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Access to aquaculture sites: A wicked problem in Norwegian aquaculture development

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Abstract

Increased complexity and interdependencies lead to problems and issues that are hard to solve. Such chronic and enduring problems are often referred to as 'wicked problems'. This article focusses on Norwegian salmon aquaculture and addresses the problems related to the industry's and government's ambitions for growth in aquaculture production and the municipalities' desire for economic compensation, usually termed area rent, from the aquaculture companies that use municipal waters for aquaculture. The government has resisted the introduction of such an area rent due to several complex institutional and distributional considerations. This complex and enduring issue is analysed here as a wicked problem, where we find that the main source of wickedness does not lie within the definition of the problem rather it's related to the available solution as the proposed solution requires changes that are not politically viable.

Keywords: Salmon farming; Aquaculture sites; Area access; Area rent; Coastal governance; Public policy; Wicked problems; Norway

Introduction

Development in marine aquaculture is dependent on several factors, including availability of feed, healthy marine environments and suitable locations. A major and enduring debate in Norwegian aquaculture involves the question of access to suitable new production sites (Hersoug 2013; Sandersen and Nikolaisen 2007). Both the government and the aquaculture industry have high ambitions for continued growth of aquaculture production. The country is already by far the world's largest producer of salmon (*salmo salar*), and both government and industry aim to at least double the current production of more than 1 million tonnes, which had an export value of 5 billion euros in 2013 (Seafood Federation] 2013; Seafood Federation] 2012; Report to the Storting Stortingsmelding no. 22 2013). Achieving this goal would require both more and better production sites (Gullestad et al. 2011).

However, there is now increasingly a general understanding that the coastal municipalities are becoming bottlenecks for this growth. The municipalities has since the 1989 revision of the Planning and Building Act (Act of 21. April 1989) had the authority to allocate and designate areas for aquaculture production in their coastal zone. Through municipal coastal zone planning the municipalities decide whether and where to designate areas for salmon production, as well as other economic and non-economic uses,

exclusively or in combination. Municipal autonomy in coastal zone planning is limited by sector laws and national guidelines and policy provisions, but it is nevertheless considerable and offers plenty leeway for independent decision-making (Sandersen and Kvalvik 2014; Jentoft and Buanes 2005). This local planning autonomy gives the municipalities a gatekeeper role regarding access to the coastal zone that is seen as a growing obstacle to further growth in salmon production. Many municipalities have increasingly become more reluctant and negative to further aquaculture growth in their waters. This reluctance is due to environmental concerns (such as sea lice and genetic interference on wild salmon, and release of faeces and chemicals), competition with other uses of the sea space (mainly fisheries and transport but also other industries, leisure and tourist activities) and the relatively modest local economic benefits (mainly due to restructuring of the industry) (Hersoug, 2013; Isaksen and Mikkelsen 2012; Gullestad et al. 2011).

Both the municipalities and the salmon producers are concerned about this issue, though for different reasons. Many municipalities argue that some kind of economic compensation for the use of their sea space for salmon production will make them more amenable to allocating new areas for the salmon industry, and a “Network of fjord and coastal municipalities (Nettverk for fjord og kystkommuner—NFKK), organizing 56 municipalities, is established to promote the introduction of an area rent (NFKK 2013; Kontali 2011; Isaksen et al. 2012).. On their webpage you can read: “Many of us are proud hosts of the aquaculture industry. But many of us saw the business become centralized. Workplaces disappear and municipalities are left with executive work and cages in the sea. Tax money does not necessarily have the same anchor as fish cages. This is one of the reasons to establish the network.” (<http://kystnettverk.no/>). Most fish farming companies have sponsored various types of local activities to foster good will and a collaborative atmosphere with their host municipalities, and in several municipalities aquaculture companies have established industry funds. The municipalities, however, want a general, permanent and predictable arrangement. One suggestion put forward during the last 15 years has been the introduction of an *area rent*, according to which the municipalities would be compensated for the administrative burden of planning, facilitating and hosting the aquaculture industry (Kontali analyse as 2011). It is assumed that this payment would make municipalities more receptive to allocating new areas for the salmon industry, thereby solving or reducing the access problem (Isaksen et al. 2012; Sandersen and Nikolaisen 2007; (NOU 2004: 19). The idea has been supported by both municipalities and many salmon farmers, but the national government has resisted it due to several complex institutional and distributional interdependencies related to the introduction of such a rent.

We will refer to this policy dilemma, created by the discrepancy between the three factors of (1) national ambitions for industrial growth, (2) local autonomy in allocating necessary sites for production and (3) lack of incentives for municipalities to allocate areas to the salmon industry, as *the wicked problem in Norwegian salmon aquaculture development*. The concept of wicked problems was introduced by Rittel and Webber (1973) but has since been developed in various fields to describe a certain type of highly complex problems. Jentoft and Chuenpagdee (2009) applied the concept to fisheries, stating that coastal management often involves wicked problems. More recently, Berkes (2012) has conceptualised ecosystem-based management in fisheries as a wicked problem, as have Khan and Neis (2010) in their analysis of the rebuilding of fish stocks. The

present study attempts to apply the concept to the context of aquaculture and consider its usefulness in understanding the area rent debate.

