the lines of an appropriate time after two or three years potentially doing an official review that is a little bit like the assessment but a little bit more condensed. So you could have some of the key indicators and then looking at some of the objectives from the plan, so what we are trying to do in the plan is set objectives that are SMART or at least measurable somehow, so that we can see whether the objectives are being met or not,</i></p>	<p>[Coded at D1:1 - Role of RMP in influencing regional governance]</p> <p>[Coded at D1:5 - National and regional interaction including the role of government]</p> <p>[Coded at D3:1 - Formal review processes]</p> <p>[Coded at D1:5 - National and</p>

<p><i>because that's one of the things I heard of as a criticism of objectives in plans, is that they are not measurable or realistic.</i></p> <p><i>[...]</i></p> <p><i>I think there's a little bit of a chicken and egg thing because without guidance on what a regional plan is supposed to be doing from government, which we don't have, then it's difficult to know how they are expecting the regional plans to make a huge difference. What we're trying to do is not repeat stuff that is in the national marine plan and our policy is added on to the National policy but some of it is not, some of it repeats national requirements that are in place already.</i></p>	<p>regional interaction including the role of government]</p>
<p><i>R: So there's obviously a lot of changes going on current and potential, what role does marine planning play in that broader picture?</i></p> <p><i>P(S): [...] Marine planning per se, the development of regional plans, the thing is, the regional plan groups that have been established or are being established they're not actually the body that's going to consent anything. All they're doing is advising. All they're doing is becoming the sort of stakeholder forum for and maybe actually adding another layer of complexity into something that is already quite difficult to manage. So actually that needs a bit of thought and discussion about well hang on a minute, how does one thing morph into the other, how do you take the responsibility (if that's what you want) away from the land based Planning Authority and put it in the hands of a another body? And if you're not going to do that what is the point of having this marine planning process going on? The two things have got to merge together in some way or other and at the moment I can't quite see how that's happening.</i></p> <p><i>I mean don't get me wrong I really, really, really like what we've done with the Shetland marine plan, it's a fantastic piece of work [...] you can't do a proper marine plan unless you've got all the data sources and huge volumes of data at your fingertips and it was really interesting, we had groups that came in and we were asked to have an input into the plan, and the local fishing industry were asked tell us where you fish, where are your key fishing grounds? Not one of them would say where they fished, because they don't want anyone else to know so that's not very helpful for a marine plan. But they quickly saw that they really needed to tell everyone where they fished, because if they didn't then their prime fishing grounds would not be protected in any way shape or form from a planning point of view. So in terms of mapping out fishing that was a fantastic exercise to map out exactly where fishing activity took place and the intensity of fishing activity and the seasonality of fishing activity all that stuff became part of the Marine plan and that is what it is should be about.</i></p>	<p>[Coded at D1:1 - Role of RMP in influencing regional governance]</p> <p>[Coded at D2:1 - Co-operation and, other - benefits of MSP]</p>

