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## **Aquaculture development in Scotland**

Peel, Deborah; Lloyd, Michael Gregory

*Published in:*  
International Planning Studies

*DOI:*  
[10.1080/13563475.2014.921417](https://doi.org/10.1080/13563475.2014.921417)

*Publication date:*  
2014

*Document Version*  
Peer reviewed version

[Link to publication in Discovery Research Portal](#)

*Citation for published version (APA):*  
Peel, D., & Lloyd, M. G. (2014). Aquaculture development in Scotland: regulation as a moving equilibrium. *International Planning Studies*, 19(3-4), 292-305. <https://doi.org/10.1080/13563475.2014.921417>

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# Aquaculture Development in Scotland: Regulation as a Moving Equilibrium

DEBORAH PEEL\* & MICHAEL GREGORY LLOYD\*\*

\*School of the Environment, University of Dundee, Dundee, UK; \*\*School of the Built Environment, University of Ulster, Dundee, UK

**ABSTRACT** *The expanding interest in marine planning and management raises important questions for the spectrum of marine, coastal and terrestrial environments. The role of state regulation in mediating conflicts over the use and development of the marine resource has spatial implications across these domains. Governance of the marine represents a very particular challenge since it involves a highly complex mix of common, legal and customary property rights and sets of defined territorial jurisdictions. The Planning etc. (Scotland) Act 2006 and subsequent policy iterations have changed institutional and organizational relations. The legislation included provisions for the extension of statutory land use planning controls to include coastal and transitional waters (i.e. to the 12-nautical mile limit), meaning that finfish and shellfish farming are subject to the terrestrial planning regime. This represents a turn from self-regulation to arrangements for state planning controls. This paper traces this evolution in terms of a moving equilibrium as both state and market have sought to minimize the transaction costs involved.*

‘The law is always behind the times, requires elaborate stitching and fitting to adapt it to this newly perceived aspects of the commons.’ (Hardin 1968, 1245)

## Introduction

The emerging focus on the exploitation of the marine environment and an interest in developing appropriate institutional frameworks for its planning, management and regulation require an understanding of how relations might be organized and how competing state–market interests reconciled. Using aquaculture as a proxy for marine exploitation, this paper explores some of the principal issues in order to highlight the complexities involved and the sensitivities required in institutional design and implementation. Specifically, we deploy thinking drawn from a new institutionalist perspective in order to examine the incremental transfer in property rights that has occurred in Scotland over

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*Correspondence Address:* Deborah Peel, School of the Environment, University of Dundee, Dundee, UK. Email: [d.peel@dundee.ac.uk](mailto:d.peel@dundee.ac.uk)

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five decades with respect to the management of marine fish and shellfish farming activities which involved a turn from self- to state regulation.

50 The expanding interest in the planning and management of the marine resource serves to highlight the competing nature of its users and uses, together with its associated bundle of property rights (Howarth 2006). In this respect, the marine is as distinctive as the terrestrial domain. A potential ‘tragedy of the commons’ (Hardin 1968, and see the earlier papers by Gordon 1954; Scott 1955) is held to be a persistent feature of the marine environment leading to its over-exploitation, the degradation of its ecosystem and, as the opening quotation suggests, legal under-provision. In the context of statutory land use planning, inter-  
55 vention is deemed necessary to manage and minimize the transaction costs involved in land and property development to serve the public interest (see, for example, Dawkins 2000; Alexander 2001a, 2005; Webster 2005a). Devising an appropriate governance regime is complex. Following Feeny, Hanna, and McEvoy (1996), understanding the underlying individual motivations; the characteristics of individuals; the nature of existing  
60 institutional arrangements; the interactions among resource users; the ability to create new institutional arrangements and the behaviour of the regulatory authorities involved is critical to understanding the social context in which institutional regimes operate and regulatory frameworks evolve.

