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Common Fisheries Policy reform A new fleet capacity policy

Erik Lindebo, Hans Frost and Jørgen Løkkegaard

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Acronyms

CFP	Common Fisheries Policy
DEA	Data Envelopment Analysis
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FIFG	Financial Instrument for Fisheries Guidance
GCF	Gross Cash Flow
GT/GRT	Gross Tonnage/Gross Registered Tonnage
KW	Kilowatts
MAGP	Multi-Annual Guidance Programme
MAMP	Multi-Annual Management Plan
MEY	Maximum Economic Yield
MSY	Maximum Sustainable Yield
STECF	Scientific, Technical and Economic Committee for Fisheries
TAC	Total Allowable Catch

Foreword

The issue of fishing capacity has been brought to the forefront of discussions surrounding the reform of the Common Fisheries Policy of the European Union. What has become increasingly apparent is the downward trend of many fisheries due to management fallacies and a clear unbalance between fishing fleets and available fisheries resources. This has led to biological overfishing of many commercial fish stocks and an under-utilisation of fishing capacity of Member State fleets.

The European Commission, in their attempt to reverse this trend, has put forward a range of management proposals under the Common Fisheries Policy reform initiative of 2002. Among the proposals include the use of multi-annual management, the reduction of fishing mortality and the strengthening of capacity controls. This report concentrates on the practical objectives of the proposed management system under the Common Fisheries Policy reform, and the particular instruments proposed for attaining those objectives.

This report specifically aims to establish the linkages between management proposals and the new capacity policy, and to further consider how this capacity policy relates to earlier capacity policies under the multi-annual guidance programme. The report also discusses the global perspective of capacity and overcapacity in fisheries. In this respect the report examines how capacity analysis approaches recommended by, among others, the Food and Agriculture Organisation of the United Nations may assist the European Commission in evaluating reductions of fishing mortality and fishing capacity in a peer review framework. Finally, the report outlines an economic approach to capacity analysis that, once economic information is consistently available for all Member States, could form the basis of capacity analysis from an economic perspective.

Danish Research Institute of Food Economics (FOI)
October 2002

Ole P. Kristensen
Director, FOI

Summary

CHAPTER 1

This chapter outlines the major cornerstones of the CFP reform proposals that attempt to deal with management difficulties in EU fisheries. These include the continued dependence of biological fish stock assessment as the basis for management measures, the lacking opportunity to include economic objectives and instruments, the absence of specific capacity objectives, the consequences of failure to comply with capacity adjustment requirements, and the role of the peer review process.

CHAPTER 2

The concepts of fishing capacity and overcapacity are presented, where definitions and approaches to measurement are considered from a global perspective. The approach of FAO and the International Plan of Action for the Management of Fishing Capacity is seen as the most appropriate in this context. The potential impacts of technological progress and fishery dynamics on fishing capacity measurements are also introduced. Further, the assessment of overcapacity is based on specific optimal or target capacity levels applied by fishery managers, which highly depend on multiple biological, economic and social criteria of fishery management.

CHAPTER 3

The EU fleet policy under MAGP is comprehensively discussed, outlining the approach to capacity measurement, the use of vessel decommissioning and fishing activity restrictions, and the role of public aid in capacity adjustment. The development of fleet capacity on a Member State level is given with respect to MAGP objectives, showing that the total EU fleet has seen reductions of around 20% in terms of vessel tonnage and engine power during the last decade. At the end of 2001, only Denmark, Spain, Portugal and Finland had met their capacity targets in all fleet segments. A critique of the fleet policy involves the modest reductions and continued fish stock overexploitation, explicitly linked to the lack of measurement transparency, complex fleet segmentation, amendment of objectives, and modest targets for cutbacks in fishing mortality.

CHAPTER 4

The CFP reform proposals are examined. The reform mainly concerns the adoption of multi-annual management plans (MAMPs) and a continuation of technical measures, incorporating objectives of fishing mortality reduction and fixing catch and effort limits to ensure the long-term sustainability of fish stocks. MAMPs will set specific biological targets against which the recovery of stocks can be measured (e.g. population size, long-term yields). The direct consequences of reductions in fishing opportunities are dealt with under a new policy approach to fleet capacity, which explicitly imposes restrictions on the use of public aid for fleet renewal and modernisation and establishes new reference levels for Member State fleet capacity based on MAGP objectives. An emergency measure for vessel scrapping is examined, which intends to address the more immediate difficulties experienced by vessel owners who are severely impacted by reductions in fishing opportunities. This aims to encourage rapid fleet adjustment in areas where fish stocks are outside safe biological limits during the 2003-06 period.

