Chapter 1.

Economic Issues in Decommissioning Programmes

The economics of decommissioning schemes has been the focus of many studies in recent years.[1] From this literature, it is clear that the design and implementation of decommissioning schemes (which are broadly defined – see Box 1.1) varies significantly both between and within countries. For example, some countries require that decommissioning payments be tied to the physical scrapping of vessels while others allow vessels to be shifted to another fishery (in which case the payment is for the removal of excess capacity from a particular fishery rather than reducing the overall capacity in the country). Some schemes are intended to remove latent capacity or effort instead of capacity or effort that is currently engaged in fishing so reducing potential rather than actual pressure on particular fisheries. Both auctions and flat rate payments are used across countries, each with advantages and disadvantages and various degrees of success.

This chapter discusses the economics of decommissioning schemes, illustrating theoretical insights with experiences from decommissioning schemes in both OECD and non-OECD economies. The analysis draws primarily on existing literature and is intended to provide policy makers with a thorough understanding of the economic underpinnings that should inform the design of decommissioning schemes. The range of economic issues addressed include:

- the objectives of the schemes;
- the importance of existing and future management arrangements;
- financing of decommissioning schemes;
- whether vessels or licences should be purchased;
- mandatory or voluntary participation;
- the price formation process;
- conditions on the further use of the vessel or licence;
- and the role of expectations and moral hazard.

Box 1.1. Terminology and Concepts

Decommissioning schemes

There is a range of terms for decommissioning schemes in common use across OECD countries. These include vessel buyback programs, licence retirement schemes, licence buybacks, vessel scrapping programmes, and vessel transfer programmes, just to name a few. This paper includes all these types of schemes under the generic heading of decommissioning schemes (which is used interchangeably with the term buyback programmes).

Fishing capacity

Fishing capacity is defined by the FAO as the amount of fish or fishing effort that can be produced over a given period of time, and for a given resource condition, by a vessel or fleet, given the technology, fixed factors of production, no restriction on variable input usage, and customary and usual operating procedures.

Overcapacity

Overcapacity in a fishery arises whenever the capacity of the fleet is higher than the minimum required to achieve a target level of sustainable exploitation of the fish stock. Assuming that the target level is determined with respect to maximum sustainable yield (MSY), overcapacity indicates that the fleet size is larger than required to harvest MSY. This will result in overfishing if the fleet is operating at or near full capacity. Overcapacity is a harmful long-run problem that does not correct itself will persist indefinitely if not addressed. This is in contrast to "excess capacity" which is the difference between what a vessel could harvest if fully utilised and what is actually harvested by the vessel owner, given the process of inputs and outputs.

Sources: OECD; FAO; Grafton *et al.* (2006).

Objectives of the Schemes

In an early survey of decommissioning schemes, Holland *et al.* (1999) identified three main goals of decommissioning schemes:

- saving vessel owners or licence holders from losses they would otherwise incur, because of the unavoidable adjustment in a fishery in crisis;
- improving the profitability of the rest of the industry following the capacity adjustment; and
- rebuilding fish stocks.

The schemes they surveyed clearly have mitigated the losses of some fishers and vessel owners, although it is debatable whether the expenditures covered total losses from adjustment. Whether such programs have had a positive effect on the profits of the remainder of the industry was not always clear according to their survey. At the very least there need to be some

controls on investment in the industry or incentives to prevent re-investment from taking place on too large a scale. However, in many of the programs they surveyed, the money spent on buy-backs apparently leaked back into the industry or removed capacity that was not very important in any case. In some cases, the reduction in the number of vessels was neutralized by increased effort by the remaining vessels. With respect to resource conservation objectives, the authors point out that all the programs they considered had other measures in place to deal with this problem. They concluded that decommissioning schemes therefore seem to have been motivated mainly by the desire to increase profitability and to mitigate losses from adjustment.

A clearly defined objective or set of objectives is, therefore, an obvious prerequisite for a successful decommissioning scheme, as this will help in ensuring that the appropriate policy tool is used to address the particular problem. For example, using a decommissioning scheme as the main policy mechanism to rebuild resource stocks is unlikely to be successful as it does not address the fundamental problem of inadequate management that generally is the primary reason for pressure on resource stocks. Excess capacity in the form of too many vessels or too many licences is a symptom of the problem, rather than the cause. A focus on improving management arrangements would provide a greater return to the use of public funds than would a decommissioning program on its own.

Similarly, the use of a decommissioning scheme to improve the profitability of the industry would not be successful if the management arrangements following the buyout did not ensure that the benefits of the buyout accrued to the remaining fishers in the form of increasing resource rent. Any resulting increase in resource rents to be competed away by new entrants or expanded effort, nullifying the short-term benefits of the scheme.

These factors point to the need to view decommissioning schemes as part of a package of adjustment measures, and not as an end in themselves. A comprehensive and coherent set of objectives and matching policy measures is needed to take a holistic approach to a particular fishery's problem, identifying underlying causes of poor profitability and resource pressure and tailoring a series of appropriate policy responses. Such packages will generally, but not always, involve a combination of management change and decommissioning schemes, perhaps with additional social support. As a result, decommissioning schemes are best viewed as a time-limited transitional measure to assist fisheries towards profitable and sustainable futures. This should be reflected in the objectives of specific decommissioning schemes.

Existing and Future Management Arrangements

The importance of the existing and future management arrangements for fisheries targeted for a decommissioning programme cannot be understated. It has been well established, both theoretically and from practical experience, that the economic and environmental outcome of decommissioning schemes depends critically on the management of the capacity and effort that remains in the fishery. Both the existing management regime at the time of the buyout, and the management regime that follows (assuming there is some change), will have an influence.

OECD (2006a) reviewed in detail the economic effects of decommissioning schemes under different types of management regimes. In the case of an open access fishery, decommissioning payments will have no effect on fish stocks as new vessels will enter the fishery to replace the scrapped vessels. Indeed, the effects may be negative on stocks as decommissioned vessels would be replaced by new vessels which are typically more efficient than older ones. There may be a short term impact in terms of reduced catches, improved profitability and stock improvements, but in the medium to long term the lack of control on effort leaking back into the fishery will negate any beneficial effects from the decommissioning scheme and dissipate any resource rent that may have been generated.

The Washington State Commercial Salmon Fishery in the US exemplifies the problems associated with the use of buyback programs in open access fisheries. This fishery, which was essentially open access during the 1990s, had a series of three buyback programs in the late 1990s at a cost of USD 14 million, primarily in response to overcapitalisation and the impact of unusual weather events (GAO, 2000).[2] A review of the three programs found that they were not effective at making inroads into fishing capacity due precisely to their open access nature, and that the programs could best be described as income transfer programs (Muse, 1999).

Under a regulated open access regime where only the catch is controlled, a decommissioning program would have no effect as, in the absence of barriers to entry, the vessels being decommissioned would simply be replaced by new vessels. If there are effort controls in place (*e.g.* through limited entry), there will still be an incentive for the vessels remaining in the fishery to engage in input (or capital) stuffing in response to the initial lower level of effort, increased stocks and greater profits. However, given that most effort controls are defined with vessels (and often a small number of vessel attributes, such as power and tonnage) as one of the main control parameters, this impact may not fully offset the increase in stocks resulting from the initial decommissioning scheme and so the effects of the decommissioning scheme will be eroded. The related issue of latent

effort is also problematic as the reduction in active capacity will be likely to trigger the activation of latent effort, resulting in a similar expansion of effective effort despite an apparent reduction in capacity (measured as the number of vessels or permits).

The problems of effort expansion in limited entry or regulated open access fisheries following a buyback of vessels or permits have been well documented. A review by the US General Accounting Office in 2000 of the effectiveness of several buyback programs in the US highlighted the role of post-buyback effort expansion. It made a number of recommendations including prohibiting buyback participants from entering any fishery with excess capacity, placing restrictions on latent effort, minimising incentives to increase capacity, and developing performance measures to evaluate buyback programs with respect to capacity and conservation of fish stocks (GAO, 2000).