In practice, and as a consequence of this evident and evolving complexity, the planning  
65 and governance of the marine environment in Scotland, for example, have come to the fore. New forms of activity for exploiting the sea-bed and marine eco-systems require new institutional arrangements. Wave and tidal energy, mineral extraction and ecotourism are illustrative of the new marine uses which necessitate associated infrastructure and user requirements. Changing marine contexts may conflict with established and relatively more  
70 traditional marine and coastal activities, and necessitate appropriate modes of mediation and strategic planning (Peel and Lloyd 2004). The shaping of governance and regulatory arrangements then becomes of critical importance. As noted above, there is a need to understand and explain the social interplay of institutional arrangements and organizational behaviours involved in the efficient, effective and equitable use of the marine  
75 resource, particularly as alternative commercial and resource-based markets and technologies emerge.

The societal dynamics involved in devising appropriate governance of the marine environment are highly complex. The ways in which different transactions and relations  
80 between different marine users are mediated may themselves be prone to challenge and contestation. It is the heterogeneous nature of those interests and uses that arguably pose the greatest challenge to devising an appropriate governance regime to manage the marine resource as a collective good with its embedded potential for property rights mismatches (Yandle 2007). Technological advances, scientific discoveries and innovative methods of exploiting the marine environment provide for a dynamic context which  
85 raises important issues for decision-making arrangements. It is, therefore, important to anticipate the responses to embryonic forms of institutional design in the sustainable exploitation, planning and management of the marine resource. New ‘rules of the game’ (North 1980) are layered upon established sets of power relations, property rights, customs, behaviours and attitudes (Feeny, Hanna, and McEvoy 1996). It follows  
90 that specific interest groups may wield relatively more power than others over decisions about how to — or how not to — access, use or conserve aspects of the marine resource (Peel and Lloyd 2009). Of particular interest here is the role of the state in mediating

95 competing sets of private interests in what is deemed to be the public interest. The purpose of this paper was to contribute to an understanding of the nature of these changing relations and interactions; following Alexander (2001a), to infer aspects of discriminating alignment and institutional design necessary to obtain multi-actor buy-in and, finally, to reflect on how different actors respond to new marine governance regimes — and work towards a moving equilibrium.

100 The broad context for this paper explores the complex nature of the bundle of common and private property rights associated with aquaculture, alongside the allied interrelations between economic action, social and environmental costs, and the institutional designs relating to the marine and coastal–marine interface. The discussion examines the emergence of a new planning regulatory framework to manage aquaculture in Scotland, drawing on Coase’s (1937, 1960) seminal work on the nature of transaction costs and market efficiency. Our reasoning is informed by the cross-disciplinary new institutionalist perspective on understanding the changing nature of social and economic relationships and institutions (Hall and Taylor 1996; Nee 2001). For example, Merton (2001, ii) argues that:

110 the contemporary paradigm of institutional analysis involves an ‘intellectual trade’ that transcends the traditional boundaries of the social sciences. The benefits of such trade can be seen in the exchange and application of such domain-bridging concepts as choice within institutional and organizational contexts, bounded rationality, social embeddedness and social networks, transaction costs, human and social capital, externalities and enforcing trust.

115 New institutionalism’s translation into a number of individual disciplines — e.g. sociology, economics and law (Hall and Taylor 1996) — and the expanding breadth of interest in the topic, alerts us to its potential relevance in studying planning and governance in the specific and inter-disciplinary context of the marine. The following section provides an overview of these theoretical perspectives before examining their potential for understanding a transaction costs analysis to planning and regulating aquaculture. The dynamics of devising an appropriate governance regime are then illustrated with respect to the ongoing recalibration of state regulation of aquaculture in Scotland. The final section discusses the theoretical and applied implications of a moving equilibrium.