CHAPTER 5

This chapter links two feasible approaches to capacity analysis with the proposal to introduce a peer review process for monitoring the progress in fishing mortality and fishing capacity reductions. Following the recommendations of FAO, the use of Data Envelopment Analysis is outlined, an approach that builds on traditional efficiency analysis and relatively modest data requirements. The approach helps to assess the potential fishing capacity, or potential production output, for given level of inputs (e.g. vessel tonnage, days at sea, etc.) with constant fish stocks. The difference between potential output of 'best practice' vessels and a vessel's current observable output serves as an indicator of the level of overcapacity. A simple and robust economic approach to capacity analysis is also presented. This builds on the use of economic indicators sourced from the Annual Economic Report for European fisheries, which can be applied to define Break Even revenue estimations. These estimations help to identify capacity levels in a bio-economic framework that relate to economic sustainability and overcapacity respectively. Economic sustainability relates to the situation where only invested capital and labour are remunerated, while overcapacity also takes account of the remuneration of fish stocks. The method implies that a fleet segment can be economically sustainable even though there is overcapacity. In this respect the method highlights the difference between the objectives of fishers and those of society.

1. Fishery management and CFP reform

Fishery management authorities around the globe have over many decades attempted to regulate the harvest levels from the seas and oceans, whilst sustaining the existences of fishers and dependant coastal communities, as well as upholding the viability of an important food source. However, problems with fishery management have been apparent in many forms, none more evident than the continued over-harvesting of fish stocks by an increasingly overcapitalised fishing fleet. The existence of excessive fishing capacity is largely responsible for the degradation of fishery resources, for the dissipation of food production potential and for significant economic waste (Cunningham and Greboval 2001).

Many European Union (EU) fisheries have not been exempt from such management difficulties. In fact, the multi-species nature of these fisheries, the heterogeneity of national fishing fleets and interests, and the numerous fallacies of the Common Fisheries Policy (CFP), have only contributed to exacerbate the problem. In addressing the ineffectiveness of the CFP, the European Association of Fisheries Economists (EAFE) highlights the lack of consideration given to an economic approach in policy-making. They explicitly state that:

“Fishing is an economic activity which exploits a self-renewing common property resource, fish stocks. The absence of effective stewardship permits a race to fish which is free to the user but which nevertheless has an economic value. This separation between the private cost and economic cost causes market failure. It creates an externality – a spillover effect – which manifests itself as an incentive to overcapacity and overexploitation” (EAFE 2001, page 1).

The economic performance of fisheries has been an issue in fishery management as most commercial fisheries have experienced dramatic declines in fish stocks, and thus also in the economic health of fishers, industries, and coastal communities. This has been highlighted by the magnitude of subsidies offered to the industry in recent years and has received global attention as a result. Many of these subsidies work in collaboration with the lack of resource ownership to encourage excessive effort, overinvestment in fishing capital and overexploitation of the fish stocks. From an economic perspective, excessive capital investments in the fishing industry represents a wasted economic rent, or an opportunity cost of invested capital, that could and should be utilised in a more efficient manner elsewhere in society.

It is the failure of incorporating an economic approach that has at least partly been responsible for the continued problems of fisheries policy. The theory of fisheries economics indicates that fisheries can be regulated efficiently if market forces are allowed to dictate the evolution of fishing fleets. This creates an environment that removes incentives for competitive build-up of excessive capacity and fishing effort, an otherwise rational response by fishers to profits existing in the fishery. A management strategy that is based on output constraints and the internalisation of externality problems, through the use of for example landing taxation or individual property rights, would lead to divesting of capital in the fishery and a gradual optimisation of fleet capacity. Prime examples of where property rights have been successfully introduced include New Zealand, Iceland, and a handful of fisheries in Canada and the United States. However, Cunningham and Greboval (2001) recognise that the range of capacity management methods is limited and further constrained by socio-political and technical considerations. This is none more evident than in EU fisheries.

The CFP reform proposal involves a management system that is based on biological assessment of fish stocks. A consequence of this is that the determination of objectives and instruments are based on physical measures, such as stock size, fishing mortality, fishing effort, fleet tonnage and engine power. The reform proposal also includes the long-term ambition of incorporating economic considerations into the management system. The current situation, however, where there is a considerable unbalance balance between fleet capacity and fishing opportunities, does not support an economic approach to EU fishery management.

On this basis, there does not appear to be an option to include economic objectives and instruments, specifically regarding fleet capacity policy in relation to the CFP reform. Further, current data availability does not support an economic management approach, as the collection of economic data for fisheries will first become obligatory in 2004. It can therefore be expected that an economic approach to EU fishery management is first likely to be considered in 2006. However, in the overall structure of the CFP reform proposal, fleet policy and structural policy are grouped collectively. Hence, this indirectly serves as an economic approach to fleet management, as the use of public aid for capacity adjustment is of essential importance. This is explicitly related to the withdrawal of aid for capacity renewal and the enhancement of aid for capacity reduction, for example, using decommissioning in cases where impacts of fishing effort reductions are severe. From an economic perspective, this adapted framework is of fundamental importance in relation to the adjustment of fleet capacity.

The new management system does not define a set of specific capacity objectives. The adjustment of capacity will occur indirectly via limitations on fishing effort defined under multi-annual management plans. The main instrument to physically control fleet capacity will be established via a reference level for the capacity of the individual Member State, based on the objectives of the current multi-annual guidance programme (MAGP). However, the lack of transparency of the MAGP will create some uncertainty with regard to the establishment of these reference levels, since the foundations of fleet data of Member States is ambiguous. Hence, with regard to strengthening the effectiveness of the physical control, it will be essential to define the degree of the reference levels of Member States. The simple framework is nonetheless expected to be more practical than the MAGP.