The New England Groundfish fishery was one of the fisheries reviewed by the GAO. The National Marine Fisheries Service (NMFS) implemented a vessel buyout and a permit buyout in this limited access fishery. The two buyback programs were implemented at different times and for different reasons (Thunberg *et al.,* 2004). The vessel buyout was introduced at a time when resource conditions were very poor and was designed to provide financial assistance to the fishing industry as well as removing active fishing capacity. However, it was feared that the entry of formerly inactive vessels would thwart the gains in resource recovery and, in turn, require further reductions in vessels that that had borne the brunt of effort reductions in the fishery. The permit buyout was therefore designed to remove as much potential fishing capacity as possible before latent effort could be activated. The two buyout programs removed nearly 20% of the potential capacity output and helped to lay the foundations for a shift in management regime towards more market-based methods of adjusting capacity and effort (including leasing and transfers of days-at-sea among limited access vessels, and community-based quotas).

The impact of effort creep in offsetting the positive effects of decommissioning of capacity in input controlled fisheries is well illustrated by the experience in Australia's Northern Prawn Fishery (NPF) (Box 1.2). The NPF has been controlled by input measures and has been subject to almost continuous restructuring and capacity reduction over the past two decades. However, improved harvest technology and a rise in the use of unregulated fishing inputs largely negated the effects of the dramatic capacity reductions that took place.

In the case of the EU, Frost and Andersen (2006) argue that the combination of decommissioning schemes and increasingly strict entry

conditions has made it more difficult to increase capacity and substitute between inputs. They also note that the recent shift in the EU towards tradable days-at-sea for a number of fleet segments that exploit species under stock recovery plans has many characteristics of ITQ systems and may have much the same effects on automatic capacity adjustment in the longer term. However, such a command and control approach to fisheries management requires regulators to stay one step ahead of fishers and can induce a "race to regulation" between fishers and regulators (OECD, 2006a).

Box 1.2. Continuous Adjustment in Australia's Northern Prawn fishery

The Northern Prawn Fishery (NPF) has, for many years, been managed through a combination of input controls (limited entry, seasonal closures, permanent area closures, gear restrictions and operational controls). Poor profitability and serious declines in resource stocks led to a process of fleet restructuring and capacity reduction that has been almost continuous over the past two decades. A series of industry-funded buybacks (with limited government assistance through the provision of government backed loans) reduced the fleet from a maximum of 302 boats in the early 1980s to 137 boats in 1995 and to 83 boats in 2005. The effectiveness of the buyback schemes needs to be viewed over both the short and medium term. In the short run, the schemes were effective at removing capacity from the fishery, resulting in some stock recovery and increased net returns over what would otherwise have been the case. Over the medium term, however, effective effort increased steadily in response to continually improving harvest technology and a rise in the use of unregulated fishing inputs. This resulted in further rounds of buybacks and the cycle continued. While the key stocks of banana, tiger and brown prawns are no longer classified as over-fished, net economic returns to the fishery have fluctuated markedly over the last decade and have declined rapidly since 2001.

More recently, a buyout of fishing concessions took place under the *Securing our Fishing Future* structural adjustment package in 2006 (see Chapter 2). This is to help the industry move towards a management regime with a stronger set of use rights including the introduction of fully transferable Statutory Fishing Rights governing the number of trawlers that may operate in the fishery and the gear that can be used. A harvest strategy was also introduced in 2007 containing definitive decision rules for the tiger and banana prawn fisheries.

Source: Newby *et al.* (2004); Galeano *et al.* (2006); Australian Fisheries Management Authority.

Problems of latent effort and effort creep evident in many limited entry or input controlled fisheries are likely to be exacerbated by the use of decommissioning schemes. The short term impacts of such schemes in terms of improved catches and profits can provide an incentive to spur effort expansion or activation of capacity. It has also been pointed out that decommissioning can facilitate such expansion by providing a source of funds for reinvestment (Jorgensen and Jensen, 1999; Banks, 1999). Measures are therefore needed to ensure that the post-buyout management regime effectively constrains capacity and effort from expanding.

In the case where there are effective use or property rights, vessel decommissioning schemes have no effect on landings, but they can speed up the adjustment process and reduce pressure on the management system stemming from poor profitability, enforcement difficulties and lack of compliance with regulations. It also can reduce pressure on the ecosystem. The remaining owners of the quota or effort rights receive the benefits from capacity leaving the fishery but have no incentive to expand effort or capacity and so decommissioning schemes merely represent a transfer from taxpayers both to those leaving the industry and to those remaining behind. In the case of individual transferable quotas, the quota holders have incentives to achieve optimal effort and capacity with market processes driving automatic adjustment. In a fishery with too many vessels, some vessel owners would find it attractive to sell their quotas rather than renewing their boats, while other vessel owners would find it attractive to buy quotas to improve the profitability of their own operations. In a regime like that, the industry could on its own initiative, and at its own expense, restructure itself.

Despite the apparent redundant nature of decommissioning schemes within a management framework based on strong property rights, there are examples of them being used in such situations. In the 1990s in Iceland, for example, there was a buyout of vessels with licences within the ITQ system (Box 1.3). The decommissioning scheme was financed primarily through levies and surcharges on the vessels and a firm in the fisheries sector, supplemented by a state guaranteed loan, and was intended to rationalise quota holdings and improve financial performance of individual companies and the sector as a whole.

In another example, a structural adjustment program was instituted in the south east trawl fishery in Australia in the wake of the final round of allocation of individual transferable quotas in 1994. One of the primary reasons for the buyback was to reduce overcapacity that had carried over from the pre-ITQ era and which was proving difficult to remove through natural attrition due to the multispecies nature of the fishery (where not all species were under ITQ management) (Newby *et al.*, 2004). The buyback resulted in six latent and fourteen active permits being retired and, in conjunction with the establishment of an industry-assisted quota brokerage service, resulted in a significant improvement in economic performance (Fox *et al.*, 2006). However, a secondary purpose of the buyback was to alleviate opposition from aggrieved fishers to the initial allocation of quotas (AMC, 2000). Litigation over the quota allocation continued for some years and created uncertainty within industry and government about the security and stability of the ITQ management arrangements. The buyback was therefore also partly intended to compensate fishers who had their fishing

operations affected by the move from input-based units to output-based ITQs.

Box 1.3. Decommissioning Vessels in the Icelandic ITQ system

Following a series of three publicly funded decommissioning schemes in the 1980s which were ineffective in reducing capacity, the Icelandic government established the Development Fund of the Fisheries (DFF) in 1994. The main objectives of the DFF were to: buy obsolete processing plants and equipment to reduce overcapacity in the land-based fish processing industry; subsidise the decommissioning of vessels and reduce capacity in relation to the sustainable catch of fish; and to facilitate structural and organisational changes to rationalise operations and increase profitability of the fisheries. Low profitability in the fishing sector was caused primarily by the high level of financial gearing (leverage) and low level of equity ratio in fisheries companies. By decommissioning vessel with quota shares it was anticipated that the quotas would be transferred to vessels which remained in the system. The scheme therefore addressed financial problems and rigidities in the sector rather than stock over-exploitation concerns.

The DFF was funded through levies and surcharges on the vessels and firms in the fishing sector. Vessel owners with a fishing licence paid IKR 750 per GRT, with the maximum payment being IKR 285 000 per vessel. From September 1996, all quota holders paid a levy of IKR 1 000 per tonne of quota. Owners of processing plants paid a surcharge of 0.75% of the value of the plants' assets. The decommissioning payments were calculated as a percentage of the full coverage insurance value of the vessel. In 1994, the payment was set at 45% of the full insurance value, decreasing to 40% and then 20% in following years. Special provision was made for small vessels both inside and outside the ITQ system.

During the period 1994-98, payments to the DFF was IKR 2.3 billion and subsidies for decommissioning of vessels and obsolete processing plants amounted to IKR 3.2 billion, with 87% being directed towards vessel decommissioning. The difference was covered by a state guaranteed loan. Most of the expenditure on vessel buyouts occurred early in the programme (1994) while payments to retire obsolete plants followed a few years later. A total of 459 vessels were retired, totalling 7 829 GRT with an average vessel age of 18 years.

