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Rebuilding the Northeast Arctic Cod Fisheries – Economic and Social Issues

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Abstract: The Northeast Arctic cod (NEA cod) fisheries in Norway are now one of the richest cod fisheries in the world. In the past the fishery has experienced several stock declines and low economic returns. In this paper we review management approaches applied over 20 years to address one of the most severe crises in the fishery. Emphasis is on management strategies and the measures carried out to ensure successful rebuilding of the fishery, both biologically and economically. Though the rebuilding of the Northeast Arctic cod fisheries has in many ways

been a success, a multitude of issues connected to social and economic consequences still remain. The lessons learned from this study relate to management, legitimacy, and economic issues, and may be relevant to other struggling fisheries.

Key words: Northeast Arctic cod (NEA cod); Fisheries Management, rebuilding fishery

1. Introduction[1]

The Northeast Arctic (NEA) cod stock is the largest in the world, and currently in very good condition. NEA cod are highly migratory fish, grazing in the Barents Sea and spawning along the Norwegian coast. From January to April each year they accumulate in particular around the Lofoten islands, and since the Viking Age this spawning fishery has been important both for the region and for Norway as a whole as a source of food and export income. The cod stock moves across national boundaries between Norway and Russia, who together, based on biological advice, determine total allowable catches and their respective share, as well as those of third countries.[2]

The Norwegian share of the fishery has been managed using a number of input controls, such as limiting gear type, mesh size, and number of vessels. Trawlers were first made to adhere to a total quota in 1978, while coastal vessels operated relatively freely until 1989, when the fishery was halted in April due to an estimated stock decline. Since then coastal vessels too have been limited to individual and group quotas. Some transferability of quotas was also introduced.[3] Post-1990 the NEA cod stock and harvests increased rapidly, but combined with low individual fish growth and a rise in cannibalism, yet another decline occurred towards the end of the 90s. This triggered new management approaches for rebuilding the fishery.[4]

Like many other fish stocks, the NEA cod stock has fluctuated with prolonged periods of stock decline (see Figure 1). A recent study shows that more than half the fisheries around the world are in decline, and that the stocks are in worse condition than previously thought. But the study also shows that strong management

1. This paper is based on an earlier report carried out for OECD. The authors thank Ingrid Pettersen and Marius Berntsen for assistance with data, Bjørn Hersoug and Svein Jentoft for inputs on lessons learned, and Guri Hjallen Eriksen, Sverre Johansen and Vidar Landmark for valuable comments on an earlier version. Two anonymous reviewers are also thanked for useful comments. Any errors or omissions remain the responsibility of the authors.

2. Armstrong and Flaaten 1991: 137; Eide et al. 2012.

3. Armstrong and Clark 1997: 206; Hersoug 2005.

4. For presentation of these management approaches, see Nakken et al. 1996; Sandberg et al. 1998.

can prevent further decline, and in some cases get the stocks growing again[5]. The management of NEA cod seemingly has been successful, though presumably aided by favorable environmental conditions, resulting in cod spawning stock biomass (SSB) now at a record high, and the total stock biomass being close to the highest observed since scientists started studying the stock some 100 years ago (see Figure 1).[6] Furthermore, although the large total allowable catch (TAC) may have pushed market prices in a downwards direction, there is substantial optimism surrounding the fishery, reflected in both income and quota acquisitions.

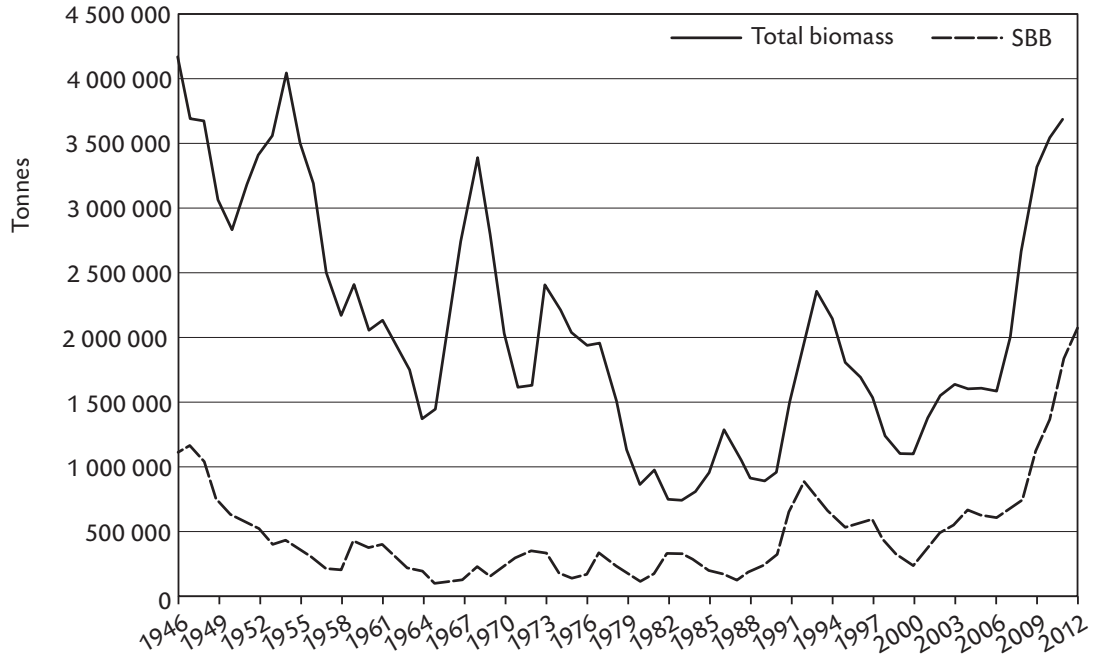

Figure 1: Total biomass (1946–2011) and spawning stock biomass (SSB) (1946–2012) of Northeast Arctic cod in the Barents Sea.[7]

Clearly there is much to be learned reviewing the case of the NEA cod fisheries. In this paper we take a closer look at NEA cod management and examine the strategy employed to rebuild the fishery. We investigate the social and economic consequences of rebuilding the fishery, and identify some of the lessons learned in the process.

5. Costello et al. 2012.
6. ICES 2012a.
7. Data from ICES 2012b.

2. Background

The Northeast Arctic cod (*Gadus morhua*) fishery is one of the most important fisheries in Norway, and is operated in the Norwegian and the Barents Seas, including both offshore and coastal fleet segments. The cod stock migrates between Norwegian, Russian and international waters in its life cycle (see Figure 2), and is managed jointly by Russia and Norway in the Joint Norwegian-Russian Fisheries Commission (JNRFC).