### 125 **New Institutionalism**

130 New institutionalism has offered fresh insights into understanding the complex interrelations involved in the reconciliation of private property rights and the public interest. New institutionalism explores the complex relations involved in economic, societal and environmental decision-making (Williamson 2000). It is explicitly interdisciplinary in nature which has led to considerable exchange, debate and cross-fertilization of its constituent disciplinary ideas. In the context of statutory land use planning and governance discourses, for example, both the institutionalist perspective (Healey 1997, 1999; Vigar et al. 2000; Alexander 2005) and the transaction costs analytical approach (Alexander 1992; Dawkins 2000; Sager 2006) are important strands of thought. In particular, Alexander’s (2001) exploration of transaction cost theory in relation to public land use planning is helpful in providing a systematic approach to differentiating alternative feasible forms of



governance arrangements. Moreover, Alexander (2001) makes a critical distinction between the transaction costs incurred by those directly involved in an exchange, for example, a developer and a local planning authority, and indirect parties, such as the wider public or future generations, who may benefit from enhanced governance and regulation. This reasoning helps inform our understanding of the processes involved in securing a wider public interest.

Whilst we should not underestimate the intellectual tensions in new institutionalism, we can highlight two important dimensions of the institutional turn in rethinking state–market relations. Firstly, theories of governance concerned with ‘the coordination and fusion of public and private resources’ have become more commonplace in the context of Western European local government (Pierre 1999, 373). Secondly, this fusion has emphasized an active appreciation of the *value dimensions* which structure, guide and give meaning to the arrangements and processes of governance (Pierre 1999). In particular, this realignment of a state–market dichotomy reflects the development of ideas promoting a shift from government to governance, the latter being based on the broad partnership model of public and private interests (Buitelaar 2003). A perceived need for a dynamic, fluid and non-linear understanding of developing complex regulation has prompted a search for new forms of governance, including statutory land use planning (Buitelaar and Needham 2007). New institutionalism offers the potential of providing fresh insights into understanding processes of institutional design, organizational relations and social exchange and how these are negotiated and reconciled to secure (more) efficient outcomes by, and for, the parties involved.

There are critiques of new institutionalism. For instance, we may point to concerns that particular applications are relatively selective in their explanatory rigour (Barzelay and Gallego 2006). There have been questions as to the general validity of institutionalist explanations for understanding and exploring institutional and organizational change (Gorges 2000). Moreover, distinctions exist between the various schools of thought which comprise the broad institutionalist umbrella (Hall and Taylor 1996). Thus, whilst the promotion of interdisciplinary thinking through disciplinary boundary crossing may be considered to be fruitful, following Thelen (1999), this has tended to result in ‘intellectual sprawl’. Thus, for example, Pierre (1999, 373) observed that whilst ‘institutional theory has become a *leitmotiv* in much of mainstream political science, the institutional dimension of urban politics remains unclear and ambiguous’. This ambiguity and a perceived relative lack of clarity simultaneously open up important theoretical and empirical research agendas and demand clearer explanation.

Cognizant of these caveats, what remains of interest is that an institutional analysis offers the potential to unpick the dynamics and narratives in changing state–market relations. In particular, new institutionalism focuses on the nature of the social relations and motivations which prompt state (public) and market (private) actions. It allows for an appreciation of how different institutional arrangements can affect the behaviours of individuals (Webster 2007). This relational dimension itself reflects the balance of power in the underlying bundle of property rights, the transaction costs involved and the reconciliation of different interests. Reconfiguring and understanding these relations are of direct significance to the mobilization of collective action and the design of appropriate social institutions where competing individual interests prevail. More precisely, we follow the line of argument put forward in the new institutionalism which focuses on the importance of transaction costs in social and economic behaviours (Hall and Taylor 1991)

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and related theoretical discussions within statutory land use planning (see, for example, Alexander 2001a; Webster 2005b; Buitelaar and Needham 2007). This paper contributes a marine dimension to this emerging knowledge base.