While it is normally expected that a comprehensive ITQ system such as that in Iceland will induce automatic capacity adjustment within the sector, the DFF effectively provided an impetus for the industry to rationalise quota holdings. The relative quota per vessel increased and vessel efficiency and profitability improved. The industry funded decommissioning scheme thus served to speed up the adjustment process and reduce pressure on the management system stemming from poor profitability, enforcement difficulties and lack of compliance with regulations.

Source: Klemensson (1999).

In summary, it is clear that the effectiveness of decommissioning schemes in securing long-term benefits to a fishery will be determined by the existing and future management regime in the fishery. Ensuring that capacity does not re-enter the fishery is crucial as failure to do so would not achieve the expected improvements regarding the resource and economic sustainability of the fishery. Decommissioning schemes are therefore best

viewed as a strategic tool that can facilitate the transition of a fishery to improved management arrangements based on a stronger and well-enforced set of use or property rights. This will help to restructure incentives for autonomous fleet capacity adjustment following the completion of decommissioning and avoid the need for future buybacks. The improved economic conditions that usually follow an effective buyback can provide a window of opportunity to garner support for management changes. Crucially, though, it must be recognised that decommissioning schemes do not in themselves alter the underlying incentives to over-invest in open or limited access fisheries.

Financing Decommissioning Schemes

From an economic perspective, a relevant public policy principle in determining how decommissioning schemes should be funded is that of "beneficiary pays". Under the beneficiary pays principle, industry participants who stand to benefit from a policy intervention should contribute to the costs of the policy intervention (Weimer and Vining, 2004). This is similar in many ways to the user pays and polluter pays concepts in that it seeks to better match incentives and objectives within an industry or sector. The beneficiary pays principle forms the basis of the cost recovery programmes used in a number of OECD countries, including New Zealand, Australia and Iceland (OECD, 2003). The range of beneficiaries from a buyout need not be restricted to commercial fishers as other groups may also benefit following a buyout, depending on the particular circumstances. For example, recreational anglers can benefit from higher catch rates, and NGOs can gain from an increase in non-market benefits (see the case study in Chapter 3 on an NGO-funded buyout in the United States).

In practice, decommissioning schemes have historically been funded by governments. This has reflected, at least in part, a concern that the need for decommissioning of licences or vessels is required to correct for past policy failures. Where governments have allowed fleet capacity to expand, or even encouraged expansion through the use of vessel construction and modernisation subsidies, there may be an obligation for government to redress the resulting excess capacity problem when the inevitable industry downturn occurs in the form of rent dissipation and pressure on stocks. For example, decommissioning schemes in the European Union have been funded by governments with funds coming from the Financial Instrument for Fisheries Guidance and, from 2007, the European Fisheries Fund, and EU Member States. EU regulations govern the amounts of money that may be spent and in what manner (see EC Regulation governing

decommissioning 2792/99 and Box 2.1). In many non-EU countries, decommissioning schemes are also predominantly publicly funded. For example, the shrimp vessel decommissioning scheme undertaken in Mexico in 2005 was 100% government funded. Similarly, decommissioning schemes in Canada and Japan have been publicly funded.

Increasingly, however, mixtures of public and private funding are being used in OECD countries. In these cases, the industry contribution to the buyout is often facilitated through a government loan that is then repaid through annual levies on landings or through licence fees. A trend towards greater industry involvement in buyouts is evident in the United States where privately funded buybacks are regarded as a more effective approach to buybacks (NMFS, 2004). Amendments to the Magnuson-Stevens Act in 1996 allowed buyback loans to be paid off by some combination of Federal grants and special appropriations, funds provided by States or other public or private or not-for profit organisations, or by industry fees. In recent years, three large buyback schemes have been predominantly funded by industry (Table 1.1). The Northern Prawn Fishery in Australia has seen a series of industry funded buybacks (with some limited government assistance) in which the government backed loan to the industry was repaid through levies on the remaining fishers (Box 1.2). In contrast, a buyback in the Northern Territory barramundi fishery was financed by a commercial loan on the basis of expected revenues from licences (World Bank, 2004). Norway provides yet another model for facilitating public/private funding and ensuring incentives are well aligned (Box 1.4).

Box 1.4. An Alternative Model of Public/Private Funding in Norway

An alternative model of public/private funding for decommissioning has been used in Norway. On 1 July 2003, a fund was established for the decommissioning of coastal fishing vessels up to 15 meters holding annual permits. The scheme is funded through a fee on the value of first-hand landings of every Norwegian fishing vessel (not just the vessels remaining in the coastal fleet). The government provided a capital injection to the fund of NOK 35 million in 2004, estimated to be around 50% of the contribution from the industry in that year. Further government contributions were not guaranteed and there is a five year sunset clause for the scheme. The aim of the scheme is to collect about NOK 350 million over the five years which would enable the scrapping of approximately 15% of the coastal fleet less than 15 meters.

Source: OECD (2006b)

Table 1.1. Funding of Vessel and Permit Buyback Schemes in the United States

Buyback name	Year	Number of vessels	Number of permits	Cost of buyback (USD million)			
				States	Industry[a]	Federal	Total
NE Multispecies	1994	11	67			2.0	2.0
NE Multispecies	1995	68	475			22.5	22.5
Texas Inshore Shrimp	1995		310			1.4	1.4
Washington Salmon	1995		142			5.2	5.2
Washington Salmon	1997		391	1.2		3.5	4.7
Alaska (Bering Sea) Pollock	1999	9	17		75.0	15.0	90.0
NE Multispecies	2002		245			10.0	10.0
Pacific Coast Groundfish	2003	91	240		35.7	10.0	45.7
Alaska (Bering and Aleutian) Crab	2003	28	43		100.0		100.0
Total		**207**	**1 930**	**1.2**	**210.7**	**69.6**	**281.5**

a. Industry cost is the form of a loan from the government that is repaid by the industry following the buyback.
Source: NMFS (2004).

In an innovative development, a privately funded buyout of fishing permits was carried out by a consortium of environmental NGOs in the United States in 2006. This buyout, which is reviewed in detail in Chapter 2, involved the joint purchase by The Nature Conservancy and Environmental Defense of a number of permits which were active in a closed area for bottom trawling, prior to a marine park being declared. This initiative is a marine extension of similar terrestrial purchases to preserve specific habitats that have been made by environmental groups in recent years in a number of countries.

Another innovative private scheme was introduced in 1989 with the establishment of the North Atlantic Salmon Fund (NASF). Founded by Icelandic entrepreneur, Orri Vigfússon, the NASF has strived to protect the diminishing wild North Atlantic salmon stock. Since 19889, NASF has raised USD 35 million to buy out the netting rights from and brokered moratorium agreements with commercial salmon fishers across the North Atlantic, including the Faroe Islands, Iceland, Wales, Iceland, England, Greenland, France and Norway. The buyout has been relatively successful to date, with wild salmon runs being restored in many areas. The attention of the NASF is now turning to addressing the challenge of protecting the salmon runs within countries such as Scotland, Ireland and Norway.

From an economic perspective, the use of industry financed buyback programs helps to provide appropriate incentives for those fishers who remain in the industry. The remaining fishers are (usually) committed to repayment of a long-term loan (for example, up to 30 years in the case of the United States) and so have a strong incentive to maximise long-term profits within the constraints of resource sustainability. This is, of course, conditional upon the institutional arrangements being coherent with such an incentive, in particular by ensuring that effort is not able to creep back into the fishery. If this was not the case, the remaining fishers would have an incentive to maximise short term profits, with the attendant possibility that profits will decline over the longer term, resulting in possible default on the government loan or pressure for further adjustment assistance, as well as adverse pressure on resource stocks.

Another advantage of an industry funded decommissioning scheme is that the debt obligation becomes collective, rather than individual (Squires *et al.,* 2006). Collective borrowing also spreads the risk among the remaining fishers. Both these factors increase the prospects for cooperation both between fishers and between fishers and regulators in the future management of the fishery.