We certainly acknowledge that there are other and serious challenges related to further aquaculture development, in particular the problems related to environmental impact and ecosystem effects (sea lice and genetic interference on wild salmon, release of faeces and chemicals). Among stakeholders and in the local debates these environmental issues and the area rent issue are certainly intertwined, but strikingly in the national public debate of area rent and environmental concerns are rather two parallel discourses with limited interference with each other. The more general question of area access and environmental concerns are however tightly interconnected in debates. The area rent discussion is taking place in other forum with other actors, including municipalities that do not want aquaculture in their waters or do not want an increase due to environmental impact. Further, competing uses of the coastal zone, like fishing and recreational use, might be affected by the introduction of an area rent. This has received very little attention in the debate, but are still considered to be an important factor in the debate about aquaculture growth.

The aim of this article is to examine the 'wickedness' of Norwegian discussion of area rent for aquaculture. In general problems are wicked when they are difficult to define and delineate from other problems and when they cannot be solved once and for all but tend to reappear (Jentoft and Chuenpagdee 2009; Rittel and Webber 1973). Wicked problems are complex and hard to solve mainly because they are inter-linked with broader social, economic and policy issues present at multiple levels (Weber and Khademian 2008). Our point of departure is that the multi-level character and organisation of the above-described policy dilemma in Norwegian salmon aquaculture and the resulting political stalemate can be described and analysed as a wicked problem. Our research questions are: What are the main considerations that contribute to the barriers regarding introduction of an area rent for salmon farming? Will an area rent solve the Norwegian aquaculture industry's difficulties in gaining access to new suitable production sites? How wicked or solvable is this policy dilemma?

The following discussion is based on literature studies, document analysis, and interviews with municipal, regional and national decision makers in Norway and industry actors. Another source of information has been public documents related to area access for the aquaculture industry and area rent and news articles, in addition to interviews with the interest organisation for the industry, the Norwegian Seafood Federation (Fiskeri- og havbruksnæringens landsforening—FHL/Sjømat Norge) and the Network for fjord and coastal municipalities (Nettverk for fjord og kystkommuner—NFKK) which was established to further an area rent on aquaculture to be allocated to the municipalities, as well as the Ministry of industry and fisheries. We also participated at the 2014 Annual Meeting of the NFKK where political or administrative leaders of the municipal members were present. In addition representatives of the general public and opponents to aquaculture growth in selected municipalities have been interviewed.

In the next section the wicked approach is presented and discussed. This is followed by a description of the development of the Norwegian aquaculture industry and of the municipalities' justifications for a rent on salmon production sites. After that follow an outline of the area rent debate and national policy answers. Based on this we analyse the area rent as a wicked problem and discusses whether an area tax can be expected

to solve the problem of area access. Finally, we consider the wickedness of the problem and discuss whether the area rent issue really can be considered a wicked.

Wicked problems

The term 'wicked problem', originally developed to focus on micro-level issues, is now increasingly used to describe large, fragmented, complex and interconnected societal challenges that span disciplines, knowledge bases and value systems. It has also been applied to a wide range of public problems such as the climate crisis, conservation of forests, obesity, global health, drug use and many others with no technical, simple and definitive solution or quick fix (Weber and Khademian 2008). Such problems share the characteristic of being highly resistant to resolution.

Ritter and Webber introduced the concept of 'wicked problems' in their seminal work on rationality in city planning in 1973. The article is a critique of the linear, rational-technical understanding of planning, decision-making and problem-solving in a societal context, and the approach is developed to analyse complex and interlocking problems that do not fit into this pattern. 'Wicked problems' are contrasted to 'tame problems' that are simpler and can be solved within existing management or problem solving systems (Rittel and Webber 1973). The following four elements of wicked problems are based on Rittel & Webbers (1973) and Conklin (2006) and Weber and Khademian' (2008) summary of their work.

Wicked public problems have a tendency to *defy definition* in the sense that it is hard to point at the factor(s) causing the problem. According to Rittel and Webber (1973) you cannot truly understand the problem until you have developed a solution. Furthermore, as stated by Weber and Khademian (2008), wicked problems constantly 'morph and move'. When a new solution is offered, it exposes new aspects of the problem, again requiring further adjustment of the solution. Setting up and constraining the solution space is thus the wicked part of the problem (Ritter and Webber 1973). Wicked problems are therefore not objectively given, as their formulations and solutions rely on the viewpoint of those presenting them. They also involve complex problem-solving processes as resources, stakeholders, political ramifications and other constraints are constantly changing. Wicked problems are thus relentless, persistent and subject to redefinition in different ways over time (Weber and Khademian 2008; Rittel and Webber 1973).

Since there is no definitive problem, there is also *no definitive, final or correct solution*. There are no objective criteria or identifiable rules to tell us when *the solution* or even *a solution* has been found (Rittel and Webber 1973). However, we cannot avoid making a decision at some point. According to Conklin (2006), the process of solving a wicked problem ends when one runs out of resources and the available solution or compromise is 'good enough', not when a final solution emerges. Solutions to wicked problems are therefore not right or wrong. In a wicked problem situation the context is ultimately ambiguous and resolution depends on elusive political judgments. From this it follows that solutions to such problems are shaped in negotiation among multiple stakeholders who are equally equipped, interested and entitled to judge. Rather than definitively solving wicked problems we have to design more or less useful, effective and efficient compromises based on who participates and how the problem is defined.