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### Transaction Costs: a Moving Equilibrium

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Transaction costs represent the dynamics realities of complex market transactions, and may be extended to understanding the nature of state–market relations, and further state–market–civil arrangements (Alexander 2001a). Transaction costs comprise those costs involved in facilitating and negotiating economic and social actions associated with market production, consumption and exchange. Transaction costs may be distinguished from the normal costs of production and refer to those costs associated with the facilitating of economic relations, contracts and compliance. The concept was initially identified in relation to the legal, financial and contractual costs incurred as private firms engaged in their various activities. Early thinking had assumed that such costs either did not exist or did not have any effect on private sector decision-making. Dawkins (2000, 507), for example, summarized the initial understanding of transaction costs as set out in the *original* reasoning of Coase (1937):

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According to Coase, in a world of zero transaction costs, public policy intervention is not only unwarranted, it is irrelevant from the standpoint of economic efficiency. Private decision makers will resolve market failures through voluntary agreements. Only when positive transaction costs are considered do interventionist policies become one of the many nonmarket mechanisms that may be required to create a pareto optimal economic outcome, defined as any economic outcome that benefits at least one person without harming someone else.

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The original theoretical exposition of zero transaction costs was located in market to market contexts. It was recognized, however, that the assumption of the absence of costs involved in market transactions was untenable. Indeed, Coase (1960) pointed to the existence of positive transaction costs and the complex nature of the types of tasks required to prosecute a market transaction as follows:

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In order to carry out a market transaction it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on. These operations are often extremely costly, sufficiently costly at any rate to prevent many transactions that would be carried out in a world in which the pricing system worked without cost (Coase 1960, 7).

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Building on his work relating to the theory of the firm, Coase (1937, 14) advanced a ‘theory of equilibrium’ to explain how those involved in any market exchange constantly *experiment* with the institutional arrangements for organizing or controlling the range of transactions involved. These ideas were initially formulated in the context of market to market relations and asserted a model of economic exchange based on hierarchical authority as a means of economizing on transaction costs. The argument was that firms behave

so as to minimize transaction costs. Significantly, Coase (1937) pointed to ‘a theory of moving equilibrium’ in which contractual relations are transacted and are likely to change over time. In other words, institutional structures and relations are reworked and adapt to the evolutionary organizational contexts in which they are embedded in order to remain efficient. This process of readjustment involves considering notions of cooperative market behaviour so as to reduce the costs of exchange, compliance and enforcement. In effect, the various interests involved in market to market exchanges must subscribe to, or align themselves with, the prevailing institutional objectives. Where institutional arrangements are perceived as inefficient, it follows that there will be pressure for reform to secure efficiency gains and reduce—or remove—the transaction costs involved.

The underlying argument then was that behaviours would change as firms sought to minimize or avoid the transaction costs which were incurred in closing a specific exchange between private interests. Following Alexander (2001a), there is a helpful distinction between behaviours of discriminating alignment of transaction costs and institutional design to fit the transaction costs. The latter involves the designing of rules and processes to enable behaviour to comply with wider societal values (Alexander 2005). This reasoning provides an insight into the behaviours which might be expected in state–market transactions and relations since they may be associated with the reconciliation of private and public interests. In seeking to reduce or mitigate externalities, for example, the state through its interventions can generate new or additional transaction costs for private firms. In effect, securing greater compliance by firms to minimize the socio-environmental impacts of those costs of their activities involves additional (transaction) costs on those businesses. Moreover, in devising appropriate or institutional regulations, the state itself incurs transaction costs, such as those linked to the planning, monitoring and enforcement of its standards. Following the logic of the moving equilibrium idea, it is in the interest of state and markets to explore the minimization of those costs. Alexander (2001b) posits that the appropriate institutional design will seek to secure new transaction cost reduction. This suggests the case for deliberate reconciliation of public and private interests.

Transaction costs are thus an important variable in understanding the evolution of the institutional framework for the management of the marine resource. Firstly, in the context of state–market relations, the momentum for any redesign of institutional and interventionist arrangement is influenced by the countervailing institutional, subinstitutional and market relations in which individuals and organizations behave, operate and interact. Secondly, the redesign of those institutional arrangements will be determined by the nature of the transaction costs involved. More specifically, it will be informed by the ways in which the efficiency problem (understood here as managing any social cost) is socially constructed. Thirdly, for the new institutional arrangements to become embedded in the established economic system, the parties involved must be open to the dynamism of institutional relations and take account of the experimentation and associated learning with respect to securing an appropriate equilibrium. This is to ensure that there is institutional and political legitimacy for the regulatory framework imposed. These narratives are now used to discuss the evolution of aquaculture planning and regulation in Scotland and to consider why government controls have been deemed to be the appropriate mode of intervention in the management and governance of aquaculture, as opposed to relying solely on private and voluntary arrangements.