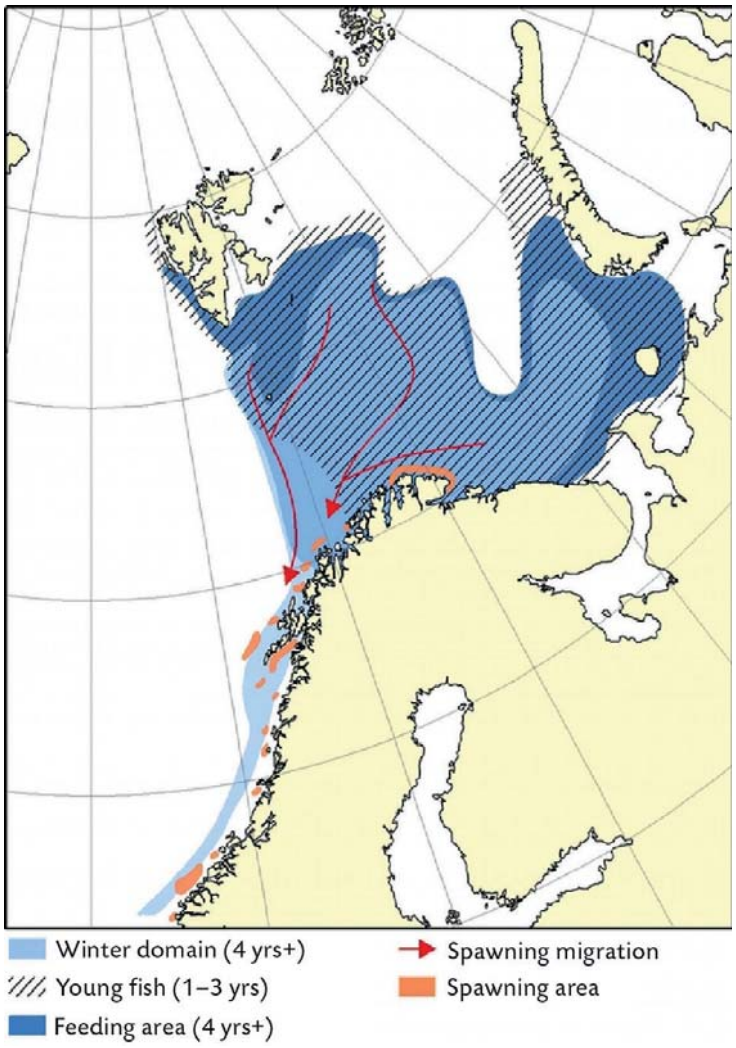

Figure 2: The distribution of the NEA cod stock[8]

The first rebuilding of the cod fisheries in the early 1990s started before the introduction of management plans and precautionary reference points, which are the mainstay of today's fisheries management. Hence the early 1990s rebuilding

8. Source; The Institute of Marine Research, Bergen, Norway.

of the fishery was largely an incremental management learning process aimed at aligning efforts to better fit with the decline in total allowable catch (TAC). On the biological side, spawning stock biomass (SSB) was the focus. This is not to say that the lack of more modern management plans was the reason for the second stock decline in the mid-1990s. The decline in prey species such as capelin due to the increase in the herring stock is presumed to have been the main cause.

The most important threat to the rebuilding of the fishery as first assessed in the early 1990s was the lack of control of excessive conventional gear fishing, combined with insecurity around profitability in the fishery. One focus area of fisheries management was to put into place a scheme that ensured a dynamic effort adjustment via the introduction of conditionally transferable quota rights in the trawl fleet, and combined with buy-outs allocating individual quotas to the most active segment of the coastal fleet. Currently different segments of the fleet operate under a variety of quota restrictions, consisting of non-transferable and conditionally transferable quotas, i.e. transferability dependent upon vessel type and size, geography, and fishery, as well as group quotas. The fishery is also restricted by minimum fish and mesh size, by-catch and area restrictions, as well as a discard ban.

In the second rebuilding phase, starting at the end of the 1990s, the focus has been on increasing the NEA cod stock, and thereby securing stable long-term harvests by introducing a number of different management plans. The focus has been on securing a precautionary level of fishing mortality and spawning stock biomass, the latter at a level of 460,000 tons.

By-catch of juvenile cod in other fisheries, as well as illegal, unregulated and uncontrolled (IUU) fishing have been recognized as serious threats to the NEA cod stock. Regarding the former, area closures have been implemented in several fisheries when the number of juvenile fish in catches exceeds a certain limit. Sorting grids are also required. IUU fishing has been estimated to exceed 100,000 tons some years,[9] and here policies have been implemented to remedy this problem, as described further below. Environmental conditions and the availability of prey also play an important role for the strength of the NEA cod stock.

The upholding of viable coastal communities along the Norwegian coastline is also a stated socio-political aim.[10] Norwegian fisheries management has also accepted management options in recognition of the needs of the people of North-West Russia,[11] i.e. the rebuilding of the NEA cod fisheries is a collaborative effort based on a multitude of different goals.

9. ICES 2012a: 7.
10. Flaaten and Heen 2004: 451.
11. JNRFC 1999: 2.

Furthermore, the transferability of quota rights has been more broadly introduced in the fishing fleet, as a response to the political aim of increased resource rent. The objective of the restructuring of the fishing fleet is therefore to secure economic viability while maintaining a diverse fleet structure. The focus on limiting effort, mainly through the number of fishing permits and hull length, combined with technological development and viable alternative employment possibilities, has resulted in declines in the number of fishing vessels (see Figure 3) and fishers (see Figure 4). In Figure 3 we observe that both the number of large and small fishing vessels has been heavily reduced over the last ten years, with vessels greater than 15m declining by 33 % and vessels smaller than 15m declining by 52 %. As seen in Figure 4, the number of fishers has declined relatively less than the number of vessels, but there has nonetheless been a more than 60 % decline in the number of part-time fishers in the last 20 years, while the number of full-time fishers is more than halved. Though unemployment in Norway is low (2–7 % the last 20 years), and alternative work has been available for fishers on a national level, there may be more marked limitations in small coastal communities.

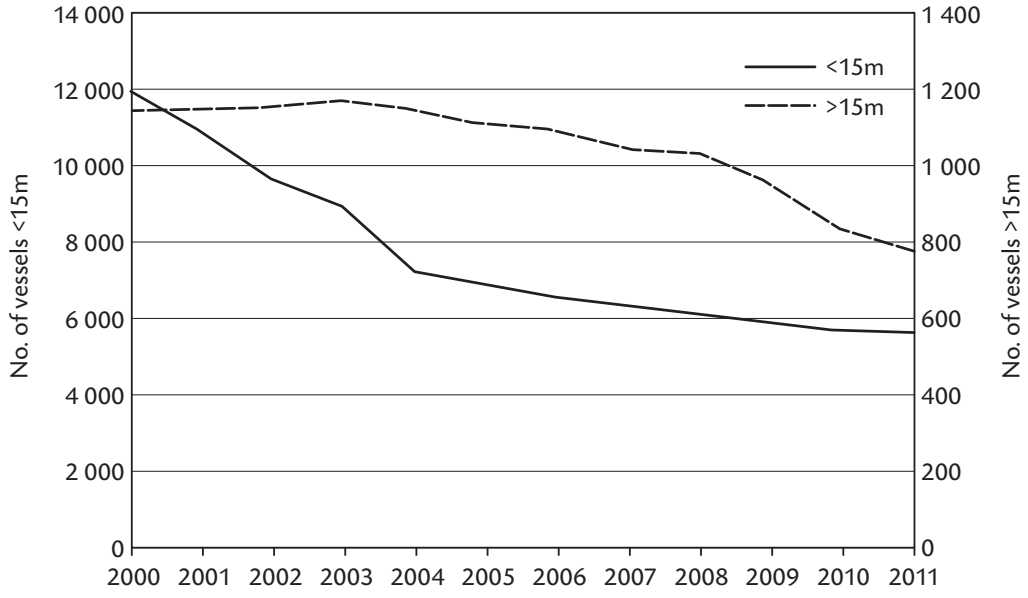

Figure 3: Number of fishing vessels in Norway, larger and smaller than 15 metres, from 2000 to 2011[12]