Regulation of fleet entry and exit will be established in relation to the reference levels of the fleet. The proposal suggests an entry/exit ratio of 1. In further deliberations it may be proposed that the entry/exit regulation is strengthened. For example, a 0.5 ratio could mean that only 50% of the removed capacity can be reintroduced. The replacement of existing capacity with new capacity will likely result in a rise in efficiency and is hence worthy of further attention.

A strengthening of the reform proposal would involve the defining of guidelines for the reduction in fishing opportunities of Member States, seen in the context of failure to comply with fleet adjustment requirements (reference levels, entry/exit ratio and reporting requirements). This could involve a simple percentage reduction in fishing opportunities, defined in terms of the extent of failure to comply with capacity adjustment requirements.

A 'peer review' process is proposed under the CFP reform to support the monitoring of Member State obligations to comply with fishing mortality reductions during 2003-06. This report considers two feasible options for capacity analysis that should assist to strengthen this review process, namely Data Envelopment Analysis and Break Even revenue estimations.

2. Capacity and overcapacity

Conflicting definitions and measures of fishing capacity often prevail as a result of economic, biological and technical impartiality. These definitions and measures have also often been adopted to agree with objectives of fisheries managers. In order to assist a global recognition of the fishing capacity issue, the Food and Agriculture Organisation of the United Nations (FAO) initiated an extensive consultation programme in 1998 in order to discuss the many conflicting definitions of fishing capacity and the possible means of measuring and managing fishing capacity.

Capacity, or ability to catch fish, has tended to be more often than not expressed in relatively simple and easily monitored technological (input) terms. These could include number of vessels, physical characteristics of vessels (type, size, engine power, electronic equipment, etc.), gear and fishing methods used, the time available for fishing, as well as a major role for human skill and experience. The sum of physical equipment and human characteristics is called the “fishing (or harvesting) capacity”. However, capacity has also been defined in terms of catch (output) or in economic terms (e.g. capital costs). Defining capacity in economic terms has been less widely used due to the relatively large demand for data collection.

In 1999, the FAO agreed on an International Plan of Action for the Management of Fishing Capacity. The Plan calls for all member states to achieve efficient, equitable and transparent management of fishing capacity by 2005, and to provide estimates of capacity of their fishing fleets by 2001. In this regard it has been concluded that the capacity definition proposed by Johansen (1968), with slight modification, can be shown to provide a suitable measure of capacity. Guidelines laid down by the FAO Technical Working Group on the Management of Fishing Capacity (FAO 1998a, p.10), hence propose that capacity should be viewed as a physical (technical) output, where:

“Fishing capacity is the maximum amount of fish over a period of time (year, season) that can be produced by a fishing fleet if fully utilised, given the biomass and age structure of the fish stock and the present state of the technology”.

The optimal level of capacity is often perceived to be a capacity target level of fishery management. The difference between the target capacity and the current potential fishing capacity of a given fishing fleet would therefore indicate the level of overcapacity that exists. Such an estimate would then allow managers and administrators to

set a series of meaningful fleet adjustment targets in order to rebalance fleet capacity with resource availability. Porter (1998) discusses that biologically, overcapacity can be thought of as a level of capacity that, when fully utilised, produces a level of fishing mortality that threatens to reduce the fish stock biomass below the maximum sustainable yield (MSY). From an economic perspective, overcapacity can be defined as a fully utilised fishing capacity that reduces yield below the maximum economic yield (MEY).

FAO recommend that MSY be used as a global reference point in addition to reference points that may otherwise be chosen at the national or international levels (Cunningham and Greboval 2001). They go on to stress that overcapacity assessed with regard to MSY indicates that fleet size is in excess of the fleet size required to harvest MSY. If the fleet operates at near full capacity then biological overfishing is likely to result. However, if management measures can be successfully introduced to prevent overfishing, leading to low capacity utilisation, then this may not be the case. Thus, overfishing implies overcapacity but overcapacity does not necessarily imply overfishing.

Only a limited amount of empirical work has been undertaken to assess the extent of global overcapacity in fisheries. Garcia and Newton (1997) assess overcapacity to be about 30% with respect to MSY of the major stocks representing 70% of global landings in 1989. However, since management often favours a precautionary approach (below MSY), an overcapacity of 30% with respect to biological criteria should be regarded as a minimum. With respect to MEY, they estimate overcapacity to be in the vicinity of 25-53%. Based on this work and preliminary estimates of fleet/stock evolution during the 1990s, FAO calls for a “*drastic reduction of at least 30% of world fishing capacity*” (FAO 1998b, p.1). Mace (1997) further states that perhaps as much as a 50% reduction in global fishing capacity is required for capacity levels to become commensurate with sustainable resource productivity.