Purchasing Vessels or Licences?

There are a number of factors that will influence the decision on whether to buy back vessels, licences, or both. First, the cost may vary significantly between vessels and licences. In general, purchasing licences is often cheaper than purchasing vessels, which in turn is often cheaper than buying both vessel and licence. As a result, there is a trade-off between affordability and the objectives of the scheme. Purchasing only the licence may leave the vessel free to fish elsewhere, while purchasing the vessel could allow the licence (if transferable) to be used with another vessel. The likelihood of such capacity spillovers can be mitigated by the imposition of conditions on the transfer and subsequent use of the licence or vessel, whichever is not the subject of the buyout. However, such conditions will have an impact on the purchase cost of the licence or vessel as the constraints will be factored in, or capitalised, in the value of the asset to be purchased.

A second factor is the nature of the regulatory arrangements in the target fishery. In some cases, the vessel and licence are bundled together and must be transferred (or decommissioned) as a package. This is the case, for example, in most of the Norwegian fisheries. In other cases, a vessel owner may have multiple licences, allowing them to fish in several fisheries, or for several species in the same fishery, or to use multiple types of gear. Such "stacking" of licences is common in multi-species fisheries or in fisheries where there are a high proportion of part-time or inactive fishers. The value of the licence in the latter case is equivalent to an option value.

Third, purchasing inactive, or latent, licences or vessels may not have a significant or lasting impact on capacity or profitability in the fishery. In many cases, decommissioning schemes will generally either buy out the currently inactive capacity, with little effect on the actual level of capacity being employed in the fishery, or encourage the latent capacity to become active (Cunningham and Greboval, 2001). This latter point is particularly significant from a political economy perspective as it highlights the dynamic nature of fisheries and fisheries policy and the rational response of fishers to policy signals from governments. Unfortunately, the lowest priced licences tend to be the least active vessels, such as vessels fishing part-time or in multiple fisheries, or those which are otherwise marginally profitable. Purchasing these licences may result in a high nominal rate of licence retirement, but with little actual effect on effective effort or capacity.

The potential problem of latent capacity was highlighted in a 2000 report by the US General Accounting Office (GAO, 2000). In its review of the New England groundfish fishery buyback scheme, the GAO found that the 79 vessels that were purchased in the buyback accounted for around 15% of the total groundfish catch in that fishery in 1996. However, because of the

number of unused fishing permits in the fishery, 62 previously inactive vessels began catching groundfish in the same year as the buyout. It was estimated that the 62 vessels collectively had over two-thirds of the potential fishing capacity of the 79 vessels purchased in the buyback. The problem was compounded by vessel owners who participated in the buyback purchasing a vessel with buyback funds and re-entering the fishery.[3]

A potential solution might be to provide a larger initial budget for the buyback in anticipation of purchasing both active and latent capacity or permits. Such an approach was advocated by Funk *et al.* (2003) in their review of the licence buyback for the Texas Bay Shrimp Fishery. They demonstrated that the benefits from a combination of licence limitation and buyback would be realised sooner if additional funds were available to purchase a higher number of licences at the start of the buyout, rather than through the endogenously determined licence acquisition program then in place.

One of the common assumptions in the debate on decommissioning schemes is that the optimal strategy is to remove the vessels with the highest catch for the lowest cost. However, this assumption may be misleading if vessel characteristics are not the most important determinant of catching power. Branch *et al.* (2006) reviews the debate on the extent to which the "skipper effect" may explain a more significant variation in catch rates relative to other determinants commonly assessed such as vessel tonnage, power or gear. The review concluded that the individual differences among skippers were indeed significant, meaning that the effect of removing vessels may be offset to some extent by skilled individuals re-entering the fishery on other vessels. It is, of course, difficult if not impossible to regulate and restrict such movements in human capital.

In summary, careful consideration of the desired outcome of the decommissioning scheme is required during the planning stage in order to determine whether vessels or licences or both should be targeted. This may in large part be determined by the nature of the regulatory arrangements governing participation in the sector, and the extent to which vessel and licence are locked together. It may also be influenced by budget considerations. Regulators also need to be aware of the extent of latent vessels or permits in a target fishery. The order in which capacity or permits are bought out can be significant in designing decommissioning schemes for fisheries in which latent effort is a problem. There may be advantages to purchasing latent effort first in order to ensure that it is not reactivated when a buyout of active capacity improves the economic conditions improve in the fishery.

Voluntary or Mandatory Participation?

Virtually all decommissioning schemes have been implemented on a voluntary basis. This is primarily due to perceptions of fairness and equity, as well as to the likelihood of legal complications that may arise in the case of compulsory acquisition. Two schemes have been identified as examples of compulsory decommissioning schemes, or schemes that have a compulsory component. In 1993, there was a compulsory, across-the-board surrender of a proportion of fishing rights in the Northern Prawn fishery in Australia as the target set for a voluntary buyback had not been met (AFMA, 1999). In Chinese Taipei, there was a mandatory buyout of large scale tuna long-line vessels in 2005 and 2006 (this scheme is reviewed in Chapter 2).

Determining the Price

A key issue in the design of decommissioning schemes is the way in which purchase prices are determined for vessels, licences, fishing rights or gear. The experience of decommissioning schemes to date indicates that four broad types of mechanisms are used: auctions; fixed rate payments; one-on-one negotiations; and independent valuations (Holland *et al.,* 1999). Each type of mechanism has advantages and disadvantages, and the relative effectiveness of each type will vary according to different situations. Table 1.2 provides a summary of the different types of price mechanisms and their advantages and disadvantages. The two main approaches used to date have been auctions and fixed rate payments; in cases where there are many potential sellers, as is the case with most fishing vessel buyout schemes, the choice is practically constrained to auctions or fixed rate payments.

From an economic perspective, the fundamental objective in the choice of pricing mechanism is to achieve a cost-effective outcome which achieves allocative efficiency and provides "value for money". That is, the price mechanism should deliver either the most capacity reduction for a given budget, or achieve a given capacity reduction target at the least cost. A voluntary buyback process should therefore seek to elicit the valuations that individual fishers have of their willingness to sell their vessel or licence. These private valuations will be different for each fisher and will be influenced by a wide range of factors such as age, skill, alternative opportunities, assets, etc. Typically, the government has limited information about individual fishers' private valuations and must rely on revelation mechanisms to assist in overcoming the information asymmetry.

Auctions

In principle, an auction (or tender or bidding scheme) will provide the most effective means of ensuring that buyout prices for vessels or licences adequately takes account of private information held by the bidders.[4] The main advantage of an auction is its tendency, if properly designed, to attain allocative efficiency without requiring governments to have prior knowledge of resource values or costs. This outcome is achieved by promoting competition among bidders for decommissioning payments, forcing them to reveal information about their valuations through their bid. A fisher's bid will be influenced by both their own private valuation and their individual assessment of available information on other fishers' bids and private valuations. Theoretical analysis suggests that under standard auction rules, the optimal strategy is one of slightly overbidding so that the auction will not reveal bidders' true opportunity costs (Latacz-Lohmann and Schilizzi, 2005). Overbidding is highest for low-cost bidders whereas high-cost bidders will bid closest to their true costs. However, low-cost bidders are usually selected early and so get paid well above their true costs. Box 1.5 provides a graphical analysis of the nature of the auction process.