12. Data from Norwegian Directorate of Fisheries 2012a.

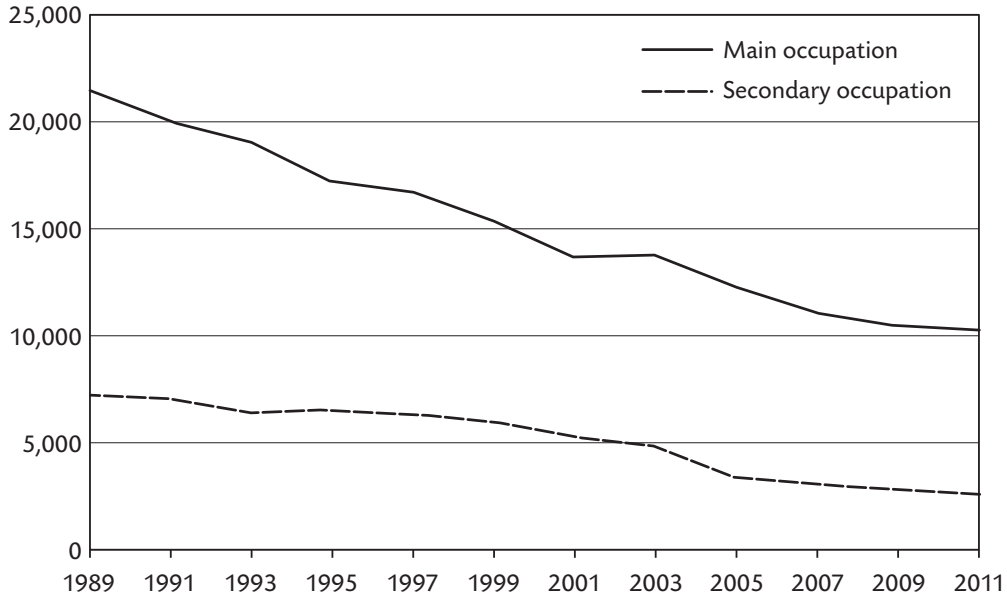

Figure 4: Norwegian fishers with fishing as the main occupation and with fishing as a secondary occupation, 1989–2011[13]

Since 1980 the average operating margin (or earnings before interest and tax in percent of total revenue) in the Norwegian demersal fisheries has fluctuated between –0.6 and 12.8 %, with an average of about 6 % (see Figure 8). On average, negative operating margins are only found in the years 1989 and 2003, the former year when the coastal fishery was abruptly halted in April, and the latter marked by a substantial price decline, illustrating that the profitability of the fishery depends both on the state of the ecosystem and the market situation.

The rebuilding of the NEA cod fisheries has involved both international collaboration with Russia, as well as national cooperation between government, researchers and fisheries interests, as will be presented in the following.[14]

3. Management

Since 1975 the NEA cod stock has been managed collaboratively by Norway and Russia (then the Soviet Union) in the Joint Norwegian-Russian Fisheries Commission (JNRFC). Here the total allowable catch (TAC) of shared stocks as well as shares to each party and third countries are determined. Since 2004 the annual NEA cod TAC has been determined by the agreed Harvest Control Rules (HCRs) as presented later.

13. Data from Norwegian Directorate of Fisheries 2012b.
14. Eide et al. 2012.

In Norway fisheries are restricted by the *Act relating to the Management of Wild Living Marine Resources* (Havressursloven) of 2008 (and predecessors), and the *Act relating to the Regulation of Participation in Fisheries* (Deltagerloven) of 1999 (and predecessors). The former regulates all marine harvesting in order to secure sustainable and profitable utilization of living marine resources, while at the same time securing coastal settlement and employment. The latter law regulates access to commercial fishing activities, aiming to restrict fishing capacity to the available resources. In special cases of threatened or endangered marine species, the *Nature Diversity Act* comes into play setting out requirements for the protection and implementation of recovery strategies.

The Ministry of Fisheries and Coastal Affairs is responsible for the management of living marine resources. The Fisheries Directorate is the advisory and executive body under the Ministry. Monitoring, control, surveillance and enforcement are carried out by the Coast Guard, the Directorate of Fisheries, and the sales organizations.

There are several ways that stakeholders participate in the management of fisheries in Norway. The institution of consultation via public hearing is central in Norwegian policy-making in general. The importance of securing legitimacy and compliance regarding management requires even closer ties to stakeholders, and policy suggestions from industry organizations are not uncommonly incorporated directly or alternatively with some revision into the management. This encourages constructive policy suggestions from stakeholders.[15] Collaboration through research is also common, e.g. in the development of fishing gear with lower environmental cost, such as the sorting grid for trawls. The Advisory Meeting for Fisheries Regulations is a biannual public meeting where fishermen's associations, industry organizations, trade unions, the Sami Parliament, local authorities, and environmental organizations as well as other stakeholders may participate and express their opinions.

In 1989, the initial response to the crisis was to work towards ensuring that the capacity of the fleet was better suited to the available fish resources. This was done by asserting the TAC, limiting access, decommissioning, reducing subsidies, implementing individual vessel quotas (IVQs) in the coastal fleet, group quotas, and conditionally transferable rights. Even prior to 1989 there were relatively strict access limitations through licensing and vessel quotas in the trawler fleet. On the biological side, it is important to note that cod are predatory and flourish according to availability of prey fish and ecosystem health. So a broader multispecies approach to managing fisheries was implemented, as the joint Norwegian-Russian

15. Anon 2010a: 15.

management of the capelin stock became a function of predation by cod stock. Hence capelin harvest was only allowed once the expected capelin spawning stock had exceeded a certain level necessary to reproduce well. The capelin stock should first serve as prey for the more valuable cod before being harvested for its own lower market value. Management alternatives were based on reference points related to different fishing mortality (F) rates, which later were used as the basis for the new precautionary values.[16]

4. Restructuring the fishing fleet

Since the 1989 crisis a number of institutional changes have taken place. It was known even in the early 1980s that subsidies were negatively impacting the fishery by exacerbating already high effort levels. The phasing out of a number of different subsidy mechanisms reduced subsidies to Norwegian fisheries by more than 80 % from 1991 to 1996.[17]

In political terms the coastal fleet is considered the backbone of the Norwegian fishery. Trawl fleet owners were apprehensive that capacity reducing measures leading to increased efficiency in the trawl fleet would result in political pressure to transfer quota from trawlers to coastal vessels. In order to reduce the number of trawler vessels, owners required security that their harvest share would remain unchanged. The Norwegian Fishermen's Association therefore recommended the so-called *Trawl Ladder*, which determined the relative share to both trawler and coastal vessel groups, dependent on the size of the TAC. This sharing system was implemented by the Ministry of Fisheries in 1990 and functions in a revised version today.[18]

Decommissioning has been applied in Norwegian fisheries since the 1960s, in some cases combined with financial aid for vessel renewal. The results of decommissioning are mixed; though the reduction in some vessel groups has been advantageous, leading to higher vessel quotas and an improved economic situation, the total capacity of the fleet has not been reduced, i.e. the reduction in vessel numbers has not been able to compete with technological development.[19]

From 2003 to 2008 a decommissioning tax on all harvests was implemented in order to contribute to the funding of decommissioning of coastal vessels under 15m. Overall the industry funded just over 50 % of the decommissioning. This