As discussed, the extent of overcapacity can be estimated by accounting for the difference between the current potential capacity of the fleet and that of a defined optimal capacity. However, the estimation of an optimal level will be fishery specific and the contrasting perceptions of biologists, economists, fisheries managers and politicians will affect the optimal capacity level that is applied. For example, an optimal level may be determined in accordance with management objectives that maximise firm profits, supply to markets or regional employment, or those that promote fish stock growth. Holland and Sutinen (1998) state that regardless of which level is cho-

sen, and on what basis, the levels and the mix of variable inputs are expected to change as biological, economic and regulatory conditions change in a dynamic fishery. Hence, despite an unaltered fleet size, the potential and optimal capacity levels of the fleet may alter considerably over time.

The impact of technical development, through new constructions and modernisation of vessel and gear, would also need to be incorporated if an accurate portrayal of the level of overcapacity is to be given. Technological progress clearly enhances the catching efficiency of fishing vessels. A modest estimate of an effective efficiency increase of 2% per annum in capacity has been suggested in the research literature. However, a recent study (Banks *et al.* 2000) concludes that a standard correction factor cannot be applied to all vessels, as the results from various national case studies differ substantially. A considerable factor that needs addressing is the management system that is in place, where for example effort-based regulation in the Mediterranean appears to have enhanced technological progress and input substitution.

3. EU fleet policy under MAGP

3.1. Capacity measurement

Fishing capacity in the EU has historically been measured in terms of two vessel characteristics, namely gross tonnage of the vessel and engine power – assuming full utilisation of fishing vessels. These two characteristics have been measured, monitored and registered as indicators of fishing capacity in the majority of Member States, as specified by Council Regulation (EEC) No 2930/86, and are regarded as the most pertinent parameters for expressing fishing capacity of the fleets using active gears¹.

The number of kilowatts (total of the maximum continuous power) of a vessel engine is a relatively straightforward measure, although differing measurement procedures in Member States have caused some complications. Problems have included de-rating practices, the exclusion of auxiliary engines, as well as differing measurements in terms of official kilowatt (kW) and maximum effect kW.

The gross tonnage measure of the vessel has been less straightforward. Historically, tonnage has been measured as Gross Registered Tonnage (GRT), as defined by the Oslo Convention 1947, or as a particular national unit of tonnage. The EU has been progressively moving to a common standard for measuring tonnage, a volumetric measure known as Gross Tonnage (GT), as defined by the International Convention on Tonnage Measurement of Ships 1969. However, the tonnage registration of many Member State fleets still includes a mixture of measurements as a result of the slow and complicated conversion procedure, and so has limited the transparency of results of capacity reduction initiatives. A range of standardisation procedures has been adopted for various vessel length categories and re-measurement is expected to be complete by the end of 2003.

In addition to this fishing capacity terminology, fishing capacity has been used in the EU to define a further term known as fishing effort, an aggregate measure of tonnage, engine power and fishing activity (days at sea). The two terms have since 1992 worked in parallel to achieve desired fleet reductions.

¹ Council Decision 97/413/EC

The lack of reliable and homogeneous capacity indicators should be seen as one of the main stumbling blocks in past and present capacity reduction initiatives. Defining fishing capacity in terms of two inputs should be scrutinised. Fishing capacity, or the ability of a vessel to catch fish, is a highly complex concept and depends on multiple inputs. Although tonnage and engine power will significantly impact a vessel's catching ability, and monitoring of these inputs may provide a simple indicator of capacity, it should be acknowledged that other inputs that are not monitored might allow an increase in effective capacity (through input substitution).

The Community register of fishing vessels was set up in 1989 to allow the European Commission to implement and monitor the CFP. The register is a record of the physical characteristics of all the commercial marine fishing vessels in the EU fleet. In monthly declarations, each Member State must notify the Commission of any changes to the fleet, such as new constructions, withdrawals, modifications or changes in activity. At the end of 2001 the register contained just over 92,000 fishing vessels (cf. Table 3.1).

Table 3.1. Community register of fishing vessels – Total EU fleet 1991-2001

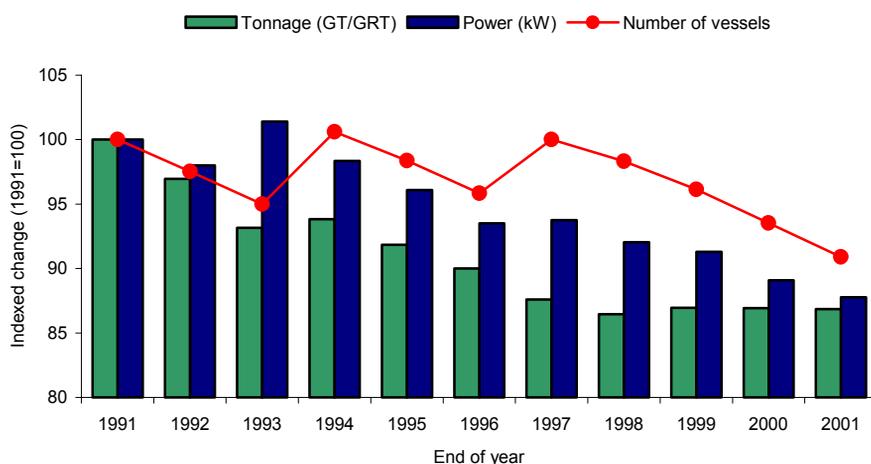
End of year	Tonnage (GT/GRT)	Power (kW)	Number of vessels
1991	2,295,443	8,471,314	101,733
1992	2,225,460	8,302,453	99,213
1993	2,138,615	8,589,645	96,641
1994	2,153,719	8,331,780	102,348
1995	2,108,060	8,140,679	100,085
1996	2,066,136	7,921,283	97,503
1997	2,010,830	7,942,347	101,746
1998	1,984,251	7,797,787	100,035
1999	1,996,162	7,734,172	97,800
2000	1,995,615	7,547,034	95,163
2001	1,993,511	7,434,614	92,472