Further, *every wicked problem is essentially unique* and novel and every situation is likely to be one of a kind. 'The wicked problem space comprises multiple, overlapping, interconnected subsets of problems that cut across multiple policy domains and levels of government. Wicked problems, in other words, cut across hierarchy and authority structures within and between organisations and across policy domains, political and administrative jurisdictions, and political 'group' interests' (Weber and Khademian 2008: 336). According to Rittel and Webber (1973) there are apparent similarities between wicked problems, but 'one can never be certain that the particularities of a problem do not override its commonalities with other problems already dealt with' (Rittel and Webber 1973: 165). This makes it difficult or impossible to transfer known solutions to new wicked problems. It is not very likely that such a process can follow any pre-determined recipe or model of established practices; rather, solutions must be tailor-made and fitted to the unique situation.

Finally, because wicked problems are multi-causal with connections to many other issues, there is no reliable way to test in advance if a public policy will work; it is necessary to try implementing the proposed solutions and see what happens. Every solution to a wicked problem is therefore a '*one-shot operation*'. Still more problematic, each try may be expensive and may generate lasting unintended traces and consequences that can in turn create new wicked problems, or it may have other undesirable consequences and repercussions that could be difficult or impossible to undo.

Rittel and Webber (1973) seem to contend that nearly all modern societal or public planning problems are inherently wicked (as people are what make problems wicked). The term 'wicked problems' seems to indicate that there is no solution, and to avoid this slippery linguistic trap it is more accurate to talk about the degree of 'wickedness' present in a given situation (Conklin 2006). In line with this understanding, our premise here is that not all societal issues are wicked, but rather that wicked issues display various degrees of wickedness.

The Norwegian aquaculture industry and site requirements

To produce salmon in Norway one needs both a license and a production site. The licenses are allocated by the national government. They decide when new licenses are to be allocated, the number of licenses and also the volume of fish allowed on each license and each site (i.e. the maximum allowed biomass (MTB) for each license and each site) (Gullestad et al. 2011). Of the 276 coastal municipalities in Norway, 160 currently are hosting salmon farms (Parliamentary bill (Stortingsproposisjon) no. 1 (2013)).

The industry's development has been profound. Back in 1995 the production was 200.000 tonnes of salmon a year, and the industry was composed of 565 small, local and family-run companies holding 725 licenses. Today, due to changes in government regulations, technological developments and a restructuring of the industry, the amount of production has soared to more than 1 million tonnes on 932 licenses. At the same time, the number of producers has been reduced to 90, which own 132 companies (Report to the Storting (Stortingsmelding) no. 22 (2013); Gullestad et al. 2011).

Despite the doubling of licenses and the six-fold increase in production, there are fewer aquaculture sites today than 25 years ago (Report to the Storting (Stortingsmelding) no. 22 (2013)). The production on each site has therefore increased considerably. We also see a

trend toward even bigger sites, with more applications for so-called super-locations allowing MTB over 5,400 tonnes or more (Isaksen et al. 2012). The total area occupied by the aquaculture industry is therefore increasing. Still, the aquaculture sites, including safety and anchoring area, amounts to only 0.5 per cent of the Norwegian coastal areas inside the baseline (Isaksen et al. 2012).

Salmon farming is taking place virtually all along the coast, but the main areas of production have been extending from the west coast northward. As for production growth, there remains some room for increasing production on existing sites as their capacity is not yet fully utilised (Hersoug et al. 2014), but the more industrialised type of production requires bigger and better-suited areas. Also, veterinary regulations requiring distance to other aquaculture facilities, fallowing and a rotating use of the sites impact the industry's need for suitable production sites (Gullestad et al. 2011). The municipalities are, as outlined above, the authority that designates areas for salmon farming in the coastal zone through their planning (Sandersen and Nikolaisen 2007). It is this willingness to allocate areas for salmon farming that is of concern to the industry.

The coastal municipalities: door openers and gatekeepers

The reasons for the municipalities' reluctance towards increased aquaculture production in their coastal zones are, as mentioned, diverse. Some can be ascribed to the perceived or actual environmental impact of the industry and to competition with other uses of the coastal zone (Hersoug 2013; Sandersen and Nikolaisen 2007). Parallel with this and to an increasing extent, concerns about the municipalities' share of the value created by the aquaculture industry have been voiced (Hersoug 2013; Isaksen et al. 2012; Sandersen and Nikolaisen 2007). In the industry's first years, hosting the industry was attractive as it contributed to employment in many small, rural coastal municipalities facing depopulation problems. The jobs were created at the production sites at sea, at the landing and processing plants in the community, and through a general ripple effect on local businesses (Henriksen et al. 2012; Robertsen et al. 2012). This economic growth yielded revenue to the municipalities through the income tax and company tax, as well as generating activity in local communities and optimism on behalf of the prospects of rural areas.

The changing structure of the industry during the last two decades has altered some of this dynamic. From small and family-run companies rooted in their local communities, the industry has been restructured into a more large-scale organisation with fewer but bigger companies and a more cost-effective concentration of salmon landing and processing plants (Isaksen et al. 2012; Sandersen and Nikolaisen 2007). Five listed companies with headquarters in main Norwegian cities today own more than 50 per cent of the licenses (Robertsen et al. 2012). The number of landing and processing plants has been reduced from 250 to 50 in a 20-year time period (Norsk Fiskeoppdrett 2013). For many municipalities this change has resulted in a loss of jobs and revenue, as well as a reduced local commitment by the salmon producers as the companies have no personal or local connection (Isaksen et al. 2012; Robertsen et al. 2012).