## Aquaculture Development in Scotland

The Commission of European Communities (2002, 3) defines aquaculture as the ‘rearing or culture of aquatic organisms using techniques designed to increase the production of the organisms in question beyond the natural capacity of the environment’. Highly diverse, in practice, the industry comprises marine fish-farming, marine mollusc-farming, freshwater fish-farming and aquatic plants. These activities concern a spectrum of water-based localities and, importantly, impact on the coastal zone as well as the wider marine resource. Aquaculture development has implications for different elements of the marine–coastal–terrestrial environments. These may be reduced to the use of the seabed for anchoring sea-cages, for example; the associated landward development to support facilities, such as those concerned with storage and distribution, and access requirements; and the sea-water in which the organisms are farmed. In global terms, aquaculture has expanded considerably during the last 60 years with respect to production, investment and employment (Food and Agriculture Organization 2010). The efficient, effective and equitable management and governance of the impacts of aquaculture are thus of global importance.

The aquaculture industry involves a composite of environmental considerations (Read and Fernandes 2003); legal aspects (Glenn and White 2007) and marine spatial dimensions (Rennie 2010). Whilst controlled aquaculture has been heralded by some as a positive development, paradoxically, certain types of aquaculture production are identified as representing a further source of risk to wild stocks (Naylor et al. 2000). Although productivity has increased, the associated growth and accompanying concentration of the aquaculture industry raise important questions in relation to the sector’s environmental and ecological impacts (Fernandes, Miller, and Read 2000; Whitmarsh and Wattage 2006). Moreover, the heterogeneity of marine users and the differentiated (and often competing) rights over the marine resource have drawn attention to the need to design an appropriate institutional framework capable of dealing with the marine environment’s inherent dynamism and complexity; to manage externalities and to mediate between competing interests.

Aquaculture involves potential for economic disbenefits and social and environmental costs. This makes the governance of the sector of paramount importance (Food and Agriculture Organization 2010). This agenda in itself is of comparative international interest, given the advocacy of exploring alternative governance modes, including voluntary contracting, co-management and self-regulation of aquaculture development (Commission of the European Communities 2002). In practice, however, governance including the licensing, regulation and monitoring of the aquaculture industry is highly fragmented. In different contexts, planning and regulation have tended to evolve incrementally over time in response to new waves of scientific evidence, changing perceptions of risks and more vocal public concern (Henderson and Davies 2000). As a consequence, Howarth (2006, 14) pointed to ‘the rather embryonic state of legal regimes for aquaculture, where tensions between public and private rights have not been satisfactorily resolved’. The significance of what may be described as a weak governance regime with respect to aquaculture has to be understood, in part, as a consequence of the pace and scale of technological innovation which has been developed in order to exploit the marine environment. Indeed, Howarth (2006, 15) described these developments as ‘nothing short of miraculous’.

Previous research (Peel and Lloyd 2008) explained how new regulatory controls over aquaculture in Scotland evolved over three broad phases. Firstly, the development of the aquaculture industry was managed and advanced by private ownership and operating interests through the Crown Estate. This self-regulation phase took place within a particular understanding of the wider social context to the industry in Scotland. Significantly, the specific environmental, hydrological and ecological requirements of the industry concentrated its development principally on the West Coast of Scotland and the Shetland Islands (Coull 1996) in relatively remote rural communities. As such, the sector was deemed to have significant socio-economic benefits for these localities (Highlands and Islands Enterprise 1999). The rapid growth, intensity and geographical concentration of the sector, however, precipitated an awareness of the wider environmental costs and drew attention to, for example, the impact of fish escapes on wild populations, the effects of pesticides on natural water environments, health and safety considerations and inter-farm spillover effects (Cobham Resource Consultants 1987). This mobilized efforts to redesign the institutional relations to address the various impacts and social costs involved. This iterative and incremental process of institutional redesign serves to explain its partial and incomplete form. It serves to illustrate that momentum for any redesign of institutional arrangements is influenced by the countervailing institutional and subinstitutional relations in which individuals and organizations in the aquaculture sector behave, operate and interact.