16. Bogstad and Gjøsæter 1994.
17. Flaaten and Isaksen 1998.
18. Armstrong 1999: 79.
19. Anon 2007: 76.

lead to an approximately 15 % reduction in the number of vessels under 15m in the time period 2003 to 2009, taking out a total of just over 400 vessels.[20]

In 1990, individual vessel quotas (IVQs) were implemented for the first time for NEA cod fished by coastal vessels, as proposed by the Norwegian Fishermen's Association. The IVQs were handed out gratis by the Ministry of Fisheries and Coastal Affairs, and varied dependent on vessel size. In order to obtain an IVQ the individual vessel had to fulfill certain requirements as regards historical catch.[21] Those that did not fulfill these requirements were allowed to harvest in an open group. Participation in the closed coastal vessel group was and still is limited by annual permits in combination with IVQs, the basic quota of the vessel. The trawler fleet is limited by licenses. The Norwegian share of the TAC is allocated to different vessel groups, whereupon quotas are distributed between vessels holding the necessary licenses for participation in the groups. The authorities can withdraw permits and licenses if required conditions are not met, and new licenses and permits can be allocated. Licenses and annual permits are issued to vessels, and follow the vessel when traded, if authorities give permission for this – and they usually do.

Since 1990 there have been various schemes in place allowing the trawler fleet to take vessels out of the fishery and transfer their NEA cod quota rights for a given number of years,[22] i.e. a form of transferability was introduced. In 2005 these transfers were made permanent, before they again were made time restricted in 2007, resulting in the quotas returning to the common pool of quota after a certain number of years. In 2003 coastal vessels over 15m, and in 2007 also vessels down to 11m, were allowed to collect basic quota from two or three vessels onto one vessel. These transferred quotas were made time limited from 2007. An assessment carried out in 2009 by the Ministry of Fisheries and Coastal Affairs finds the transferable rights system to be more effective than decommissioning with regards to the aims of adjusting the size of the fishing fleet to the available resources and improving the economic situation of the remaining vessels.[23]

A number of safeguards or restrictions in transferability of quotas were implemented in order to secure political acceptability and management goals connected to the fisheries, such as broad coastal settlement and a diversified fleet. Deduction of quota when transferring between vessels, as well as no transferability between vessel groups are mechanisms put in place to secure the above. There are also limitations with regards to transferability between regions.[24]

20. Anon 2009a.
21. Armstrong and Clark 1997: 207; Hersoug 2005.
22. Anon 2007.
23. Anon 2009a: 21.
24. Hersoug 2005.

5. Rebuilding the stock

The efforts to rebuild the Norwegian cod fisheries are highly dependent on the stock management collaboration with Russia in the JNRFC. In 1997 the JNRFC agreed that the NEA cod SSB precautionary level should be 500,000 tons, as suggested by the International Council for the Exploration of the Seas (ICES), and the fishing mortality in the following years was to be reduced to under F_{med}=0.46. In 1999 the JNRFC reiterate this aim for the SSB, but change the fishing mortality goal to F_{pa}=0.42 (later adjusted to 0.40). No specific timeframe was set for the reaching of these goals. The same year Norway stated in the protocol that NEA cod quota was set too high relative to the advice from ICES, but chose to take into account the difficult situation of the people of North-West Russia and therefore accepted a higher level of fishing mortality.[25]

The decline in the NEA cod stock in the mid-1990s was also believed to be a function of prey and predator availability (Hamre 1994; 2003), and this lead to increasing realization that fisheries cannot be managed in a single stock perspective. Biological models were developed to include the central species in the Barents Sea, such as cod, herring and capelin. Stock assessments of e.g. capelin, a key prey species for cod, are carried out taking into account the consumption by cod. Hence TACs for capelin are dependent upon the prior and expected cod consumption.[26] In 2003 the JNRFC agreed to a management strategy where TACs for capelin should ensure a capelin SSB of at least 200,000 tons with a 95 % probability.[27]

Despite strong external pressure, Norway has underlined the need to manage also marine mammals from an ecosystem perspective, where harvesting of seals and minke whales should be carried out in a sustainable manner. Subsidization of seal harvesting (and to some degree whaling) has been defended from the economic perspective of competition between marine mammals and the fishing industry for commercially valuable prey such as cod.[28]

For decades it has been known that harvesting less of the immature cod is beneficial to the stock. This is one of the reasons behind the agreement of Russian access to Norwegian waters, as Russian waters have greater prevalence of juvenile NEA cod than Norwegian waters. The two countries also collaborate with regards to technical measures, such as minimum mesh and fish size, as well as sorting grids for trawling.

25. JNRFC 1997, 1999: 2.
26. Anon 1999: 25.
27. JNRFC 2003: 4.
28. Anon 2009b: 8; Flaaten 1988.

After an initial aim of constant TAC, the JNRFC agreed to implement a harvest control rule (HCR) from 2004.[29] This HCR estimates TAC for the three following years based on F_{pa}. Each year the TAC is updated similarly for the three following years based on a stochastic projection model (PROST). However, TAC is not usually allowed to change more than +/-10 % compared to the previous year. If the SSB falls below the precautionary approach level (B_{pa}), the TAC is reduced according to a linear measure between F_{pa} and F=0 for the SSB=0.[30]

By 2008 the NEA cod stock was considered to be in such good condition that the restrictions on TAC increases in the HCR were disregarded.[31] In 2009, in light of the strong NEA cod stock, the JRNFC decided that there was a need to set criteria that ensure a minimum fishing mortality of 0.3.[32]

The implementation of port state control (PSC) in the Northeast Arctic Fisheries Commission (NEAFC) area since 2007 is believed to have had a positive effect on IUU fishing of NEA cod[33]. Before landing, vessels must send notice to the port state, who notifies the fishing vessel's flag state in order to verify legality of catch, and the subtraction from the vessel's allocated quotas. Furthermore, a significant percentage of the landings are to be inspected. Blacklisted vessels are not permitted to call at ports of the NEAFC member states.

As mentioned earlier, monitoring and control is carried out by three entities, the Coast Guard, the Directorate of Fisheries and the sales organizations. The Coast Guard carries out control at sea through inspections of catches and fishing gear and the checking of logbooks, while the sales organizations control landings and thereby quotas. The Directorate of Fisheries controls both on land and at sea, via fisheries inspections and surveillance on the fishing grounds, satellite surveillance (VMS), quayside control of logbooks, as well as sales control. Sealing vessels have on-board observers reporting to the directorate.

An overview of the rebuilding measures is given in Table 1.

29. JNRFC 2002: 2.
30. JNRFC 2007: 3.
31. JNRFC 2008: 3.
32. JNRFC 2009: 3.
33. ICES 2010.

Table 1: Overview of rebuilding measures

Type of measures	Rebuilding measures
Output controls	– TAC (previously coastal vessels were allowed to continue harvesting even after the national TAC was fished) – Group quotas – IVQs
Input controls	– Vessel licenses – Annual permits – Decommissioning
Economic Incentives	– Reduced price subsidies – Transferable rights – Subsidies for marine mammal harvesting – Subsidies for raw fish transportation – Taxes and fees (cost recovery, decommissioning, tax, etc.)
Technical measures	– Increased minimum mesh size – Increased minimum fish size – Sorting grid for increased trawl selectivity – Closed areas with high young fish by-catch – Trawl closure areas

We evaluate the NEA cod fisheries rebuilding process based on the stated biological, economic and social goals. The development of the NEA cod stock, and especially the SSB (see Figure 5 and Figure 6), as well as the economic situation in the fleet (see Figure 8), show a degree of success. In the last nine years, the fishing mortality has been well within the limit set, and the same for SSB since 2003 (see Figure 5 and Figure 6). This is achieved with relatively high total landings in this time period (see Figure 7), and as seen in Figure 8, the average operating margin has been positive after 2003, though fluctuating. That said, it must be added that the environmental conditions, such as temperature and maturation changes, have been advantageous in these latter years, assisting the positive biological development. It still remains to be seen whether the management will secure stability over time, both ecologically and economically.