## Appendix 4. Documents analysed to inform the case studies

Document	Accessed online at:	Case Study		
		1. RMP	2. OA	3. Kelp
Scottish Government, 2015. Scotland's National Marine Plan 2015. <a href="https://www.gov.scot/publications/scotlands-national-marine-plan/">https://www.gov.scot/publications/scotlands-national-marine-plan/</a>	<a href="https://www.gov.scot/publications/scotlands-national-marine-plan/">https://www.gov.scot/publications/scotlands-national-marine-plan/</a>	•	•	•
Clyde Marine Planning Partnership (CMPP), 2017. Clyde Marine Region Assessment – 2017.	<a href="http://marine.gov.scot/information/clyde-marine-region-assessment-2017">http://marine.gov.scot/information/clyde-marine-region-assessment-2017</a>	•	•	
Clyde Marine Planning Partnership (CMPP), 2019. Clyde Marine Plan – Pre-consultation draft, 2019.	<a href="https://www.clydemarineplan.scot/wp-content/uploads/2019/06/Pre-consultation-draft-Clyde-Regional-Marine-Plan-18-March-2019.pdf">https://www.clydemarineplan.scot/wp-content/uploads/2019/06/Pre-consultation-draft-Clyde-Regional-Marine-Plan-18-March-2019.pdf</a>	•	•	•
National Marine Plan Review 2018: Three Year Report on the implementation of Scotland's National Marine Plan (Scottish Government, 2018)	<a href="https://www.gov.scot/publications/national-marine-plan-review-2018-three-year-report-implementation-scotlands/">https://www.gov.scot/publications/national-marine-plan-review-2018-three-year-report-implementation-scotlands/</a>	•	•	•
NAFC Marine Centre, University of the Highlands and Islands (NAFC), 2018. Shetland Islands Draft Regional Marine Plan	<a href="https://www.nafc.uhi.ac.uk/research/marine-spatial-planning/shetland-islands-regional-marine-planning-partnership/sirmp-2019/">https://www.nafc.uhi.ac.uk/research/marine-spatial-planning/shetland-islands-regional-marine-planning-partnership/sirmp-2019/</a>	•	•	•
Clyde Marine Planning Partnership Meeting Minutes	<a href="https://www.clydemarineplan.scot/wp-content/uploads/2020/01/Minutes-3-December-2019.pdf">https://www.clydemarineplan.scot/wp-content/uploads/2020/01/Minutes-3-December-2019.pdf</a>		•	
Shetland Marine Planning Partnership Meeting Minutes	<a href="https://www.nafc.uhi.ac.uk/research/marine-spatial-planning/shetland-islands-regional-marine-planning-partnership/ag-meeting-minutes-and-agendas/">https://www.nafc.uhi.ac.uk/research/marine-spatial-planning/shetland-islands-regional-marine-planning-partnership/ag-meeting-minutes-and-agendas/</a>		•	
Scottish Government, 2019c. Scotland and the SDGs: A national review to drive action, draft report.	<a href="https://globalgoals.scot/wp-content/uploads/2019/02/SDG-Discussion-paper-February-2019.pdf">https://globalgoals.scot/wp-content/uploads/2019/02/SDG-Discussion-paper-February-2019.pdf</a>		•	
Scottish Climate Change Adaptation Programme: Third Progress Report 2017 (Scottish Government, 2017)	<a href="https://www.gov.scot/publications/climate-ready-scotland-scottish-climate-change-adaptation-programme-third-annual/">https://www.gov.scot/publications/climate-ready-scotland-scottish-climate-change-adaptation-programme-third-annual/</a>		•	
Strategic Considerations for Locational Regulation of Shellfish Aquaculture in Scotland (Scottish Aquaculture Research Forum (SARF), 2016)	<a href="http://www.sarf.org.uk/projects---sarf110.php">http://www.sarf.org.uk/projects---sarf110.php</a>		•	
Independent review of Scottish aquaculture consenting (Scottish Government, 2016)	<a href="https://www.gov.scot/publications/independent-review-scottish-aquaculture-consenting/">https://www.gov.scot/publications/independent-review-scottish-aquaculture-consenting/</a>		•	
Marine (Scotland) Act 2010	<a href="http://www.legislation.gov.uk/asp/2010/5/contents">http://www.legislation.gov.uk/asp/2010/5/contents</a>	•	•	•