The increased concentration of aquaculture landing and processing plants and of administrative support services, along with the accompanying relocation of economic ripple-effect benefits, makes it relevant to talk today about 'production municipalities' on one hand and

'base and processing municipalities' on the other. The first category consists of municipalities where there is only salmon production at sea, whereas the second group of municipalities also has processing plants, headquarters and other aquaculture-related service functions (Sandersen and Nikolaisen 2007). The production municipalities do not enjoy a comparable number of jobs or amount of ripple effect as the base and processing municipalities, and this asymmetry in the distribution of benefits is one of the drivers in the quest for an area rent. Continued rationalization and concentration processes can also make today's "base- and processing municipalities" tomorrow's "production municipalities", creating a situation of uncertainty for many municipalities.

Another driver is dissatisfaction with the allocation of the government's income from the aquaculture industry. The main income of the municipalities is income tax and economic transfers from the state. Until 1999 part of the company tax was allocated to the municipalities. Today the tax goes directly to the state and is then redistributed through the economic transfer to the municipalities (Isaksen et al. 2012). Even if the aquaculture companies are contributing through national taxation like other industries, their contribution to the municipalities is not directly visible, as there are no direct links between local value creation, profit from aquaculture companies and income for the hosting municipalities. Therefore, even though the value creation and profit from the industry have grown considerably (Report to the Storting (Stortingsmelding) no. 22 (2013)), many municipalities no longer experience a corresponding local return or benefit from the very profitable aquaculture industry.

Both the structural changes in the industry and the changes in taxation have modified the incentive structure of the municipalities in relation to the aquaculture industry. Many municipalities along the coast have therefore increasingly asked for compensation or their 'fair share' of the high profits generated by the aquaculture industry from the use of the municipalities' sea spaces (Isaksen et al. 2012; NFKK 2013). The municipal representatives often also refer to the costs and resource expenditures related to coastal zone planning and management and to the handling of aquaculture and site matters as reasons why they should be compensated (Isaksen et al. 2012; NFKK 2013). Hence the municipalities simply want their share of the income from this Klondike business as they provide the production sites, the core natural resource that makes this industry possible. It is also of relevance that aquaculture has been seen as a rather distinct and non-traditional way to exploit coastal and marine resources (Sandersen and Nikolaisen 2007). Whereas the traditional use forms have been transitory and seasonal, aquaculture displays a semi-permanent presence that resembles private ownership on land, and it is often seen as an atypical and illegitimate way of occupying the traditionally free-for-all coastal commons (Sandersen and Nikolaisen 2007).

The municipalities' justifications for a rent on salmon production sites are thus related to compensation for costs, fair share of a profitable endeavour, alleged property rights (i.e. a belief that the municipalities are the 'owner' of the sites and should thus be entitled to a part of the income that the sites are generating) and the somewhat exclusive character of aquaculture's use of coastal spaces.

The question of area rent and national policy answers

The question of local compensation and area rent was first put forward in the early 2000s, and it gained momentum in the second half of the decade (White Paper

(Odelstingsproposisjon) no. 65 (2000); Report to the Storting (Stortingsmelding) no. 19 (2005) and Report to the Storting (Stortingsmelding) no. 22 (2013); Parliamentary bill (Storingsproposisjon) no. 1 (2007)). The government stated in 2007 that it supported in principle the idea that the municipalities could require compensation for the use of the area in their coastal zone, and it appointed an inter-ministerial working group, headed by the Ministry of Finance, to assess how this could be done (Parliamentary bill (Storingsproposisjon) no. 1 (2007)). After a process involving the organisations of affected industries and recreational users, coastal municipalities, counties, and government-sector agencies, the government concluded that an area rent was 'not a suited instrument' because it would be difficult to determine the base for such a rent and because an area rent on salmon production does not harmonise with the established tax system. Instead the Ministry suggested allowing the municipalities to levy property taxes on aquaculture facilities in the sea (White paper (White Paper (Odelstingsproposisjon) no. 1 (2008); Parliamentary bill (Stortingsproposisjon) no. 1 (2008)). This would give the municipalities some direct and annual income from the industries' permanent use of their coastal zone. The suggestion was adopted, and today most aquaculture municipalities had levied this tax. The returns from this tax have been very modest, however, as the maximum tax rate is 7 % and the value set on the installations at sea (not the fish in the net) is quite low (Isaksen et al. 2012).

Another initiative to benefit the municipalities was to allot part of the fees for new aquaculture licenses to the County Councils, to be devoted (among other uses) to supporting municipal coastal zone planning, a task in which many municipalities lack both competence and resources (Hersoug and Johnsen 2012; Robertsen et al. 2014).

The municipalities were clearly not satisfied with this proposal, and in 2009 a 'Network for fjord and coastal municipalities' (NFKK) was established by 20 small coastal municipalities. The network's main (if not its only) agenda is to lobby for the introduction of an area rent (Kontali analyse as 2011). Their work is directed at members of Parliament and the government, as well as at other stakeholders and the media, and according to themselves dedicated efforts by the network and their municipal members have led to an increasing understanding of and support for the demand for an area rent or other form of compensation to the municipalities for the aquaculture industry's use of the coastal waters (personal communication with administrator of network). Today the network has 56 members; almost all of them are small municipalities and all but one has aquaculture sites in their waters (see their homepage <http://kystnettverk.no/> for more information).