Source: 1991-94 figures, DG Fisheries (1999) Statistical Bulletin (note: 1991-93 figures exclude Finland and Sweden). 1995-2001 figures, Eurostat New Cronos database (data extracted 12 September 2002)

The main characteristics recorded *inter alia* include:

Country of registration, port of registration, types of fishing gear, length overall, tonnage 2930/86, tonnage Oslo Convention, main engine power, auxiliary engine power, hull material, year of construction, MAGP segment, event indicator (e.g. modernisation, construction, withdrawal, public aid etc.), days at sea.

Figure 3.1. Community register of fishing vessels – Total EU fleet 1991-2001



Source: 1991-94 figures, DG Fisheries (1999) Statistical Bulletin (note: 1991-93 figures exclude Finland and Sweden). 1995-2001 figures, Eurostat New Cronos database (data extracted 12 September 2002)

3.2. MAGP framework

In order to attain a sustainable balance between the capacity of the EU fishing fleet and the available resources, and to reduce inefficient ‘race to fish’ behaviour, a comprehensive structural policy has been in force since 1983. This policy has been sought through a string of structural adjustment measures, including a comprehensive capacity adjustment policy known as the multi-annual guidance programme (MAGP).

In order to remove excess capacity from fisheries, vessel decommissioning and effort reduction have been the most frequently measures applied. Other measures such as joint enterprises, export to third countries, and reassignment for purposes other than fishing have also been applied, although to a much lesser extent. The measures have been implemented under the MAGP framework, with the present MAGP IV programme being extended to run until the end of 2002. Additional measures to renew and modernise vessels have also been applied to help restructure the EU fishing fleet, working in conjunction with the MAGP.

Currently, the EU fleet is segmented depending on how each vessel is geared towards fish stocks, defined on the basis of the zone fished, the species exploited and the fish-

ing gear used. Fleet segment reduction objectives are set in accordance with desired fishing mortality rates of certain fish stocks. The extent of these ‘weighted’ reductions has been based on biological advice on fish stock overexploitation².

The principal objective of vessel decommissioning is to reduce capacity through the voluntary removal of redundant vessels, bringing fleets fishing particular resources into balance with their allocated quota. The process works by giving fishers a financial incentive to leave the fishery, usually in the form of public aid. In theory, the vessels that remain in the fishery will benefit and improve the overall efficiency as global production increases. The expected effects will include an improvement in the economic results of the fisheries companies, through a reduction in fixed costs and improved catches, and greater competitiveness³.

A successful decommissioning programme will rely on whether fishers can be drawn out of the fishery for future financial gain, as opposed to what they would otherwise gain if they remained in the fishery (Frost *et al.* 1995). Fishers may also withdraw from the fishery because of the poor future prospects regardless, resulting in a financial loss and re-employment elsewhere. Vessel decommissioning is expected to remove the marginal players first (i.e. often the oldest and least efficient vessels), which may in effect not have a considerable impact on overall catches, and their removal may hence not have a significant effect on fishing pressure. Following vessel withdrawal, the remaining participants may also be able to increase their effort (effort creeping) in order to utilise a larger share of the quota, resulting in a similar level of fishing pressure on stocks.

A less permanent measure has been applied to the MAGP since 1992 under the fishing effort concept, where Member States may reduce the overexploiting nature of fishing fleets by limiting their fishing activity. This measure requires vessels to remain in port for a minimum number of days per year, thus reducing the overall fishing effort and subsequent pressure on fish stocks. Although this measure may address the objective of reducing fishing pressure it is unlikely to address the more fundamental issue of improving the long-term structure of the fleets. Reductions in fishing effort has allowed Member States to reduce their required cuts in physical fishing capacity and helped maintain an artificially high level of fishing capacity, in excess what is ultimately desired.

² Council Decision 97/413/EC

³ COM(96) 237 final

Public aid has been allocated to support vessel decommissioning. Aid has also been available for construction and modernisation of fishing vessels to ensure that the EU fleet remains competitive, to improve safety on board vessels, to improve the quality of fish handling and to encourage the use of more selective gears. In earlier years, criticism focused on the lack of co-ordination between decommissioning and the funding of vessel renewal and modernisation, often referred to as the ‘scrap and build’ policy. All the common structural measures relating to fisheries were integrated into an overall system of EU structural funding under a single financial instrument, the Financial Instrument for Fisheries Guidance (FIFG) in 1993. The specific tasks of the FIFG included helping to achieve a sustainable balance between resources and their exploitation, a strengthening of the competitiveness of structures and the development of economically viable enterprises.