Awareness of these individual issues prompted a concern with how best to manage specific social costs. This involved active deliberations around the transaction costs incurred by both the Crown Estate and individual fish-farms and the need to devise more efficient institutional arrangements to accommodate the plurality of interests concerned. These debates accentuated the (then) dual role of the Crown Estate as land owner and *de facto* regulator of the aquaculture industry (Lloyd and Livingstone 1991a). In short, early management of the industry was characterized by a private property regime and self-regulation as the institutional device. This was socially constructed as the most efficient way of dealing with the transaction costs involved in those particular circumstances. Yet, the individual problems resulted in sectorally devised policy responses (Edwards 2003). Moreover, and in addition, environmental groups, local planning authorities and other marine users, as well as the general public, became increasingly aware of the divergence between the social and private interests involved (Lloyd and Livingstone 1991b). Following Hannigan (2006), wider public debate and assertion of environmental claims highlighted the policy tensions.

Societal expectations of environmental values in the marine context were changing (Berry and Davison 2001), leading to pressure to redesign and rebalance the institutional framework in the light of greater diversification in the local economy. Importantly, then, institutional relations became more complex as knowledge and understanding of the impacts of the industry became more widespread and new interests in protecting and using the marine resource began to compete for attention. Critically, efficiency concerns were juxtaposed against arguments for greater democratic accountability. A perceived development–environment imbalance posed specific questions for the nature of the institutional design to manage this new set of transaction costs. The redesign of the institutional arrangements was determined not only by the nature of the transaction costs involved but also by the ways in which the efficiency problems (externalities) were socially constructed. This second phase was characterized by the questioning of the efficacy of self-regulation as an institutional device and the gradual accretion of state regulatory powers.

Underpinning the moving equilibrium idea is the argument that those involved in managing transaction costs actively experiment in the design of appropriate institutional arrangements and a perennial search to recalibrate them accordingly. In the context of aquaculture, not only is the natural environment dynamic, and the social construction of community and economic well-being iterative, but the institutional arrangements were also of necessity evolving in order to secure a more efficient governance framework. The second phase of aquaculture management involved stronger state strategic locational guidance and interim land use planning arrangements. These sought to better integrate the planning considerations relating to the siting and design issues of aquaculture-related development (Scottish Executive 2003). The transfer from private to state responsibility was a way in which aquaculture interests could lessen their transaction costs whilst the state could better secure a public interest over the industry.

A third phase involved full land use planning regulation being put into place by the Planning etc. Scotland Act 2006. This represented the maturation of thinking around managing the transaction costs to both market and public interests. The steps towards a relatively more hierarchical institutional arrangement reflected an incremental learning process around the nature of the problem, the extent of the transaction costs and the required institutional form. Moreover, in procedural terms, it is important to note that the introduction of the new planning legislation, and the accompanying policy guidance (Scottish Executive 2007), was underpinned by processes of evidence gathering, consultation and multi-stakeholder dialogue. This relational and norm-building aspect may be seen as critical components of embedding the new institutional arrangements amongst the subinstitutional actors. This deliberative dimension may be understood as an important aspect of securing stakeholder buy-in to the new institutional arrangements and has also turned on seeking to enhance both technocratic and democratic dimensions since it addresses both the efficiency and inclusivity of the planning system.