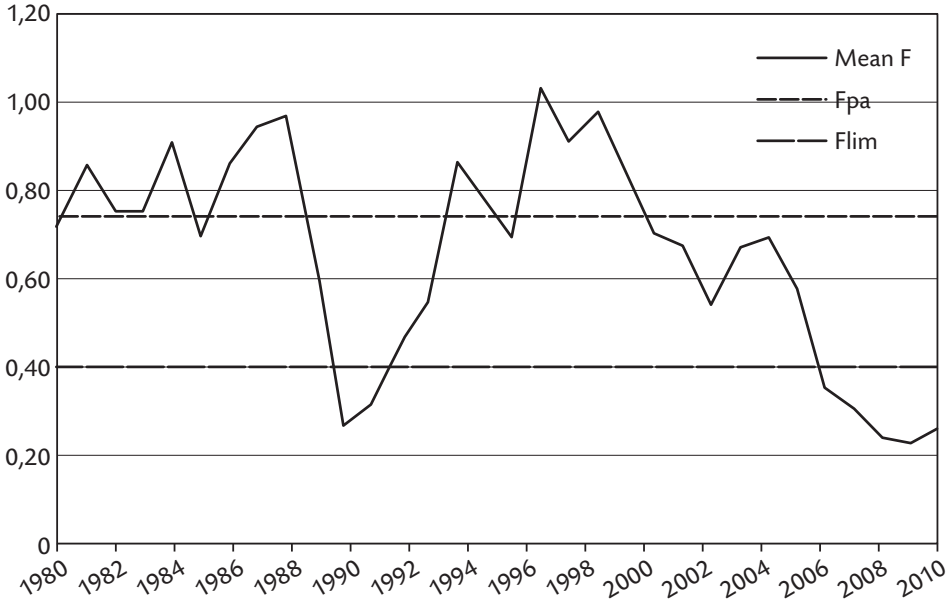

Figure 5: Fishing mortality (MeanF), fishing mortality target (F_{pa}) and fishing mortality limit (F_{lim}), 1980–2011[34]

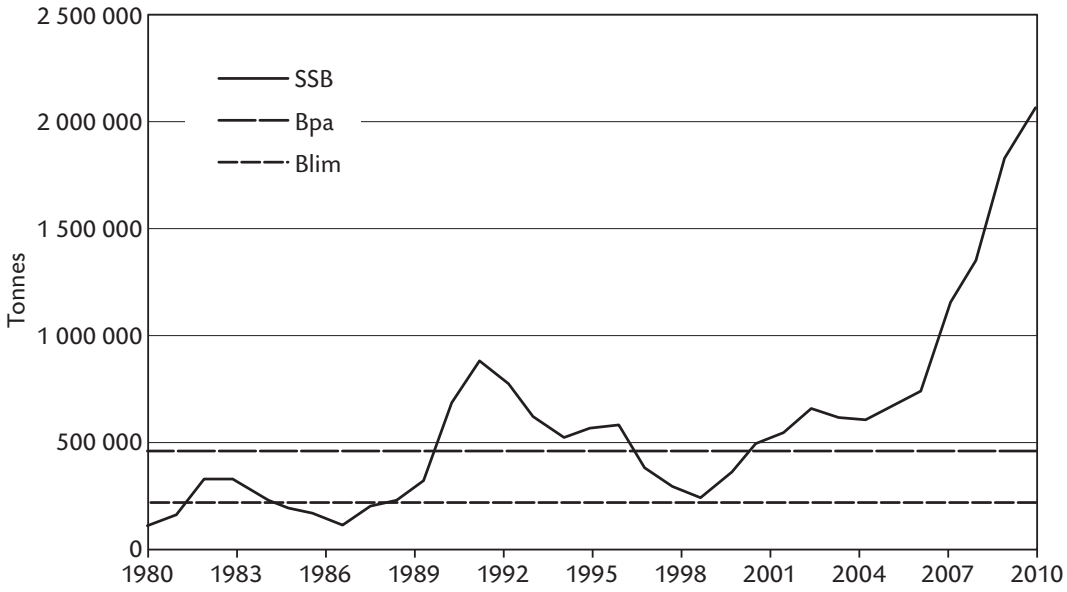

Figure 6: Spawning stock biomass (SSB), spawning stock biomass target (B_{pa}) and spawning stock biomass limit (B_{lim}), 1980–2012[35]

34. Data from ICES 2012a.
35. Data from ICES 2012a.

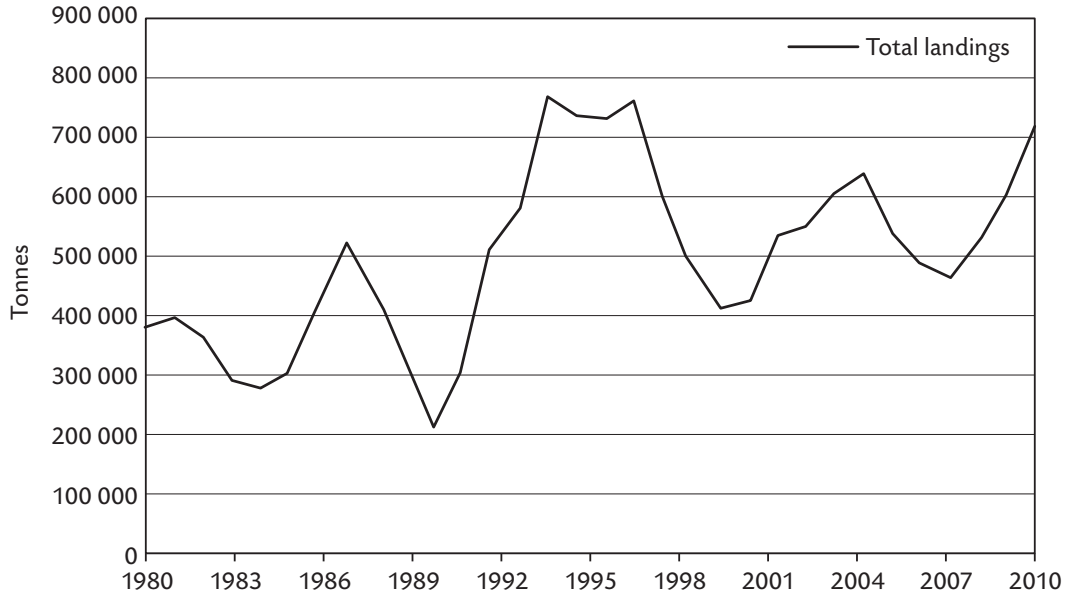

Figure 7: Total NEA cod landings in tons, 1980–2011. Landings include unreported landings[36]

6. Results

6.1 Economic Aspects

As stated above, the Norwegian NEA cod fisheries are in part a transferable quota system. The conditionality of transferability results in a less than economically optimal distribution of quotas, i.e. fewer limitations regarding transferability would increase the economic rent in the fishery. Since Norwegian fisheries policy consists of social goals as well as economic ones, the current management can be seen to be more in line with a multi-criteria optimization, as a broader set of sometimes conflicting objectives may modify the findings regarding the optimality of transferability based on simplified and idealized situations.[37] Hence there may be a trade-off between larger economic rents and other societal goals, such as securing viable coastal communities or a diverse fishing fleet.