Community and national aid to the fisheries sector was in the order of €2.6 billion for the period 1994-99. Of this figure, €894 million was granted to decommissioning and €594 to renewal and modernisation, with the remainder being made available for aquaculture, port facilities, processing and marketing. One-third of total aid was sourced nationally. Initial FIFG structural aid allocations for 2000-2006 total €3.6 billion (DG Fisheries 2001b).

3.3. Capacity development

The following tables outline the trend in capacity development under the MAGP since 1991.

Table 3.2. EU fleet development against MAGP III objectives

End of year	Tonnage (GT/GRT)		Power (kW)	
	Objective	Situation	Objective	Situation
1991	2,044,511	2,010,183	8,290,422	8,347,453
1992	2,003,621	1,934,811	8,124,614	8,188,936
1993	1,977,951	1,843,750	8,020,807	7,963,704
1994	1,936,824	1,777,083	7,896,177	7,778,111
1995	1,895,696	1,710,673	7,771,547	7,555,011
1996	1,859,028	1,644,113	7,691,700	7,328,117
	Overall change: -18%		Overall change: -12%	

Source: COM(97) 352 final

Note: Figures exclude Finland and Sweden

Table 3.3. EU fleet development against MAGP IV objectives

End of year	Tonnage (GT/GRT)		Power (kW)	
	Objective	Situation	Objective	Situation
1996	-	2,005,469	-	7,817,117
2001	2,338,215	1,967,391	8,326,627	7,357,075
		Overall change: -1.9%	Overall change: -5.9%	

Source: COM(2002) 446 final

For segments using active gears, Member States were allowed to achieve all or part of their objectives by reducing activity (days at sea). Six Member States (Germany, France, Ireland, Netherlands, United Kingdom and Sweden) chose to achieve their MAGP IV objectives by managing activity as well as capacity in one or more segments of their fleets. This led to lower capacity reduction requirements for those fleet segments concerned and lowered the capacity reduction requirements of the Community fleet as a whole under MAGP IV. The Commission has acknowledged that for these limitations to have the same effect as the limitation of capacity, activity reductions must be permanent in the same way as capacity reductions. This is especially pertinent given that the proposed reform of the CFP seeks to find a long-term solution to sustainable exploitation of fish stocks.

The assessment of MAGP IV outcomes in GT terms will be uncertain until the completion of the re-measurement of fleets at the end of 2003, although it is expected that the decrease in GT outlined in Table 3.3 is under-estimated⁴. Some Member States will likely achieve their current tonnage objectives in some additional segments after the effect of re-measurement of GT is taken into account. Indeed, Commission Decision 2002/652/EC shows how 2002 capacity objectives of, for example, France and the United Kingdom have seemingly been adjusted to account for such tonnage re-measurements (cf. Table 3.4). At the end of 2001, the Netherlands was the only Member State not to have complied with global capacity targets in terms of kW.

⁴ COM(2002) 446 final and COM(2002) 483 final

Table 3.4. MAGP IV objectives and fleet situation of Member States

Member State	Measure	Situation 2001	Objective 2001	Sit2001/Obj2001	Segment compliance	Objective 2002*
Belgium	GT/GRT	24,091	23,323	103	1/2	23,260
	KW	66,347	67,857	98	1/2	67,857
Germany	GT/GRT	68,766	81,973	84	6/7	80,965
	KW	160,562	170,050	94	6/7	166,890
Denmark	GT/GRT	99,663	132,539	75	4/4	132,706
	KW	364,030	463,437	79	4/4	459,526
Spain	GT/GRT	532,003	799,254	67	7/7	783,113
	KW	1,311,821	1,802,836	73	7/7	1,793,251
France (mainland)	GT/GRT	229,742	213,870	107	15/21	225,757
	KW	1,098,253	1,161,131	95	19/21	916,469
Greece	GT/GRT	108,739	120,755	90	5/6	119,910
	KW	637,207	654,172	97	5/6	653,497
Ireland	GT/GRT	64,412	69,649	93	2/3	83,167
	KW	185,276	199,009	93	2/3	215,939
Italy	GT/GRT	217,501	230,177	95	8/11	229,833
	KW	1,315,086	1,341,775	98	7/11	1,338,972
Netherlands	GT/GRT	179,942	145,520	124	5/7	145,520
	KW	426,867	423,161	101	4/7	423,161
Portugal	GT/GRT	116,968	195,885	60	10/10	194,756
	KW	403,245	497,246	81	10/10	492,844
United Kingdom	GT/GRT	255,634	250,684	102	6/8	269,789
	KW	953,733	1,066,463	89	7/8	1,065,278
Sweden	GT/GRT	50,183	51,159	98	4/6	51,436
	KW	243,302	261,856	93	5/6	261,029
Finland	GT/GRT	19,748	23,427	84	4/4	23,203
	KW	191,344	217,634	88	4/4	216,195
Total	GT/GRT	1,967,391	2,338,215	84	-	2,363,415
	KW	7,357,075	8,326,627	88	-	8,070,908