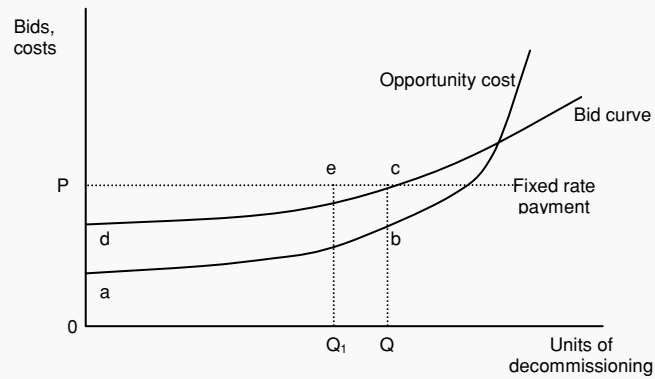
There is a rapidly growing use of auctions in decommissioning schemes in fisheries around the world. This reflects an increased policy interest in using auctions to meet environmental goals in a cost-efficient manner when there is incomplete or asymmetric information, particularly in relation to agricultural land management (Chan *et al.,* 2003; Latacz-Lohmann and Schilizzi, 2005).[5] In practice, there is a significant variation in the design of auctions within decommissioning schemes, and so auctions need to be carefully tailored to ensure that they provide appropriate incentives in particular situations. Table 1.2 covers some of the key variants but key issues include whether the auction is single price or reverse auction, uses first-price or second-price principles, has single or multiple rounds of bidding, sealed or open bids, if bids are to be weighted according to certain criteria. For example, the use of discriminative reverse auctions is increasing. Under these types of auctions, the agency running the auction accepts bids but then weights them according to a set of criteria in order to skew the resulting scores towards particular target groups. In the case of the United States Bering Sea/Aleutian Islands King and Tanner Crab Fishery, the bid prices were weighted according to the catch value history of individual vessels in order to ensure that the more active vessels received preferential rankings (see case study in Chapter 2).

Box 1.5. Auctions *vs* Fixed Rate Payments

A bidding model for decommissioning grants can be used to illustrate the effects of information asymmetry on the relative performance of auctions and fixed-rate payments. The model, developed in Latacz-Lohmann and Schilizzi (2005) and Schilizzi and Latacz-Lohmann (n.d.), assumes that fishers are risk neutral, hold private information about their own income from fishing, and use bidding strategies predicated on the belief that the government agency has decided on a maximum acceptable bid or payment level per unit of decommissioning service (a reserve price that is unknown to potential bidders). A fisher will tender a bid if the expected utility from participation in the auction exceeds the expected utility from not participating. It can be demonstrated that the optimal bidding strategy for a bidder will increase linearly with both the bidder's opportunity costs and their expectations about the reserve price. In this way, a bidder's bid will convey information about their opportunity costs and will reduce the information asymmetry, but not completely as the auction's cost revelation property is restricted by the fact that the bid also reflects bidder's beliefs about the reserve price of the agency. This creates room for fishers to bid above their true opportunity cost and thereby secure themselves an information rent arising from the information asymmetry.

This is demonstrated in the figure below. The optimal bid curve lies above the opportunity cost curve up to the point which represents the marginal bidder (beyond which participation in the auction is not optimal). If the agency purchases a given quantity (Q) of decommissioning units under an auction, the total expenditure will be the area under the bid curve from 0 to Q, equal to the area 0dcQ. This will include an information rent, abcd, that will accrue to the fishers due to the agency's lack of knowledge about the true opportunity costs of bidders.

Costs of Auctions and Fixed Rate Payments



The figure also shows a fixed rate payment designed to purchase Q units of decommissioning (assuming the agency has some knowledge of the bid price at that point). An auction is in principle more cost-effective than a fixed rate payment as the total rent accruing to fishers in this case is aPcb. If the objective of the decommissioning agency was to achieve the maximum buyout of decommissioning units for a given budget, auctions are again cost-effective. For a budget given by 0dcQ, an auction would result in Q units being purchased. On the other hand, a fixed rate auction will necessarily achieve a lower quantity of units (Q_1) as the bid curve will lie everywhere below the fixed rate payment. In the case of multiple round auctions, bidders would be able to learn about the implicit reservation price with each round and extract more rent (the bid curve will rotate upwards and become flatter, increasing the distance between the opportunity cost and bid curves).

Sources: Latacz-Lohmann and Schilizzi (2005); Schilizzi and Latacz-Lohmann (n.d.).

Table 1.2. Price Formation Mechanisms in Decommissioning Schemes

Pricing mechanism	Type	Typical format [a]	Advantages	Disadvantages	Examples
Auction	Reverse auction	Fishers submit sealed bids. Bids ranked and accepted in order from lowest to highest.	Overcomes information asymmetry	High transactions costs. Requires large number of potential bidders	Washington State Commercial Salmon Fishery buyout
	Multiple round reverse auction	Fishers submit sealed bids in first round. Bids ranked, evaluated and offered to lowest bidders. Revised bids sought after information on previous round made publicly available. Revised bids ranked, evaluated and offered to lowest bidders, and so on.	Overcomes information asymmetry. Improved information encourages bids closer to true valuations.	High transactions costs. Requires large number of potential bidders. Costs increase over successive rounds.	British Columbia Salmon Fishery buyout (Box I.6)
	Discriminative reverse auction	Fishers submit sealed bids. Agency weights bids according to specified criteria (*e.g.* volume or value of catch history of vessel) to obtain bid score or to evaluate bid. Bid scores ranked and accepted in order from lowest to highest.	Overcomes information asymmetry. Facilitates targeting of buyback.	High transactions costs. Lack of transparency in weighting system (if not publicly known). Requires large number of potential bidders.	United States Bering Sea/Aleutian Islands King and Tanner Crab Fishery (Chapter 2)

Table 1.2. Price Formation Mechanisms in Decommissioning Schemes (*cont.*)

Pricing mechanism	Type	Typical format [a]	Advantages	Disadvantages	Examples
	Second price reverse auction	Fishers submit sealed bids. Bids ranked and accepted from lowest to highest, but each successful bid paid the amount of the next highest bid.	Overcomes information asymmetry. Reveals bidder's valuations	High transactions costs. Requires large number of potential bidders.	..
	Strike price auction	Fishers submit sealed bids. Bids ranked in order from lowest to highest and accepted up until the desired amount of capacity is reached. All bids then paid the same rate (per unit) as the final accepted bid (the strike bid)	Encourages low bidding in order to be part of the accepted group of bidders	High transactions costs. Subject to collusion. Most expensive of auction systems. Windfall gains.	2001 Northern Ireland decommissioning scheme (Box I.8)
Fixed rate	Fixed rate	Fixed price paid per vessel or permit. Can be done on a first come, first served basis, or targeting particular vessels.	Low transactions costs Transparent	High information requirement for agency to set prices correctly. Potential for windfall gains	Mexico shrimp vessel decommissioning scheme (Box I.7)
	Weighted fixed rate	Fixed rate determined according to a formula combining one or more criteria (*e.g.* vessel tonnage or power, catch history, species targeted).	Low transactions costs	High information requirement for agency to set prices correctly. Potential for windfall gains.	French and many EU decommissioning schemes (Chapter 2)

Table 1.2. Price Formation Mechanisms in Decommissioning Schemes (*cont.*)

Pricing mechanism	Type	Typical format [a]	Advantages	Disadvantages	Examples
Negotiation	One-on-one negotiation	Negotiations take place directly between fisher and decommissioning agency	Feasible with low number of vessels or permits	Requires symmetrical knowledge. Results in revenue and efficiency losses	NGO buyout in US Pacific Groundfish fishery (Chapter 2)
Independent evaluation		Offer based on third party assessment of value of vessel or permit (e.g. insurance company or scrap dealer). Sometimes offer is a percentage of the assessed value.	Independent and transparent	High transactions costs. Does not reveal reserve prices. Potential for windfall gains.	Iceland buyout under DFF (Box 1.3)

a. There is a wide variation in the detailed design of these mechanisms, particularly in relation to auctions. The description in this table is intended to be illustrative, rather than comprehensive.

Three broad issues in the use of auctions in decommissioning schemes are particularly pertinent. First, there is the potential problem of insufficient bidding competition (Curtis and Squires, 2007). The smaller the group of potential bidders, the lower will be the level of bidding competition and the higher the likelihood of collusion and strategic behaviour. Such problems may arise in small fisheries, or when the fisheries agency overseeing the process invites tenders for different vessel types or species targeted, with only a small number of vessels in each category. It is exacerbated by the use of eligibility criteria, which further reduce the number of potential bidders. This may reduce the scope for targeting certain segments of the fleet.