In the same period, the industry's attitude toward an area rent seems to have changed. In the consultation process related to the inter-ministerial work in 2007–2008 the industry was critical of the idea of paying for use of the coastal zone. However, as both the need for new production sites and general support for the municipalities' demand for compensation have increased, the aquaculture industry has increasingly adapted its approach to the issue, as supportive and facilitating municipalities are the key to getting access to new sites (Seafood Federation] 2013). The roles have therefore changed; previously the municipalities had to make themselves attractive to the aquaculture industry, but now it is the other way around. The aquaculture industry now increasingly supports an area rent, but on the condition that it goes directly to the municipalities and that the total tax burden of the industry does not increase (Seafood Federation] 2012).

The Norwegian Seafood Federation (FHL/Sjømat Norge), the prominent interest organisation of the industry, has also come up with a suggestion of how to compensate the municipalities, according to which the industry would pay an annual fee to the municipalities based on an annual growth in production of 3–5 %. This should be an incentive for the municipalities to allocate more areas to the aquaculture industry. The industry prefers to pay to stimulate further growth than to pay for existing sites. The Norwegian Seafood Federation (FHL) also argues that such a fee would not disturb the established tax system, and hence that this approach would be more able to gain government approval. The municipalities, however, do not find this suggestion very appealing. The main objection is that the payment would compensate only for growth, i.e. not for the production already taking place, and that it therefore would not benefit all municipalities (personal communication NFKK).

The network has more recently launched a new proposal which it claims will not alter the basic principles and standardisation of taxation. This proposal suggests introducing a rent on production sites within the Aquaculture Act, and it calls for coordinating this rent with the company tax so that the total tax burden on the industry do not increase (Lund and Co 2013). By this the NFKK tries to meet both the industry's condition that the tax burden should not increase and the Ministry of Finance's resistance to additional taxes under the existing tax system (personal communication NFKK).

The government did not respond to either of the proposals. It did, however, seek other (perhaps preliminary) ways to meet the municipalities' claims for economic compensation by granting the municipalities the part of the license fee that, in the last license allocation, was given to the County Councils. This change was welcomed by the NFKK and the municipalities, but both pointed out that it involves only a one-time payment and also benefits only the municipalities hosting the new licenses (NFKK 2013). In a subsequent press release, however, the Minister of Fisheries and Coastal Affairs suggested reconsidering the introduction of an area rent and asked whether a property tax is indeed the right way to promote the municipalities' further facilitation for aquaculture (FKD [Ministry of Fisheries and Coastal Affairs] 2013). The new coalition government has so far not responded to this initiative. It has however suggested allowing a 5 per cent increase in the production of salmon and trout on existing licenses, under strict environmental conditions, for a fee of 1.5 mil. NOK (NFD Ministry of industry and fisheries 2014a; NFD Ministry of industry and fisheries 2014b). In the proposed state budget for 2015 it is stated that "it should be worthwhile for the municipalities to facilitate aquaculture", and the compensation to the municipalities should therefore be increased from 40 to 50 per cent of the fee (Parliamentary bill (Stortingsproposisjon), no 1 (2014):98). It therefore seems that the government prefers to pay to stimulate further growth rather than to pay for existing sites. The response from the NFKK is, again, that the compensation to the municipalities should be divided between all municipalities hosting aquaculture sites, not only the ones hosting companies that are allowed to increase production (NFKK 2014). This arrangement will give the municipalities' incentive for allocating new areas to aquaculture production, which is defined as an important obstacle to further growth. The arrangement may also open up for new alliances between individual municipalities and aquaculture companies, where access to new areas will be negotiated and the municipality compensated. It might however weaken the municipal network.

To sum up, the municipalities' reluctance to allocate more area to the salmon industry is considered a main obstacle to the industry's continued growth. An area rent is assumed to solve or reduce the industry's challenge of acquiring new production sites, but this is hindered by resistance, on the part of the national government and the Ministry of Finance, to altering the principles for taxation due to the risk of setting unwanted precedents. Neither of the compensations introduced by the government is regarded as sufficient by the municipalities, and the one-time payment is considered to reinforce rather than remedy the challenges related to asymmetric distribution of benefits from aquaculture production.

Area rent as a wicked problem

To reiterate, wicked problems are persisting, recurring societal problems that are difficult to define and delineate from other problems, have competing and changing requirements, and involve many clients and decision makers with conflicting values, and where solutions are difficult to identify because of the complex political, institutional and social considerations that surround the problem (Ludwig 2001; Rittel and Webber 1973).