The addition of planning controls over marine aquaculture is important for a number of reasons. It is innovative in that, for the first time, it takes a strategic and integrative approach to managing the coastal zone and waters out to the 12-nautical mile limit. As a particular form of state intervention, the (established) planning system involves forward planning, development management and enforcement. These elements inevitably bring with them a new set of transaction costs. The efficient management of these constituent parts forms an important challenge for articulating the public interest since intervention and non-intervention both incur costs. Critically — and this was an integral part of the logic underpinning the introduction of planning controls — planning involves opportunities for public engagement. This aspect may yet create a new layer of transaction costs to be taken into consideration. Moreover, the aquaculture sector itself is changing since it has engaged in a programme of merger and consolidation, resulting in an overall reduction of the number of registered companies (Marsden 2012). In addition, the wider debates about marine (spatial) planning suggest the potential for relatively more strategic management of the marine resource. This itself reflects the broadening of the social construction of the marine and coastal environments (Peel and Lloyd 2004) and raises questions for how sectoral micro-policy designs are integrated into the macro-institutional design.

### A Moving Equilibrium

Evidence suggests that a fourth phase may be identified which further redefines state–market relations in the aquaculture sector. This phase points to ongoing experimentation to determine the appropriate balance of the transaction costs involved in planning and managing market and public interests. Moreover, the extension of local authority planning controls to marine aquaculture is only part of a bigger governance arena and progress towards marine planning. Efforts to refine the planning regime demonstrate, in effect, a moving equilibrium. The introduction of the Scotland etc. Planning Act (2006) was part of a root-and-branch modernization and reform of the statutory land use planning system (Peel and Lloyd 2006). Implementation has involved substantial critical reflection and efforts to embed a cultural change in developmental relations in Scotland (Lloyd and Peel 2011). This reflexive phase has witnessed sustained efforts to secure the efficiency, equity and effectiveness of the planning regime (Lloyd and Peel 2012). In practical terms the ongoing refinement of the relationships involved in minimizing transaction costs is evident in a number of stages of thinking.

In May 2009, the Scottish Government set out its renewed strategic framework for aquaculture. This asserted the need for continuing improvement of the sector whilst ensuring the growth and development of the industry (Scottish Government 2009). It was based on an inclusive consultative and collaborative process and engagement with key stakeholders. In further refining its relationship with the industry, the Scottish Government (2010) stated its intentions for how the planning system would support the continued development of aquaculture:

the Government sees a reformed planning system as essential to promoting sustainable economic growth in Scotland. Important changes have been made to the planning system and recent proposals to amend its fee structure continue the Government’s aim of making it fairer and easier to set up or expand a business. However, that is *still not enough*. The Government, its agencies, local authorities and the fish farming industry have all been working to streamline the planning process for aquaculture developments (Scottish Government 2010, 1 emphasis added).

This strategic ambition forms part of the Scottish Government’s objective of removing unnecessary barriers to sustainable economic growth. In other words, the political ambition is to minimize the transaction costs not only on the aquaculture industry but also on the government itself. Subsequent research (Scottish Aquaculture Research Forum 2010) explored the possibility of introducing permitted development rights to aquaculture. This initiative was seen as a way of providing greater flexibility for fish-farmers in changing from finfish to shellfish and from salmon to halibut. The research essentially concerned those developments and changes of use which are generally non-contentious in nature — reflecting practice in terrestrial land use planning. A subsequent paper (Scottish Government 2011) further clarified the roles and responsibilities of the interests involved in aquaculture. This sought to ensure the minimization of transaction costs for the sector in complying with the expected behaviour by government. Reflecting a holistic governance approach and broader sustainability principles (Food and Agriculture Organization 2010), attention was drawn to economic goals, water quality, coastal landscapes, recreation and

tourism, wild fish stocks and environmental impacts. In effect compliance with these criteria in a responsible way would allow the industry to minimize any transaction costs involved. Finally, a draft circular (Scottish Government 2013) articulates the broader strategic context for aquaculture by linking the marine and terrestrial planning systems. Attempts to establish greater integration devise a more comprehensive marine governance framework that is illustrative of a commitment to join up thinking across all the dimensions of the marine — planning, licensing, conservation and enforcement. This experimentation in coordinating and streamlining governance seeks to minimize potential transaction costs for all interests involved.