Second, bidding systems involve the risk of learning on the part of the bidders. Auctions for decommissioning agreements are sometimes designed as sequential auctions where bids for vessels to exit the industry are invited over a sequence of years. For example, multiple round auctions were used in the British Columbia licence retirement scheme (Box 1.6). Such a system provides scope for fishermen to analyse the results of preceding bidding rounds and use this information to update their bids. In other cases, there may be a process of continuous or regular provision of decommissioning programmes. As these become anticipated by fishers, their bidding strategies are likely to be increasingly guided by what they think they can bid to be accepted rather than their true opportunity costs. The risk of this happening is quite high in 'networked' industries such as fishing, where information is spread quickly through the efficient communication networks of producer organisations or lobby groups. A review of the UK decommissioning auction system noted that fishers were becoming over-familiar with the system and that there was a significant amount of learning such that vessel owners found it increasingly easy to project the likelihood of being successful at increasingly higher rates (Nautilus, 1997).

Third, some types of auction systems can involve higher transaction costs for both fishers and government. To the extent that these are upfront fixed costs, they may deter fishers from participating in the scheme. If a discriminative auction system is used, for example, this will significantly increase the administrative costs for the government as much more time is required to evaluate and weight bids. It also opens up the process for challenges to the legitimacy of the weighting system or target groups that were chosen. This can tend to create a degree of uncertainty about the outcome of the bidding process and future in the industry.

Box 1.6. The Use of Auctions in the British Columbia Salmon Fishery

In 1996 and 1998-2000, two buybacks of licences took place in the British Columbia salmon fishery, following the relative failure of three previous buyback programmes between 1970 and 1993 to adequately control fishing effort and provide for a financially viable fishery. Under the Mifflin Plan, the 1996 buyback programme employed a reverse auction over two rounds to retire a total of 797 salmon licences representing 20% of the fleet, at a total cost of CAD 78.6 million. Area licensing was also introduced for the three different gear types used in the fishery (troll, gillnet and purse seine) in order to reduce congestion externalities in given regions. The 1998-2000 buyback programme was another attempt to rationalize the fishery and used a reverse auction over three rounds to remove licences. This resulted in a total of 1 409 licences being retired (43% of the fleet) at a cost of CAD 195 million.

The use of auctions in the process provided a number of insights into the way in which they they can have an impact on behaviour. First, fishers generally supported the use of the voluntary reverse auction system in 1996 as it allowed all eligible fishers to enter bids to exit the industry. However, the buybacks had a differential effect on different gear types. This unexpected outcome caused concern amongst fishers about the "corporatisation" of the fishery as purse seiners were predominantly owned by larger fishing companies and this may affect future allocations of fish between the three gears. As a result, more effort was made in the later rounds of the 1998-2000 buyback to focus on the retirement of seine licences.

Second, the multiple round nature of the buybacks increased administration costs, but had the benefit allowing the regulator running the auction to adjust payments to target particular groups of fishers by adjusting the criteria for what bids are accepted and allowing fishers to reformulate their bids. This reduced strategic behaviour in terms of the offers by fishers and allowed the bids to be closer to their true private valuations. This flexibility also allowed the regulator to retire a much greater portion of the seine fleet in the last buyback and at a lower cost than would have otherwise have been the case in a single round.

Third, the evolution of prices paid for licences between the buybacks and between the rounds within the buybacks is instructive. The average price increased with over the two rounds of the first programme, but then dropped during the first round of the second programme before rising again. This most likely reflects the learning process following each round within a programme, as well as the fact that the first programme did not effectively reduce effort and so lower bids were able to be accepted a few years later in the second programme.

Average Prices Paid per Licence in 1996 and 1998-2000 Buyback Programmes

Gear type	1996 Programme		1998-2000 Programme		
	Round 1	Round 2	Round 1	Round 2	Round 3
	CAD	CAD	CAD	CAD	CAD
Seine	405 118	443 475	420 152	432 115	435 578
Gillnet	73 719	84 702	77 880	80 830	84 231
Troll	70 881	82 136	77 532	82 150	85 872
Total licenses retired	396	401	99	645	665

Source: Grafton and Nelson (2005)

Fixed Rate Payments

Fixed-rate payments can be more administratively simple relative to auctions and can improve transparency. Compared with auctions, the fisher's decision collapses from a complex bidding strategy to a relatively straightforward take-it-or-leave-it decision. This reduces uncertainty and resulting transaction costs for both fishermen and the regulatory agency. However, fixed rate payments run a significantly greater risk of being inefficient due to problems arising if the price is set too high or too low.

Fixed rate payments are generally one of two types: payment of a flat rate per vessel or licence; or payment of a weighted fix rate per licence or vessel that is weighted according to specific criteria (such as vessel tonnage or power or target species). Both types of fixed rate payments are also often combined with government evaluation of the applications against specified criteria to help determine whether the bids achieve value for money or meet particular goals (a process sometimes referred to as comparative bidding or a "beauty contest" (Pratt and Valletti, 2001)). Such evaluations can be more or less transparent, depending on how well known and understood are the evaluation criteria by fishers and the extent to which subjective judgement replaces objective evaluation when selection criteria are vague or when arbitrary weights are applied to each criteria.

In order for fixed rate payments to be allocatively efficient, the information asymmetry between government and industry must not be too great and the objects of the buyout (vessel or licence) must be fairly homogeneous across fishers (Groves and Squires, 2007). This is because the performance of fixed-rate payments is independent of the availability of information on fishers' valuations of their vessel or licence. As a result, overcompensation of "inefficient" fishers is an accepted element of this mechanism. While some attempt can be made to reflect observed market values of vessels or licences, this will only rarely correspond to private valuations (the opportunity cost curve in Box 1.5). As a result, fixed rate payment schemes will be less allocatively efficient and cost-effective than auctions the more severe are the informational asymmetries, and the more heterogeneous the bidders (in terms of their opportunity costs).

The use of flat rate payments is relatively rare. However, it was used in the Mexico shrimp fishery where over 200 vessels were decommissioned in a trial scheme in 2005 (Box 1.7). In this case, the relative homogeneity of the shrimp fleet made it easier to determine a fixed amount per vessel. Buyback programmes in the Italian clam fishery in 1996 and 2000 provided each voluntarily withdrawn vessel with a lump sum payment of EUR 130 000. Each crew member who left the clam dredging industry received a payment of EUR 6 500 (Spagnolo, 2007).

Box 1.7. Mexico Shrimp Vessel Decommissioning Scheme

Under the *Alianza Contigo* programme, a decommissioning scheme was introduced to the shrimp fishery in both the Pacific and the Gulf of Mexico in response to a persistent excess of vessels, declining resources and poor profitability. The government initiated vessel retirement at the end of 2004 and the first vessels were retired in 2005. The scheme operated on a voluntary basis and no targeted decommissioning was undertaken. A fixed payment of MXN 100 000 was given for a vessel and its attached permit. The eligibility requirements for the scheme were that the vessel had to have a valid permit, a catch landing document for the immediate prior season (that is, it had to be an active vessel), and no outstanding fines. Staff from the Mexican fishing agency, CONAPESCA, evaluated the bids to ensure that sufficient capacity was being retired from both Mexican coasts. In 2005, 222 vessels were retired under the scheme, representing around 10% of the total shrimp fleet. This was a trial scheme and dependant on future funding to continue. There are plans to extend the decommissioning scheme within the shrimp fishery or to other fisheries.

Source: OECD (2006).

The use of weighted fixed rate systems tends to be more common in Europe. Individual EU countries add a further weighting to the criteria under the Common Fishery Policy in order to adapt the buyback applications to meet their particular objectives in terms of fleet or fishery or target species. In France, for example, payments under the 2006 scheme were weighted according to the fish species targeted by the vessels (see case study in Chapter 2). In the 2006 scheme, 100% of the maximum amount of aid is available to French trawlers in the Mediterranean Sea, sole fishers in the Gulf of Biscay, and vessels targeting mostly anchovy, mackerel, horse mackerel and some deep-sea species. In contrast, 80% of the maximum amount of aid is available to vessels targeting nephrops, megrim and hake in some specific ICES area, while the rest of the fleet is eligible to 50% of the maximum of the financial aid.