Several indicators could be employed for the economic analysis of the fishery. The indicator most commonly used in the profitability analysis of Norwegian fishing vessels is Operating Margin (OM). OM measures the operating profit or Earnings before Interest and Tax (EBIT) in percent of total revenue. The necessary data needed to calculate this indicator is generally easily accessible in official statistics.

36. Data from ICES 2012a.
37. Flaaten 2010.

The operating margin gives a good picture of the profitability of an industry over time, but has not been a yardstick for policy makers as such.

In Figure 8 we observe the operating margin in demersal fisheries (where the NEA cod fisheries are the largest part) since 1980. The two years where the operating margin is negative, are the two crisis years of the fisheries, the former caused by stock decline and the latter by price decline. However, the average operating margin over the last 19 years has been greater than 6 %, which though not directly comparable is similar to non-financial mainland Norwegian companies.

Figure 8: Operating margin (OM) and Return on Capital (ROC) (%) in Norwegian demersal fisheries (1980–2011).[38]

ROC numbers from 1994–1997 are for vessels 13m and larger, while 1998 –2011 encompass vessels 8m and larger, all from the Directorate of Fisheries.

The use of the OM indicator poses problems when comparing vessels groups. An alternative indicator is Return on Capital (ROC)[39] or return on total assets employed, which measures earnings before tax plus financial costs in percent of the average capital employed. This indicator gives information on the profitability of a project compared to the opportunity cost of capital. The opportunity cost is a yardstick for policy makers as it states the return on capital in the best alternative use. In the Norwegian profitability studies carried out by the Directorate of Fisheries,

38. Data from Norwegian Directorate of Fisheries 2012c.

39. Also the ROC has its limitations, and alternative indicators are Return On Capital Employed (ROCE) and Return On Equity (ROE).

the yield of government bonds has been used as the opportunity cost. In Figure 8 we can therefore compare ROC with the OM indicator from 1990 onwards. The figure shows that the two indicators demonstrate the same trends.

ROC is useful for comparing the profitability between different projects, in our case different vessel groups. The main difference between OM and ROC is the fact that OM uses sales in the denominator, while ROC uses capital. If there were a constant relationship between sales and capital, both indicators would give the same ranking of the profitability of different vessel groups. That, however, is not the case. Furthermore, ROC makes differences in capital intensity more clear, which is the case between the two vessel groups that we present here.

A problem with ROC is the determination of the value of the total assets on the balance sheet or total capital employed. The book value is often underestimated compared to the true value of the assets. This is particularly true if the company has a tax incentive of using a depreciation plan that differs from the actual reduction in the value of the assets. A particular problem in analyzing the profitability of Norwegian vessels is how fishing rights are reported in the balance sheet. In many cases this value is not reported, but included in the vessel value (Flaaten et al 1995). From 2008 the Directorate of Fisheries has included certain fishing rights in the balance sheet. The fishing rights included are the time limited rights. Since 1994 the Directorate of Fisheries has published ROC data, which are also presented in Figure 8. This gives an average ROC of 7,2 % for the period 1994–2011. It is natural to compare the fisheries to non-financial mainland Norwegian companies, where Statistics Norway presents data from 2007 to 2011. For this time period we find that the fishing vessels have an ROC of 6,1 % against the non-financial mainland companies' average ROC of 8.4 %. This supports the findings of Steinshamn,[40] that there is little or no resource rent present in the Norwegian cod fisheries.

From 2003 the Directorate of Fisheries not only published ROC for the whole fleet but also for coastal vessels (less than 28 meters) and ocean going vessels, separately. These numbers are presented in Figure 9.

40. Steinshamn 2005.

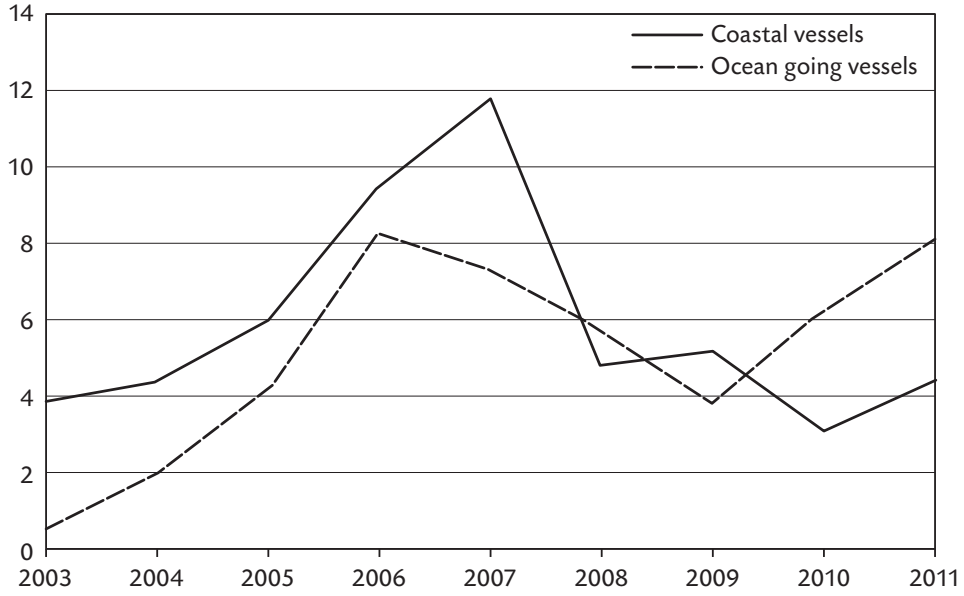

Figure 9: ROC (in percent) for coastal vessels and ocean going vessels 2003–2011.[30]
Ocean going vessels include trawlers and offshore vessels using conventional fishing gear.

On average the coastal vessels have an ROC of 5.9 % compared to 5.0 % for the ocean going vessels. It is interesting to note that in the period 2003–2007 the coastal vessels had a higher ROC each year, but from 2008–2011 the ocean going vessels had higher ROC each year, with the exception of 2009.

There has been a rapid and substantial restructuring of quota for cod fisheries. Within the three vessel groupings – trawlers, offshore and coastal conventional gear vessels – transferred quota is now 58.1 %, 57.1 % and 23.6 %, respectively, of the total quota base for cod. The substantially lower percentage for the latter vessel group is explained by the fact that not all vessels in this group are allowed to transfer quota.