A first task when analysing the issue of the salmon producers' access to production sites and area rent as a wicked question is, therefore, to examine how the problem is defined. Three main groups of actors are involved in this enduring policy debate: the coastal municipalities, the aquaculture industry, and the national government. The three approach the area rent issue from rather different interests and points of view. For the municipalities voicing the demand for economic compensation for additional aquaculture-related costs and the resource use through an area rent it is framed as a *self-government and income issue*, and an area rent is justified as their just or fair share of the value creation of the industry, and through their institutionally backed 'sense of ownership' of the coastal area. For the industry area rent is an *access and growth issue* as well as a *tax issue*; when industry representatives talk about compensation, it is framed mainly as a bonus to the municipalities for allowing further growth and less as a general compensation for the activities involved in planning for and facilitating aquaculture in general or existing production. One major concern for the industry is to demonstrate and make visible its contribution to the municipalities and its willingness to pay for continued presence and especially for additional growth. The industry would rather see its taxes go directly to the municipalities than to the state, as they need the municipalities' support and good will in order to obtain access to new production sites. The industry would certainly also welcome a change in the veterinary regulation that creates the scarcity or lack of access to production sites, or a reduction of the municipalities' autonomy in the coastal zone. The Norwegian Seafood Federation has suggested introducing a national 'protection of aquaculture' scheme (with reference to the existing national 'protection of farmland' arrangement) to avert the problem of well-suited super-locations for aquaculture being unused, or being used for other purposes, due to municipal and other priorities (Seafood Federation] 2012). But since the Norwegian local government system, which gives considerable autonomy to municipalities, enjoys such strong national support, such efforts to reframe the issue has been highly unfruitful. This conflict of interest is mainly between the industry on the one hand and the municipalities on the other, and where the government

supports the industry's wish for growth, but at the same time is a guarantor for municipal autonomy.

Finally, for the national government the question of imposing an area rent on salmon sites to be allocated to the municipalities is not only a *rural and industry development issue*, but also (or even more) a *tax system* and *just tax distribution issue* as well as a *multi-level government issue*. These concerns or conflict of interests are represented by the Ministry of Industry and Fisheries and the Ministry of Finance respectively. The issue of area rent raises concerns over the possible consequences on the overall tax system. An area rent on aquaculture sites does not fit well into the current tax system. Introducing such a new or additional tax on aquaculture production to be allocated to the municipalities will affect not only the distribution of income between government levels, an issue long debated in Norway, but also how other industries such as wind power companies and the mineral industry might meet, or be subjected to, similar tax arrangements. The government is therefore reluctant to make the changes necessary to incorporate such a rent, as this will further complicate the taxation system as well as the income systems for the municipalities. For the government it is also a question of who should pay the municipalities: the government (by a reallocation of some of the income received from the industry) or the aquaculture industry directly through a new and additional tax, hence it is also a question of income distribution between municipalities.

Interdependencies, multiple causes and internally conflicting goals make wicked problems hard to define. In this case the consensus between the parties regarding problem definition—namely, that increased municipal friendliness to aquaculture is required to increase salmon production—is rather high. The problem is here rather more related to the actors' different interests and to different and incompatible concerns regarding the suggested solution of an area rent. The wickedness lies in the solution, that an area rent will solve the area access problem. But this solution is difficult or impossible for the government to accept as it will disturb the tax system and have other unwanted effects. The suggested solution is blocked by the cross-cutting and interlocking character of the issue, and both political and bureaucratic issues and considerations of juridical precedent make this a tough nut to crack. Neither weakening municipal autonomy nor changing the veterinary regulations in order to facilitate the industry's access to the remaining super-locations along the coast seems to be a viable political option, as these actions would challenge other highly prized values like local autonomy and environmental protection.

So far the issue has found *no definitive or final solution*, another characteristic of wicked problems. Hence, the current measures targeting the problem of access have been characterised by a lukewarm compromise approach on behalf of the government. Instead, of addressing the core question of an area rent it has settled for measures like imposing a property tax on aquaculture installations at sea and allocating part of the license fee for new licences or production increase to the hosting municipalities and counties. The pressure from the strong aquaculture industry, in alliance with an increasing number of coastal municipalities, has caused national politicians to propose new measures, but the wicked, interlocking and complex character of the solution has so far made it impossible to settle on an area rent, the only solution that seem to be satisfactory for both the municipalities and the industry. The efforts to solve the problem by levying a property tax and by allocating a portion of the license fees to the

municipalities show that, instead of targeting the core problem, the authorities are trying to reduce and 'tame' the problem by introducing measures that resemble a real solution, but without challenging the tax system, governmental structure or more deeply ingrained values as an area rent would.

The government's resistance to introduce an area rent is related to the fear of establishing an unwanted precedent. If area rent allocated directly to the municipalities is introduced for salmon production, this will open up the question of also including other industries that are dependent on coastal resources or that use natural resources more generally, such as wind power, coastal fisheries and coastal tourism. Indeed, this trend is also seen in some municipalities' proposal to tax cruise ships that are entering the Norwegian fjords but not providing much ripple economic effect. Interestingly, the hydroelectric power companies are already paying the hosting municipalities a tax that could be seen as a parallel to an area rent for salmon production, and the suggestion to levy an area rent in aquaculture has been inspired partly by this example. The tax on hydroelectric power has been in place since the early twentieth century. The tax is an important source of income and the term 'power municipalities' has been used to indicate the resulting wealth of these municipalities. There has through the years been some debate about the justness of the system, especially raised by municipalities not hosting hydropower plants. The criticism is that the system results in big differences in the economic situation in municipalities with and without hydropower (Borge et al. 2013). Several of our informants refer to this as a reason for not introducing an area rent on aquaculture production to be allocated directly to the municipalities.