Decommissioning schemes in Denmark have used weighted fixed rates per vessel, but a process of comparative bidding was also used to select which vessels were to be awarded decommissioning grants. This was based on a points system in which applications for decommissioning were weighted according to pre-defined categories such as age of the vessel, species composition in the catch, age of the owner and fishing days at sea (Nautilus, 1997). The relative weightings for each category were varied from year to year depending on the prevailing fisheries management priorities.

Other Price Mechanisms

Other pricing mechanisms that have been used in OECD countries include one-to-one negotiations between fishers and regulators and payments based on independent evaluations. Both these mechanisms may be useful when there are a very small number of potential applicants for decommissioning, or when there are specific targets in a small fishery. Independent evaluations may also be useful when there is a perceived need for a higher degree of transparency in the price setting process. In general, though, both these forms of price formation do not solve the information asymmetry problem. Indeed, in a negotiation, the regulator is likely to be at a distinct disadvantage. The mechanisms rate very poorly in terms of cost-effectiveness as they will bear little relationship to the opportunity cost or willingness to receive compensation of fishers. Governments may be in a relatively weak bargaining position as they lack information on fishers' valuations and willingness to be compensated to exit the fishery.

Summary

In summary, there is clearly a tradeoff between allocative efficiency and cost-effectiveness (getting value for money) on the one hand, and the administrative and transactions costs of the various types of price mechanisms on the other. Auctions have the highest benefit as a price mechanism when there is a strong information asymmetry between fishers and the government, there is a large pool of potential bidders, and where fishers are heterogeneous in their private valuations. Fixed-rate payments tend to be much more administratively simple than auctions, thereby reducing transactions costs and improving transparency. However, they can result in windfall gains for many recipients and will be less allocatively efficient and cost-effective than auctions. These factors need to be weighed in context of the objectives of the scheme, the budget constraint, political climate and stakeholder attitudes in individual countries and fisheries in deciding which mechanism is most appropriate.

Conditions on Further Use of the Vessel or Licence

Decommissioning schemes generally place conditions on the use to which the purchased vessel, licence or gear can be put following the completion of the scheme. If vessels which are not scrapped or forced to cease fishing activity, they may be used in another fishery which may simply transfer overcapacity problems from one fishery to another while providing a windfall gain to the vessel owners. In OECD countries, vessel decommissioning schemes generally require that vessels be scrapped, put to

non-fishing use, or sold to another country. In practice, most vessels tend to be scrapped as there is a limited demand and opportunities for conversion to non-fishing uses; this particular market is relatively small. In addition, the export of decommissioned vessels from OECD countries has declined significantly in recent years as countries have become increasingly aware of the potential for such vessels to end up in IUU fishing activities. In the EU, for example, export of vessels to a third country is no longer regarded as a permanent cessation of activity eligible for public support.

Up until its modification on 31 December 2002, the EU regulations governing decommissioning (EC 2792/99) allowed for vessels to be sold to countries outside the EU, provided that they never return to EU waters. It has been noted that the specific rules governing this aspect of the EU regulation are complex, and that the control mechanisms to ensure vessels do not return to EU waters would not be cost effective (DEFRA, 2006).

The purchase of licences generally means that licences are forfeited and are no longer available for use (by anyone). Situations where vessels are decommissioned but where owners retain a licence can be problematic as there remains the possibility that the owners can reinvest in the fishery using their licence. This has, in fact, been the case in a number of fisheries [for example, Washington State salmon fishery (Muse, 1999)]. Retiring both the vessel and the permit/licence is likely to be the most effective strategy.

Role of Expectations and Moral Hazard

The role of expectations in undermining the effectiveness of decommissioning schemes has also been the subject of detailed analysis (Munro and Sumaila, 2001; Clark *et al*., 2005). Fishers, acting rationally, will come to anticipate government policy in relation to the provision of adjustment assistance and adjust their behaviour accordingly. If the government has a past record of providing decommissioning payments when stocks are declining or there is excess effort or capacity, then the risk faced by fishers in their investment decisions is significantly reduced. As a result, under any type of management regime (even individual transferable quotas), it can be demonstrated that the expectation of future government adjustment assistance will reduce the expected costs of investment and result in a higher than optimal level of investment in vessels, with negative impacts on stocks.

Not only do decommissioning schemes alter fishers' expectations with respect to investment decisions, they also result in fishers engaging in strategic behaviour to alter the outcomes of the bidding process in their favour. That fishers, as rational economic agents, learn from their

experiences is of no surprise. This was noted above in the use of auctions in the UK (Nautilus, 1997; Poseidon, 2005).

Strategic behaviour was also an issue in a voluntary buyback program in Chinese Taipei. Following a first round of buybacks over a period from 1991-95, a second round was instituted in 2000-2005. When the second round was initiated in 2000, only five vessels accepted the price offered by the government of TWD 18 000 / GRT (Sun, 2006). The government raised the buyback price to TWD 50 000/GRT for vessels smaller than 5 GRT, while the price for vessels over 100 GRT remained the same. There was still little response from fishers, primarily because they were holding out in the expectation of even higher payment schemes being introduced in the future. This prompted the government to change strategy by front-loading prices, particularly for smaller vessels, so that there was a penalty in terms of lower prices for delaying the decision to sell.

A broader concern relating to expectations arises from the potential for effects from compensation for structural reform in one sector to spillover into another sector. This occurs in the fishing sector as fishers observe government policy actions in other fisheries and in other sectors, and adjust their behaviour and expectations accordingly. For example, the provision of decommissioning assistance in one fishery, or adjustment assistance in another sector altogether, may generate demands for similar assistance to be provided in other situations irrespective of the underlying rationales for such assistance in any of the cases.

This was illustrated in the case of the Canadian response to the 2003 closure of three Atlantic cod stocks. In contrast to previous closures of the same stocks in 1992/93, the 2003 closure did not include a Licence Retirement Program (LRP, or a licence buyback program) (Ruseski, 2006). The expectations created by the government's actions in providing adjustment assistance in other fisheries (as well as the cod fishery) led to fishers demanding another LRP. However, this was not forthcoming due to the fact that the 2003 closure was long term, with no fixed re-opening date or criteria for re-opening, and an LRP was not considered an appropriate policy tool for achieving the necessary social adjustment: LRPs are designed to achieve increased economic efficiency or improved resource conservation. Instead, transition income assistance was provided to individuals affected by the closure to reduce the social cost, and economic development funding was provided to create non-fishing employment opportunities for displaced fishers and plant workers.

A number of moral hazard issues also arise in decommissioning schemes.[6] The purchased vessels are frequently older and less productive than the remaining vessels and the decommissioning scheme will accelerate the departure of these marginal vessels that would have departed the fishery in any case. The scheme facilitates and accelerates their exit, generally at a higher price than would have otherwise been achieved. This may encourage fishers from delaying their natural retirement or exit plans in order to benefit from anticipated decommissioning funds.

Ex Post Evaluation

Ex post evaluation of the effectiveness and impact of decommissioning schemes will help to understand whether the expenditures achieved their objectives. Such evaluations are consistent with best practice principles of sound governance. They would also provide useful insights and lessons for the future design and implementation of decommissioning schemes. *Ex post* evaluations of decommissioning schemes appear to be conducted on an *ad hoc* basis with no OECD country having a regular review process in place.

Four broad types of *ex post* evaluations can be identified. First, national governments occasionally undertake in-depth evaluations of decommissioning schemes. These are typically initiated by fisheries departments in response to concerns over the efficacy of current or past programmes and are intended to help inform future policy choices. Evaluations also can be requested by Treasury and Finance Departments as they have a strong interest in ensuring that public moneys are effectively spent. In 1997, the then UK Ministry of Agriculture, Food and Fisheries engaged a consultant company, Nautilus Consultants, to provide a detailed review of the UK vessel decommissioning schemes that operated from 1993 to 1996 (Nautilus, 1997). The report contained a number of recommendations, some of which were taken up in later decommissioning schemes or fisheries management changes. Also in the UK, a mid-term evaluation was undertaken of the UK's use of the 2000-06 FIFG in order to analyse progress on the programme, provide a course of information for the *ex post* evaluation of the Financial Instrument for Fisheries Guidance (FIFG) (to be completed by 2009, and to prepare for the 2007-13 round of funding under the European Fisheries Fund (EFF) (Poseidon, 2005). This mid-term evaluation included a report on the uptake and impact of decommissioning schemes in the UK from 2000-03. Interestingly, one of the recommendations of the report was that there should be a review of the costs and benefits of vessel decommissioning schemes.