The total costs of fisheries management vary around 9 % of the catch value, depending on market values for fish and cost of services.[41]

In a model analyzing economic data from 2002 and average quotas from 1999–2002, Steinshamn[42] indicated that there was little or no resource rent present in Norwegian fisheries at that point in time. With no restrictions on transferability of quota, the resource rent potential in Norwegian fisheries was estimated to be around NOK 7 billion. As there has been a substantial reduction in the fleet since 2002, the presence of resource rent in Norwegian fisheries today seems probable. However, it may be expected that to a large degree this resource rent is to be found,

41. Anon 2010b.
42. Steinshamn 2005.

partly invisible, in companies that have transferred quota and licenses between their own fishing vessels, or have sold such rights to other companies.[43] There is currently no resource rent taxation in Norwegian fisheries, other than a partial cost recovery tax to cover control costs, of 0.2 % of gross catch value.

6.2 Social Aspects

Over the years the Norwegian coastal communities' dependency on fisheries has declined, in part due to technological development. However, many communities still have strong fisheries interests. Hence the stakeholders in the rebuilding of the NEA cod stock are not just the fishers and the fishing industry, but also the coastal populace as a whole. This has led to broad interest in the management changes that have been carried out since 1990, and much controversy as well.

Norway has a strong tradition of stakeholder involvement through what has been coined a system of centralized consultation, where the ultimate authority lies with the central government after a consultative process of hearings.[44] Furthermore, this Norwegian co-management structure with industry participation and consultation, to quite some extent has given user groups direct input into fisheries management.[45] The Advisory Meeting for Fisheries Regulations, which replaced the Management Council (Reguleringsrådet) in 2006, has opened up for greater participation of a broader set of stakeholders, such as environmental NGOs and the Sami Parliament, in addition to the traditional user groups.

In Norway the central equity issues in the rebuilding of the fishery are connected to geographical distribution and vessel group diversification. Furthermore there is a focus on resources belonging to the community, be that a community of fishers, coastal communities or the Norwegian populace as a whole. For instance there is a strong focus on transferability not resulting in concentration of quotas in one part of the country, or within one segment of the fleet. Hence sale of quotas between counties or vessel groups is not permitted.[46] Furthermore, the formal requirement that quotas (in excess of the basic quota connected to each vessel) fall back to the state after a set number of years, is meant to ensure that the fish resources remain in public possession. Despite the focus on distributional issues in the management, the transferability of quotas has indeed affected some communities – there are winners and losers in quota consolidation. However, changes

43. Flaaten et al. 1995: 354.
44. Mikalsen and Jentoft 2003.
45. Hersoug and Ånes 1997.
46. Despite formal rules against moving of quota vessels with licenses and permits from the North to the South, media reports indicate that such transfers are to some extent taking place.

in quota ownership have also allowed the consolidation of specific quotas, e.g. pelagic versus demersal quotas, allowing a greater degree of specialization. Clearly there has been increased concentration of quotas amongst fewer holders, but this has mainly been debated regarding the offshore fleet where the concentration has been most marked.

Though the decline in number of fishers has been most marked since the first management changes in the 1990s, the decline is by no means outstanding in this time period (see Figure 10), and reflects the general substitution of labor by capital in primary sector industries. According to a study carried out in 2008[47], 66 % of the fishers believed they would still be fishing in 5 years' time, while almost 20 % expected to be retired by then. This may also explain why the study showed no great worry amongst fishers as regards recruiting crew for fishing. The attitudes to fishing were largely optimistic, with almost 80 % stating they would recommend fishing to others.[48]

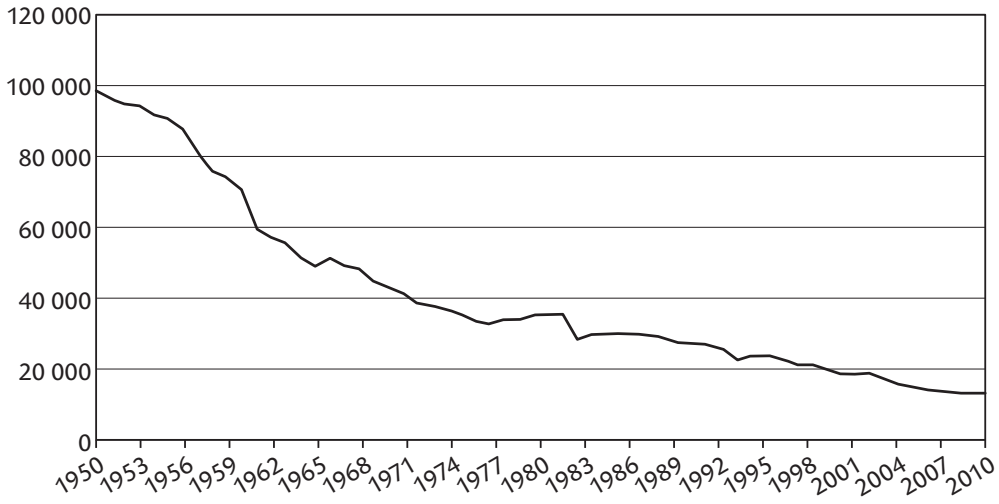

Figure 10: Number of fishermen in Norway (full and part time), 1950–2011[49]

The average age of fishers in Norway has increased, as Table 2 shows. The share of fishers under 30 years of age is almost halved, while the share of those over 50 has increased more than 30 %. Between the age of 30 and 50, the share has stayed largely unchanged. Since 2009 there has been a small increase, +1 %, in fishers under 30 years of age. There has also been a small decline in fishers between the age of 30 and 50, with the same increase in fishers over 50 years of age.

47. Johnsen and Vik 2008.
48. It must be mentioned that the recent record TAC of cod has caused worry regarding market prices, as it is speculated that supply may swamp demand.
49. Data from Norwegian Directorate of Fisheries 2012b.

In 2009 the Norwegian Ministry of Fisheries and Coastal Affairs put in place a total of 30 start-up grants, each the value of 250,000 NOK, and 10 annual participation rights, in order to encourage recruitment of young fishers. The grants were allocated over a period of three years.[50] The scheme is continued in 2013, with some revisions.

Table 2: Percentage of full-time fishers in different age groups for the years 1983 and 2011[51]

	1983	**2011**
<30 years of age	31.4	17.7
Between 30 and 50 years of age	39.2	40.8
>50 years of age	29.3	41.5

There have been a number of compensating mechanisms put in place to soften the effects of the restructuring of the fishing fleet. Decommissioning has allowed fishers to retire from the fishery with a comfortable compensation package. Furthermore, the quota deductions, i.e. the reduction in the transferred quota which then is divided among all remaining vessels, has attempted to also improve the conditions for the fishers who are unable or who choose not to buy additional quota.

The decline in number of vessels along the Norwegian coast varies geographically. In Figure 11 we see how the West Coast and the northernmost counties are the hardest hit as regards the decline in active vessels, with the former having less than 70 % of their 2001 numbers. It should be noted that the largest number of vessels are found in the northernmost counties; hence a reduction of 20 % of the active vessels from 2001 to 2008 consists of more than 700 vessels in this case. The average size of vessels is significantly larger on the West coast than in Northern Norway.