Scottish Crown Estate Act 2019	<a href="http://www.legislation.gov.uk/asp/2019/1/contents/enacted">http://www.legislation.gov.uk/asp/2019/1/contents/enacted</a>	•	•	•
(UK) Climate Change Act 2008	<a href="http://www.legislation.gov.uk/ukpga/2008/27/contents">http://www.legislation.gov.uk/ukpga/2008/27/contents</a>		•	
Climate Change (Scotland) Act 2009	<a href="http://www.legislation.gov.uk/asp/2009/12/contents">http://www.legislation.gov.uk/asp/2009/12/contents</a>		•	
Climate Change (Emissions Reduction Targets)(Scotland) Act 2019	<a href="http://www.legislation.gov.uk/asp/2019/15/enacted">http://www.legislation.gov.uk/asp/2019/15/enacted</a>		•	
Town and Country Planning Act 1997 (and secondary legislation: the Town and Country Planning Marine Fish Farming (Scotland) Order 2007 and Town and Country Planning (General Permitted Development) (Fish Farming) (Scotland) Amendment Order 2012)	<a href="http://www.legislation.gov.uk/ukpga/1997/8/contents">http://www.legislation.gov.uk/ukpga/1997/8/contents</a>		•	
Aquaculture and Fisheries (Scotland) Act 2013	<a href="http://www.legislation.gov.uk/asp/2013/7/enacted">http://www.legislation.gov.uk/asp/2013/7/enacted</a>		•	
Crown Estate Scotland Draft 2020-23 Corporate Plan (Crown Estate Scotland, 2019)	<a href="https://consult.gov.scot/crown-estate-strategy-unit/2020-23-corporate-plan/">https://consult.gov.scot/crown-estate-strategy-unit/2020-23-corporate-plan/</a>		•	•
Wild Seaweed Harvesting SEA 2016	<a href="https://www.gov.scot/publications/wild-seaweed-harvesting-strategic-environmental-assessment-environmental-report/">https://www.gov.scot/publications/wild-seaweed-harvesting-strategic-environmental-assessment-environmental-report/</a>			•
Scottish Parliament Research Briefing: The Scottish Crown Estate Bill	<a href="https://sp-bpr-en-prod-cdnep.azureedge.net/published/2018/3/9/The-Scottish-Crown-Estate-Bill/18-20.pdf">https://sp-bpr-en-prod-cdnep.azureedge.net/published/2018/3/9/The-Scottish-Crown-Estate-Bill/18-20.pdf</a>	•	•	•
Scottish Parliament Research Briefing: Seaweed Harvesting	<a href="https://digitalpublications.parliament.scot/ResearchBriefings/Report/2018/11/12/Kelp-harvesting">https://digitalpublications.parliament.scot/ResearchBriefings/Report/2018/11/12/Kelp-harvesting</a>			•
Publicly available reports, research briefings and written submitted evidence of the Environment, Climate Change and Land Reform (ECCLR) Committee through Stage 1, 2 and 3 of the Scottish Crown Estate Act 2019)	<a href="https://www.parliament.scot/parliamentarybusiness/CurrentCommittees/107740.aspx">https://www.parliament.scot/parliamentarybusiness/CurrentCommittees/107740.aspx</a>			•
Individual consultation responses from SNH	<a href="https://www.nature.scot/sites/default/files/2018-08/Consultation%20-%20MBL%20-%20kelp%20harvesting%20-%20west%20coast%20of%20Scotland%20-%20scoping%20-%20SNH%20response_0.pdf">https://www.nature.scot/sites/default/files/2018-08/Consultation%20-%20MBL%20-%20kelp%20harvesting%20-%20west%20coast%20of%20Scotland%20-%20scoping%20-%20SNH%20response_0.pdf</a>			•
Scoping Report submitted to Marine Scotland on July 2018 (cited as MBL, 2018)	<a href="http://marine.gov.scot/sites/default/files/r3007_wild_seaweed_harvesting_scoping_report_17july2018lr_0.pdf">http://marine.gov.scot/sites/default/files/r3007_wild_seaweed_harvesting_scoping_report_17july2018lr_0.pdf</a>			•
Scoping Advice provided to MBL by MS-LOT, including 21 appended consultation responses and summary of representations received in response to MBL's submission, 3rd October 2018 (cited as MS-LOT, 2018)	<a href="http://marine.gov.scot/sites/default/files/mbl_scoping_advice_-_signed_-_03_oct_2018_redacted_0.pdf">http://marine.gov.scot/sites/default/files/mbl_scoping_advice_-_signed_-_03_oct_2018_redacted_0.pdf</a>			•

Marine Scotland Science correspondence released in response to FOI lodged in July 2019 (cited as FOI, 2019)	<a href="https://www.gov.scot/publications/foi-18-03511-appeal/">https://www.gov.scot/publications/foi-18-03511-appeal/</a>			•
Written evidence received by the Committee in response to their Call for Evidence on the inquiry between 9 February and 23 March 2018 (70 documents) and supporting reports including a financial memorandum	<a href="https://www.parliament.scot/S5_Bills/Scottish%20Crown%20Estate%20Bill/SPBill24FMS052018.pdf">https://www.parliament.scot/S5_Bills/Scottish%20Crown%20Estate%20Bill/SPBill24FMS052018.pdf</a>			•
Stage 2: ECCLR Committee Meeting Minutes, 25th Meeting, 2018 (Session 5), Tuesday 18 September 2018	<a href="https://www.parliament.scot/parliamentarybusiness/Bills/107415.aspx">https://www.parliament.scot/parliamentarybusiness/Bills/107415.aspx</a>			•
Stage 3: Video and written record of ECCLR committee meeting (Debate of Stage 3 Proceedings: Scottish Crown Estate Bill) during the Meeting of the Parliament 21 November 2018	<a href="http://www.parliament.scot/parliamentarybusiness/report.aspx?r=11794&amp;mode=html#iob_106698">http://www.parliament.scot/parliamentarybusiness/report.aspx?r=11794&amp;mode=html#iob_106698</a>			•
Minutes of the Seaweed Review Group meetings 16th May and 26th Sept 2019 and associated reports	<a href="https://www2.gov.scot/Topics/marine/seamanagement/seaweedrev">https://www2.gov.scot/Topics/marine/seamanagement/seaweedrev</a>			•
Statement from Marine Scotland in response to recent media commentary around mechanical dredging trials 13th Jan 2020	<a href="https://www2.gov.scot/Topics/marine/seamanagement/seaweedrev">https://www2.gov.scot/Topics/marine/seamanagement/seaweedrev</a>			•
Petitions and associated correspondence	<a href="https://www.change.org/p/scottish-parliament-ensure-that-mechanical-kelp-dredging-does-not-happen-in-scotland">https://www.change.org/p/scottish-parliament-ensure-that-mechanical-kelp-dredging-does-not-happen-in-scotland</a>			•