Second, national auditors have sometimes focused on specific decommissioning schemes and have conducted in-depth reviews of the effectiveness of the schemes. These usually occur in response to some problems being observed by the auditor with the effectiveness of public spending, or because the government of the day has referred the schemes to the auditor for review. A recent example is the report by the Northern Ireland Audit Office in October 2006 of the 2001 and 2003 decommissioning schemes in Northern Ireland (Box 1.8). One of the points made by the Audit Office was that the Northern Ireland Department of Agriculture and Rural Development should have completed its evaluation of the 2001 scheme before introducing the successor scheme.

In the United States, the General Accounting Office (the investigative arm of the US Congress) examined the outcomes of three buyout schemes (the New England groundfish, Bering Sea Pollock and Washington State salmon fisheries) (GAO, 2000). The GAO recommended that future buyback schemes be designed to; restrict buyback participants from entering a fishery that has excess capacity; restrict the use of unused fishing permits in a buyback fishery with excess capacity; identify mechanisms to minimise incentives to increase capacity in a buyback fishery; and develop and evaluate performance measures for the results of future buyback programmes.

Third, evaluations can be undertaken by supranational bodies (such as the EC) or inter-governmental organisations (such as the OECD). The European Commission regularly reviews expenditures under the FIFG on a country basis, although these tend to be reports on the uptake of funding opportunities under the various elements of the FIFG rather than on the effectiveness of particular programmes. Cross-country reviews, such as this report by the OECD, provide valuable information on lessons learned from the experiences of countries and can assist in identifying the advantages and disadvantages of alternative approaches. They do not, however, necessarily substitute for detailed evaluations of programmes at the country level.

Finally, the academic community undertakes research on the economic costs and benefits of decommissioning schemes (see, for example, Curtis and Squires, 2007). A glance through the bibliography of this report indicates that academia has been a significant contributor to the body of information evaluating decommissioning schemes. In some cases, this research is supported by governments through research grants. The key advantages of evaluations carried out by academic community are that they are independent and are likely to incorporate leading edge economic analysis and tools. The biggest challenge is to ensure that their findings get incorporated into the policy development process in governments.

Box 1.8. Auditing Northern Ireland's Decommissioning Schemes

Three decommissioning schemes have been employed in Northern Ireland: a UK wide scheme that was run from 1994-98 by the UK Ministry for Agriculture, Food and Fisheries; and two schemes in 2001 and 2003 which were run by the Northern Ireland Department of Agriculture and Rural Development. In October 2006, the Comptroller and Auditor General of Northern Ireland tabled a report examining the structure, implementation and impact of vessel modernisation and vessel decommissioning schemes operating in the Northern Ireland's fishing sector. The report had been requested by the House of Commons. One of the factors that motivated the request was the number of legal challenges to the conduct and outcome of the 2001 decommissioning scheme.

The audit report focused on the 2001 and 2003 decommissioning schemes and raised a number of concerns about the conduct and outcomes of the schemes, including:

- Errors in the application of the strike price auction mechanism in the 2001 scheme which resulted in otherwise eligible bids being excluded from the final set of accepted bids and ineligible bids being accepted. This increased the cost of the scheme and reduced the amount of capacity retired below the potential level. It also lead to a series of expensive legal challenges that eventually found against the Department
- Concerns that the strike price mechanism does not provide value for money as there is a high likelihood of collusive behaviour amongst fishers.
- A finding that "[i]n keeping with best practice, the Department should have completed its evaluation of the 2001 Scheme before introducing the successor scheme" (p. 28).
- A recommendation that the Department considers using "reduction in fishing effort" as one its performance measures in assessing the impact of decommissioning.
- An overall finding that the schemes "generally failed – sometimes quite significantly – to achieve its performance targets, in terms of the level of decommissioning secured and the relative cost" (p, 34).

While the report was highly critical, it highlights the important role that independent evaluation plays in ensuring that programmes provide a net benefit and meet objectives, while providing recommendations for improving the performance of similar schemes in the future.

Source: Northern Ireland Audit Office (2006).

NOTES

1. See Campbell (1989), Holland *et al.* (1999), Banks (1999), Cunningham and Greboval (2001), Munro and Sumaila (2001), Clark *et al.* (2005), Squires *et al.* (2006), OECD (2006a), Hannesson (2007). The major recent addition to the literature was a collection of analysis and case studies that had been presented at an international meeting in the United States in 2004 (Curtis and Squires 2007).

2. Note that the GAO report only reviewed the vessel buyback. The permit buyback was not reviewed by the GAO but did take into account some of the GAO's suggestions for other buyback in its design.

3. A complicating factor here is the fact that the vessel buyback was one of several programs implemented at the time to provide financial assistance to the groundfish fleet. The fact that participants sold their vessel then purchased another means that the scheme provided them with a better financial position. This wealth transfer from the government to the private sector may be regarded as a cost in facilitating the transition to a more sustainable fishery, provided that overall capacity was reduced as a result. However, it does beg the question of why the taxpayers should support such a wealth transfer.

4. There is a well developed literature on the design of auctions under different conditions; see Klemperer (2003) for a survey of the literature.

5. In the United States, for example, the Conservation Reserve Program uses an auction mechanism to award land management contracts to farmers through a competitive bidding process. The land management contracts specify conservation practices that must be adopted by successful bidders in return for payment. Such a system has also been trialled in Australia under the BushTender program in which landholders bid for payments for undertaking conservation activities on their farms (such as maintaining native vegetation and riparian corridors, etc.) (Stoneham, 2000; Chan *et al.*, 2003).

6. Moral hazard refers to the possibility that the redistribution of risk (such as in the case of insurance which transfers risk from the insured to the insurer) changes people's behaviour.

List of Acronyms

AFMA	Australian Fisheries Management Authority
BSAI	Bering Sea/Aleutian Islands Crab Fisheries (Alaska, US)
BSCZSF	Bass Strait Central Zone Scallop Fishery (Australia)
CFP	Common Fisheries Policy (EU)
DFF	Development Fund of the Fisheries (Iceland)
EC	European Commission
ED	Environmental Defense (US)
EEZ	Exclusive Economic Zone
EFF	European Fisheries Fund
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FIFG	Financial Instrument for Fisheries Guidance (EU)
FMP	Fishery Management Plan (US)
GAO	US General Accounting Office
GRT	Gross Registered Tonnage
GT	Gross Tonnage
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICES	International Council for the Exploration of the Sea
IFQ	Individual Fishing Quota (US)
IPQ	Individual Processor Quota (US)
ITQ	Individual Transferable Quota
IUU	Illegal, Unreported and Unregulated Fishing

Kw	Kilowatt
LLP	Licence Limitation Program (US)
LRP	Licence Retirement Program (Canada)
MAGP	Multi-Annual Guidance Programme (EU)
MOMAF	Ministry of Maritime Affairs and Fisheries (Korea)
MPA	Marine Protected Area
MSY	Maximum Sustainable Yield
NASF	North Atlantic Salmon Fund
NGO	Non-Governmental Organisation
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration (US)
NPF	Northern Prawn Fishery (Australia)
NPFMC	North Pacific Fishery Management Council (US)
PFMC	Pacific Fishery Management Council (US)
PME	Permis de mise en exploitation (France)
RFMO	Regional Fisheries Management Organisation
SFR	Statutory Fishing Right (Australia)
TNC	The Nature Conservancy
TAC	Total Allowable Catch
VMQ	Vessel Moratorium Qualification (US)

Table of contents

Tables

Figures

Boxes