50. Norwegian Ministry of Fisheries and Coastal Affairs 2009.

51. Data from Norwegian Directorate of Fisheries 2012d.

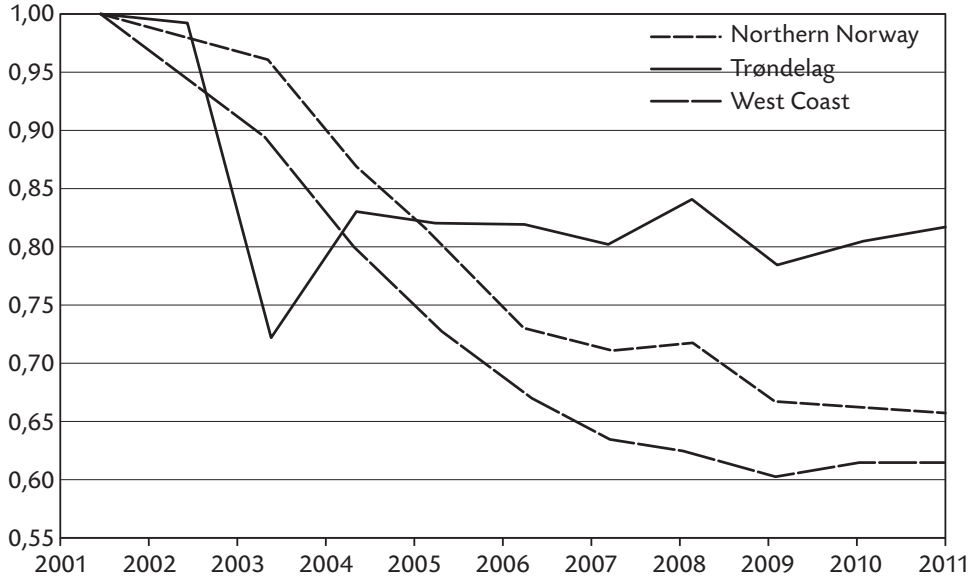

Figure 11: Remaining active fishing vessels in three Norwegian coastal regions in 2002–2011 compared to numbers in 2001*[52].

* The West Coast includes the following counties: Møre og Romsdal, Sogn og Fjordane and Hordaland. Northern Norway consists of the following counties: Nordland, Troms and Finnmark. The counties of Trøndelag are located in-between the other two regions.

In another attempt to rectify some distributional issues, the Ministry of Fisheries and Coastal Affairs opened for the first time in 2011 for additional quota allocated to conventional gear fishers in the areas of coastal Sami, the Norwegian indigenous peoples.

7. Discussion

Fisheries management over the 20 years following one of the most severe crises in the NEA cod fisheries to date has led to a number of lessons learned. These can be divided into management, legitimacy, and economic issues.

Regarding management, an important asset has been long-term collaboration on a transnational level, both through the JNRFC and NEAFC, ensuring beneficial cooperative forward planning. The institutionalization of a number of collaborative measures within research and management has played in important role with regards to long-term goals for transboundary fish resources such as the NEA cod stock,[53] and clearly has applicability to other transboundary or straddling stock fisheries.

52. Data from Norwegian Directorate of Fisheries 2012e.
53. Jakobsen and Ozhigin 2011.

Furthermore, management in the form of harvest control rules has allowed tradeoffs between long-term stability, and flexibility under changing circumstances. Despite management focus on long-term stability for its beneficial industry effects, the clear need for rapid change of tactics due to biological or market-based variations has also been incorporated, and become an important aspect of Norwegian fisheries management.

The rebuilding of the NEA cod fisheries has been an ongoing learning process for the managers, and no one expects the future to be any different. Many permanent management institutions have been put in place, but other institutions require ongoing adjustment and fine-tuning. For instance, technological advances will presumably force changes in the limits as regards the number of quotas that can be gathered on one vessel. Thinning quota markets within geographical limits can also be expected to force change, for example through grey and illegal markets for quotas, licenses and permits. These aspects will demand adaptive measures in the future.

A central legitimacy issue is the development and maintenance of political support and avoidance of stakeholder opposition. There are marked differences in the perceptions of how successful the management of fisheries has been in Norway over the last 20 years. Within the industry, and especially within the groups that have attained quota rights, there is largely an appreciation of the system, and the optimism in the fishery is reflected in the willingness to invest. However, outside the fishing industry there are negative feelings as a result of the societal consequences of the restructuring of the fishing fleet. The concentration of fishing rights is seen as a threat to the many small coastal communities that historically have depended on fisheries. The concentration of rights on fewer vessels and vessel owners has been criticized by parts of the land-based industry,

Though the above-mentioned concentration of rights is by no means without contention, the security of rights to individual rights holders has played an important role in the general optimism in Norwegian fisheries. Furthermore, stable allocation keys within the different vessel segments have secured vessel groups' stable harvest expectations. In an industry where uncertainty traditionally was linked to policy, markets, and natural resources, the increased stability of the former and the latter as well, has enabled more long-term planning than previously possible.

Broad consultation and adoption of stakeholder preferences in policies have been important mechanisms for development and maintenance of support for policy initiatives. Evaluations of both new and implemented policies carried out by governmentally-appointed committees or the ministry itself, have also played a role.

The increased focus on securing profitability in the fishery has improved the economic situation via the reduction in the number of vessels operating. It has ensured that Norwegian fisheries now have no need for subsidies, excluding man-

agement costs paid by the general governmental budget, and the fishing fleet self-adjusts effort through conditional quota transferability in order to meet the continuous technological development in the harvesting of fish. The geographical limitations in transferability have, however, led to some small markets for rights. This has resulted in fishers moving physically to access a better quota market, or just formally by registration of fictitious moves. The latter type of action circumvents regional policy goals and is considered illegal.

There are clear tradeoffs between economic efficiency and other societal goals, as reflected in the potential for resource rent creation.[54] In Norwegian politics there is a willingness to pay for securing the viability of many communities and people along the long coastline.

The rent creation through the increased efficiency in the harvesting of cod and other species is partly invisible and can be found within companies or with individuals that have transferred quota and licenses between their fishing vessels, or have sold such rights to others. The fact that the resource rent is not taxed in excess of normal taxation therefore opens for the amassing of wealth among a few. This is perceived by some as the central legitimacy problem within Norwegian fisheries today. From the authorities the lack of resource rent taxation has been played off as securing that the coastal communities reap the benefits of the fisheries. It has also been a way of garnering acceptance amongst fishers for the transferability of quota rights. On a broader national scale, however, fisheries are not afforded much attention, and hence these legitimacy issues are of concern only to a limited section of the population.

Availability of data has been important both on the biological and social side of fishery management. The NEA cod stock is one of the most data-rich fish stocks in the world, and fisheries data is also extensively available. Economic data in Norwegian fisheries is also highly developed due to collection initiated in connection with the subsidy regimes in the 1970s and 80s. This wealth of data has made it possible to argue comprehensively both with regards to the need to manage the stock and the effort in the fishery. This data has also contributed to the broader sets of management initiatives where there are tradeoffs between different fisheries, e.g. the subsidization of sealing due to negative effects of large seal stocks, the reduction in by-catch of juvenile cod in shrimp fisheries, as well as the interest in keeping a large capelin stock as feed for the more lucrative cod stock.

Lessons learned that may be of value for other fisheries include the importance of cooperation, both nationally and internationally, the focus on efficiency measures calibrated to take into account legitimacy issues, as well as long-term biologi-

54. Leung et al. 2001.

cal aims, coupled with flexibility in relation to changing circumstances, be they ecological, social, or economic.

Fisheries management in Norway is perceived as a permanent learning process, where the current management of the NEA cod stock has by no means seen its final state. Technological progress and continual environmental and market changes demand flexible and adjusted management actions. Public preferences may also be expected to change how fisheries management is carried out in the future, clearly indicating that this is not the last chapter in the story of the Norwegian NEA cod fisheries.

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