Source: COM(2002) 446 final and (*)Commission Decision 2002/652/EC

Table 3.5. EU fleet development against MAGP IV intermediate targets

	----- Tonnage (GT/GRT) -----		----- Power (kW) -----	
	Objective	Situation	Objective	Situation
End of 1996	-	2,020,770	-	7,872,386
30 June 2002	2,397,193	1,949,629	8,330,580	7,272,752
	Overall change: -3.5%		Overall change: -7.6%	

Source: COM(2002) 483 final

At 30 June 2002, all Member States had met their overall intermediate targets for kW, whereas only Denmark, Spain, Portugal, Ireland and Finland had met their kW targets in all segments of their fleets. As a consequence, all other Member States had to suspend public aid schemes for the construction and modernisation of their fleets in one

or more segments. In fact, in some segments capacity had risen substantially beyond the MAGP target levels.

3.4. Critique of fleet policy

The European Commission has played its role in the poor results attained through MAGP. Recognised problems include:

- Accepting a variety of capacity units
- Complex fleet segmentations and weightings
- Amendments of objectives
- Not implementing biological advice for cutbacks in fishing mortality

In connection to these recognitions, the Scientific, Technical and Economic Committee for Fisheries (STECF 1999, p.11) state that:

“In view of the low reduction rates applied to Member States’ fleets in MAGP III and IV in comparison to what was recommended according to the state of the stocks, and the way they have been applied, the primary objective of matching fishing capacity to resource availability is unlikely to have been fulfilled by the end of 2001”.

The difficulties of trying to address biological imperatives while accommodating a multitude of political, economic and socio-economic interests have hampered the progress of capacity adjustment programmes. Although most of the reduction objectives were met during the 1990s, the translated effect of a similar reduction in fishing pressure on stocks has not materialised.

The Commission (COM(2000) 272 final, p.5) acknowledges that *“the fleet would still be more than capable of exerting excessive levels of fishing effort”* despite the observed capacity reductions. The Commission further states that:

“Although the current exploitation rates are too high, they represent only a fraction of what existing fleet capacity is potentially able to exert if it were not for the constraints imposed by Community regulations, and in particular the quota allocations”.

4. Reforming the Common Fisheries Policy

4.1. Introduction

In connection with their proposal to reform the CFP, the European Commission (COM(2002) 181 final, p.3) acknowledges that there is currently:

“An alarming state of many fish stocks that are outside biological limits” and “if current trends continue many Community fish stocks will collapse”.

With regards to the current level of fishing capacity they continue, by expressing that:

“The fishing capacity of the Community fleet far exceeds that required to harvest the available fishery resources in a sustainable manner. The most recent scientific advice from ICES suggests that the level of fishing mortality of the main Community fish stocks needs to be reduced by between one-third and one-half, depending on the type of fishery and area concerned, in order to ensure sustainable fishing.”

These symptoms have resulted from the ineffectiveness of the CFP, which the Commission attribute to the following internal systematic weaknesses:

- Poor enforcement
- Lack of multi-annual management approach
- Fleet overcapacity
- Insufficient stakeholder involvement
- Inability of reversing the increasing threats to important fish stocks and of providing economic sustainability to the fisheries sector

The Community therefore needs a new framework that provides a basis for coherent fishery management measures, based on the precautionary principle.

4.2. Proposed management reforms

The Commission proposes that more effective conservation and management of fisheries resources is a clear objective of the CFP. Specifically, they regard the aims of a new approach to fishery management to include, among others, a long-term approach to securing sustainable fisheries with high yields. Also, they seek to manage fishing

effort in line with catching opportunities, requiring an immediate and significant reduction of fishing effort.

The Commission proposes multi-annual management plans (MAMPs) for commercial stocks. These plans are to be based on the best available scientific methods and advice, be consistent with the precautionary approach to ensure long-term safe levels of stock size and fishing mortality, be designed to ensure recovery of depleted stocks, take into account bio-diversity and habitat objectives, and finally allow high and stable yields given the aforementioned constraints. The plans will particularly set targets for population size and fishing mortality rates of fish stocks and harvest rules that establish methods for fixing catch and fishing effort limits to secure long-term goals.

Member States will be responsible for the allocation of quotas and fishing effort between vessels. Fishing effort limits are an essential part of the management plans and will gradually become the prime management instrument for mixed fisheries, requiring a reduction in the activity of the existing fleet (up to 60% in several fisheries).

Technical measures will continue to play an important role. The main aim by the Commission is to reduce catches of younger fish, by-catches in mixed fisheries and discards, and so helping to increase yields from the fisheries in a sustainable manner. Measures will include more selective fishing gear, restricting fishing in areas of juvenile fish, sensitive non-target species and habitats, minimum landing sizes, “discard ban” trials and voluntary code of conduct to reduce discarding, and economic incentives for the use of more selective gears.