This evolutionary and reflexive approach to regulatory design indicates that for new institutional arrangements to become embedded in the established economic system, the parties involved must be open to the dynamism of institutional relations and take account of the experimentation and associated learning with respect to retaining and nurturing an appropriate moving equilibrium. The nature and associated processes of this moving institutional framework also provide institutional legitimacy for the technocratic costs imposed on the market and the public interests and benefits derived from opportunities for democratic engagement.

## Conclusions

This paper has sought to contribute to an understanding of the nature of the relations and interactions of marine actors through a case study of the regulation of aquaculture in Scotland. Whilst the details are case specific, we have sought to identify issues of more general relevance and from which it is possible to infer aspects of institutional design for marine planning. Importantly, these insights turn on the need to obtain multi-actor buy-in to any new marine governance regime if the anticipated efficiency, equity and effectiveness gains are to be secured. A new institutionalist approach offers a nuanced heterodox insight into the recalibration of institutional arrangements for aquaculture in Scotland. Specifically, the paper has argued that transaction costs are an important variable in understanding the evolution of the institutional framework for the management of aquaculture and illustrate the necessary dynamics of laws, regulations and standards. The (re-)framing of the transaction costs involved in aquaculture has clearly been different over time as those involved sought to establish an appropriate equilibrium in institutional relations from self-regulation to state control of development rights. This involved both discriminating alignment and institutional design considerations.

The movement from self- to state regulation took account of emerging scientific evidence and reflected broader societal, ecological and governmental agendas (Gubbay 1995). These concerns were, in part, disseminated by environmental campaign groups (Scottish Environment Link 2002). Notably, this evolving process has involved consideration, for instance, of how best to design institutional relations that facilitate a diversification of the local economy (Scottish Natural Heritage 2002). The extension of land use planning controls in the legislation to include the coastal and transitional waters was a step-change in conventional statutory land use planning since this means that finfish and shellfish farming are subject to statutory (land-based) planning controls. In effect, the regulatory powers fall on the established local terrestrial planning authorities to manage and enforce. This represents much more than a narrow construction of state intervention to redress the existence of market externalities since it forms part of a much wider



project to reform and modernize the planning system and to enhance its efficiency and democratic accountability through the creation of a (relatively) more consistent planning and development framework (Peel and Lloyd 2007). Statutory controls are an explicit acknowledgement of the increasing importance of devising an appropriate regulation of the marine resource and of recognizing the inter-connectedness of land and sea at the coastal interface. The later phases demonstrate the importance of research and critical reflection as regulation becomes more sophisticated, behaviours are modified and perceived norms become consolidated in practice.

Reworking Coase's (1960) argument of a policy or regulatory time-lag in relation to the management of the (marine) commons, the costs of introducing planning controls is deemed necessary relative to the costs of not doing so — or allowing the social costs and market inefficiencies to prevail. This hybrid approach is consistent with theoretical and empirical developments in fisheries which challenge the assumption of a polarized politics where state and market regimes are diametrically opposed (Feeny, Hanna, and McEvoy 1996). The expectations informing the introduction of state planning controls are that this iteration of marine governance is intended to reduce the costs of transactions in these contested relations, including in policy-making, monitoring or enforcement. It is to be anticipated that any such system will be sufficiently flexible to accommodate unforeseen circumstances and involve negotiating a moving equilibrium.

This case study of regulating the aquaculture sector offers potential insights for the planning and management of the marine resource as a whole. In the UK, the tentative advance of a legal framework to control and manage the marine environment (Slater 2007; Scottish Government 2013) could be served by the application of a transaction costs analysis. Debates, to date, have tended to highlight the complexity and dynamism of the marine environment, the contested interests of users and the relative paucity of information in certain quarters. Any proposed matrix of intervention would need to be sensitive to these specific operational, jurisdictional and organizational constraints. How the individual motivations and interactions of the various users are further refined over time will, in part, also be informed by the particular modes of exchange, the nature of the transaction costs involved, the extent to which different values are acknowledged and how efficient the institutional design is perceived to be in securing an acceptable equilibrium in practice. In short, the behaviour of the regulatory authorities and the arrangements to support processes of collective learning must shape the tone of any new institutional context for the marine.

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