Further, not all types of aquaculture will be able to bear the burden of an additional tax. Other forms of aquaculture, such as cod, shellfish and sea ranching, do not enjoy the same high profit and are often operating on the margins. Also, an area rent on salmon sites could reduce the municipalities' willingness to allocate areas to these less profitable industries that do not produce as much local income. An area rent on salmon production sites will also undermine the very strong tradition of perceiving the coast as an open and common area free for all, based on the *allemannsrett* (literally 'all men's right') codified in 1957. An area rent may therefore not only change the tax system but also impact the deeply rooted coastal regime.

The lack of sufficient political support for an area rent also stems from the fact that it is not clear that the current diagnosis will stand the test of time for very long, as both the situation and its framing can change quickly. So far the question of access has been framed mainly as an economic issue, but at some point it may also be reframed as an environmental issue, placing greater emphasis on environmental concerns related to nutrient wastes, disease outbreaks, escapes and salmon lice. Some of the municipalities who are not taking part in the NFKK network do not see economic compensation as a condition for growth in their waters, while others are critical and will not designate new areas even with economic compensation. Hence, it is not only economic reasons for the municipalities' reluctance to host aquaculture. These issues have however not been central in the discussion on area rent. Nevertheless, area rent as a means to solve the area access challenge of the industry will be influenced by this. It is also possible that competing activities in the coastal zone, such as coast-based tourism or developments of second homes, will be more highly prioritised in the future, making it even harder for the industry to 'buy out' the municipalities. An area rent explicitly tailored

to make salmon aquaculture more interesting to the municipalities may also have democratic implications, as this may put non-commercial interest and less affluent actors and stakeholders in a weaker position relative to aquaculture.

How likely, then, is it that an area tax will solve the problem? Is access to new sites really necessary to sustain a strong growth in salmon production? Only the introduction of an area rent will show conclusively whether its use would cause the municipalities to become more positive toward allocating areas to the salmon industry. This would reveal whether the municipalities' reluctance towards the salmon industry is actually the bottleneck for further growth in the industry—and, hence, if the problem has been properly defined. Industrial representatives frequently admit the main obstacle to continued growth, at least in the short run, is not access to new production sites but rather government license politics, MTB limits and environmental regulations. On a longer term, however, new sites will be required. Further, an area rent does not necessarily give the aquaculture industry access to its preferred production sites, either because the municipalities still may not want to allocate more areas to aquaculture even if more generously compensated or because the national government's nature-protection, environmental and veterinary regulations would still limit access to desired areas. Thus an area rent might not be the right cure for the problem. The very existence of the debate over area rent may itself make access to new sites more burdensome and difficult at this time, as municipalities may be reluctant to offer any new sites pending an expected lucrative policy change, as seen in the cases of Alta and Tysnes municipalities. A worst-case scenario for the industry is that the municipalities, once they obtain an area rent, may conclude that they have already allocated sufficient area to the salmon industry from which they would now be receiving an area rent. In this scenario the municipalities would get their money but the industry would not get its desired expansion. It seems quite clear that introducing an area rent is no panacea for the industry's problem of access to new production sites for growth, and that moreover it would create a variety of new and related issues, especially for the government.

Conclusion: How wicked is the problem?

The core of the problem is the industry's and government's ambition for continued growth of the aquaculture industry and the municipalities' status as independent and autonomous political bodies in coastal zone planning. When the municipalities were granted the right to designate their coastal areas for different uses, the national government certainly gave away substantial decision-making power and gave the municipalities a role as gatekeepers regarding the aquaculture industry's access to the coastal zone. To some extent this power can be counterbalanced by government guidelines and so-called 'national expectations', but so far the municipalities' autonomy in the coastal zone has been respected by the government. For an ever-expanding aquaculture industry, this has made site availability an increasingly urgent issue as many municipalities have become more reluctant to granting new areas to salmon production without being economically compensated.

The area rent issue is wicked in the sense that it is inescapably connected to other issues and in that the proposed solution challenges deeply held values. The strong inter-linkages with other issues certainly contribute to making the issue of access to aquaculture sites a

wicked context. However, consensus about the core problem seems to be shared among the three main parties. Thus, the problem should not be classified as 'super-wicked'. The national government has resisted the introduction of an area rent due to the complex institutional and distributional interdependencies related to the proposed rent. There could also be more practical, institutional reasons behind the national government's resistance to introducing an area rent on salmon farming. It might be receptive to the idea but unable to find a way to integrate it into the existing tax system without creating precedents for other sectors. The main problem is thus not that the problem defies definition, but more that the suggested solution requires too big changes to be politically viable. The wickedness therefore lies mainly in the problems related to the available solutions, not necessarily in the problem definition. This study therefore suggest that Rittel and Webbers statement that "The process of formulating the problem and of conceiving a solution (or re-solution) are identical, since every specification of the problem is a specification of the direction in which a treatment is considered" (Rittel & Webber 1973: 157) in this case should be understood mainly as an encouragement to try to by-pass the "wickedness of the available solutions" by finding new, less wicked and more legitimate and feasible solutions, as the wicked problem lies in high political costs of the available solution, not in the wickedness of the problem per se.

So far the government does not see the problem as serious enough to compromise the other values at stake, even if the alliance between the industry and the municipalities is pushing hard. In this sense the logjam may as well be analysed in terms of political power and legitimacy than as wickedness, and the problem framed more as a 'tragic choice' rather than a wicked problem. In their work on tragic choices Calabresi and Bobbit (1978) deal with the public-policy dilemma of allocating scarce resources, contending that conflicts over deeply held values are tragic both in the sense that some deeply held values lose out to others and in view of the legitimacy problems that may occur when sources of social and political power are revealed and laid bare in such decisions. However, a management system will always favour some interests, type of knowledge and worldviews at the expense of others. In the "wicked problems" tradition such elements are obscured or masked, focusing more on the established definition of a problem and the suggested solution. The wicked approach can contribute in understanding enduring, unsolved goal or means conflicts where the stalemate is due to the intertwined character of the issues. With wicked problems it is often unclear if there is a conflict of goals or conflict of means as the complexity makes these distinctions interwoven and blurred. Analyzing a problem's degree of wickedness contributes to the understanding of why some defined solutions to a problem might be difficult to gain acceptance for due to its interconnectedness with other issues. The wicked problems approach's contribution is to focus on the importance of the framing of a given management problem. The strength of the approach is that it emphasizes that a societal steering or management issue has to be framed in a way that fit the larger management system, and that some problems becomes largely unsolvable if they are framed too differently.

The government's previous measures and policies and its hesitancy to introduce an area rent system can thus be understood as a way to avoid the deeper and much more politically costly conflicts that establishing such a rent system would create. The results of the 'tame' measures already introduced by the government, however, indicate that

the range of politically viable, legitimate and practical solutions may not be sufficient to address the defined problem,—and solution. But again, the defined solution of area rent might not solve the underlying problem of area access.

The environmental debate related to aquaculture is in Norway rather loosely linked to the area rent debate, as the opposition groups have so far not been interested in this issue. But if the environmental problems are not rather soon handled through changes in technology, regulations or incentive structures it is likely that the two discourses will converge and make the area rent question even harder to solve for the government and the industry.

The Norwegian aquaculture area access problem certainly falls between the existing 'stove-piped' problem-solving systems, and this clash between a wicked problem and the traditional problem-solving systems calls for either institutional innovations or new ways of working across all stakeholders. Recognizing the wickedness of this problem can provide a more realistic framework for further policy making, as the problem is not necessarily solvable within the current framework. Nevertheless, if wicked problems generate new and "outside the box" solutions, it is likely that these new solutions will contribute to the creation of even more complexity and generate more wicked situations for governments and other stakeholders.

Endnotes

¹In 1990 there were about 1,400 sites. In 2000 the number peaked at about 1,800 sites (with production of about 500,000 tonnes). Today there are about 950 sites. This means that the production on each site is now much higher. The limit on production is on the biomass (i.e. the MTB for each licence and each site set by the government), but it is also limited by the size and quality of the production site available to each company. The size of the areas designated for aquaculture by the municipalities varies, and procedures are established for the companies to apply for permission to set out fish cages, anchoring, feeding rafts etc. (Isaksen et al. 2012).

²There are big geographical differences in the availability of new and suitable sites. The southernmost areas of the country have less room for allocating more space to aquaculture, as the areas are more or less fully occupied by aquaculture, as well as by other commercial and non-commercial activities and interests (fisheries, transport, tourism, recreation and environmental protection). In the areas further north there is generally more space available, though with local differences.

³The Labour Party government terminated in 1999 an arrangement where the municipalities received a fixed portion of the company tax. In 2005 the centre-right coalition government reintroduced the arrangement, but with a joint municipal tax fund as beneficiary. In 2008, when the Labour Party again held office, the company tax regime was again removed. This arrangement, however, benefited only the municipalities where the companies' main offices are located and not those who only host aquaculture sites at sea (Isaksen et al. 2012).

⁴The background papers of the working group are not publicly available, only the conclusion put forward in the white paper and the state budget.

⁵In Norwegian NFKK stands for *Nettverk for fjord og kystkommuner*.

⁶See also their homepage www.kystnettverket.no.

⁷In its last state budget the Labour-led coalition government suggested that a part of the license fee (up to 4 mil. NOK) from the 2013 license allocation round should go to the municipalities where the licensed activity will be located. The government had previously communicated that this part should go entirely to the regional democratic institution, the County Councils, and this change was disapproved by some of the counties. The decision was, however, in line with the Report to the Storting on seafood (2013) in which the government stated that it would contribute to a larger amount compensation for municipalities allocating areas to the aquaculture industry.

⁸This idea is also contained in a remark in the latest state budget by the majority of parties (Parliamentary bill no. 1 (2013–2014)).

⁹The hydropower revenues are mainly collected from three sources; property tax from hydropower plants, natural resource tax (equals NOK 0.11 per kWh produced) and revenues from concession power (the hosting municipalities are entitled to buy up to 10 percent of the power generated). There are also some minor revenues (concession fees and revenues from reversions) earmarked for business development funds (Borge et al. 2013).

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¹¹Interestingly, however, even though the salmon industry supports or could accept an area rent to the municipalities, similar to the tax on hydroelectric power, it does not want to agree to something parallel to the reversionary right (*hjemfallsretten*), introduced in 1909, which states that ownership of the license, waterfall, power plant and reservoir should go back to the state after 60 years.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

HS and IK have contributed equally to all parts of the manuscript. Both authors have read and approved the final manuscript.

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