4.3. Multi-annual management plans

The Commission proposes that fish stocks be managed on a multi-annual basis, incorporating targets which take account of scientific advice against which the state of stocks can be measured, and defined harvesting strategies that will pre-determine the method to be used for setting catch and fishing effort limits. The essential components of multi-annual management will be effort limits, catch limits and technical measures.

Measures may be imposed for each stock to limit fishing mortality and the environmental impact of fishing activities by:

- Adopting MAMPs
- Establishing targets for sustainable exploitation of stocks
- Limiting catches
- Fixing the number and type of fishing vessels authorised to fish
- Limiting fishing effort
- Adopting technical measures (gear restrictions, closed areas/seasons, minimum landing size, measures to reduce impact on marine ecosystems and non-target species)
- Establishing incentives to promote more selective fishing

MAMPs shall include targets against which the recovery of stocks to within safe biological limits can be measured, where targets are expressed in terms of:

- Population size, and/or
- Long-term yields, and/or
- Fishing mortality rate, and/or
- Stability of catches

The plans include harvesting rules that consist of a pre-determined set of biological parameters to govern catch limits. For stocks for which an MAMP has been adopted, the Council shall decide on catch and/or fishing effort limits as well as the conditions associated to those limits for the first year of fishing under the plan. For the following years, the Commission shall decide catch and/or fishing effort limits.

4.4. Fleet capacity policy

Reductions in fishing mortality and the establishment of effort limits will have repercussions for fleet capacity. The reduction of fishing capacity in response to the fishing effort limits will be the responsibility of Member States, with the Community fleet policy being asked to create the environment to encourage this capacity reduction. An overall reduction in the capital employed is the first essential step towards improving economic performance of the sector.

The Commission proposes that a new fleet policy should be based on three main lines of action:

- Restrictions on aid for modernisation, renewal and export of fishing vessels
- Special measures for vessels affected by MAMPs
- A simpler system for limiting fishing capacity

Public aid to investment in the fishing fleet is counter-productive, promoting over-supply of capital by reducing costs and investment risks and thereby distorts competition. Hence, the Commission proposes to restrict aid for modernisation, renewal and export of vessels. No funds can be expected for this purpose from the FIFG following the end of MAGP IV (December 2002).

More specifically, the Commission proposes to:

- Remove aid for new capacity
- Remove aid for export of vessels and joint enterprises
- Restrict modernisation aid to safety on board, more selective fishing gears, and improvement of production quality (not concerning engine power). This is conditional on the status of overall fleet capacity and does not allow an increase in fishing effort
- Ensure that any fleet renewal must take place without any increase in fishing effort
- Ensure that once a fishing vessel is withdrawn from the fishery, the licence associated with that vessel is also withdrawn from the fishery
- Ensure that measures that support small-scale coastal fishing do not increase fishing effort nor increase the impact of towed gears
- Ensure that Member States' programmes under FIFG prioritise fishing capacity reduction measures (scrapping of fishing vessels)

While capacity has been reduced through MAGP, recent reduction targets have been very modest and increasing fleet efficiency and dwindling stocks have meant that, in some segments, the fleet still remains too large for the size of the stock it is targeting (cf. Chapter 3). The funding of scrapping via FIFG has not always allowed for sufficient targeting of fleets where overcapacity is particularly marked. The MAGP has been too complicated and insufficiently ambitious to manage fleet capacity and therefore the Commission now proposes a simpler system for limiting fishing capacity. Within this system an overall ceiling ('reference level') for fishing capacity for national fleets will be fixed. This will prevent further expansion of fishing fleet and help

ensure that Member States comply with obligations under MAGP IV. Hence, the new policy does not set a new range of capacity targets as under the previous programme.

The reference levels will be based on the final objectives of MAGP IV (cf. Table 3.4 in Chapter 3). Failure to comply with these levels, as well as failure to comply with reporting obligations and withdrawal of capacity with public aid, will lead to the withholding of all public FIG aid (except aid for scrapping). It may also lead to a reduction in the allocation of fishing opportunities (quota) or fishing effort. Further, any new entry will have to result in at least an equivalent withdrawal of capacity (1:1), and when capacity is withdrawn with public aid the reference level will be adjusted downwards by the amount of capacity withdrawn.

A ‘peer review’ process will evaluate the progress of fleet capacity reduction and corresponding fishing mortality rates during 2003-06⁵. It is immediately unclear how the peer review process is to be structured. However, the process should be able to monitor the progress of required reductions in fishing mortality on a Member State basis, helping to ascertain whether Member States are complying with targets set by the new management plans for fish stocks.

4.5. Scrapping of vessels

An emergency measure has been proposed to provide additional incentives to the owners of fishing vessels in order to urgently address overcapacity in fisheries where stocks are outside safe biological limits and for which MAMPs have been implemented. The management plans will likely cause severe reductions in fishing opportunities in certain segments of the fleet, as currently seen in the downturn in cod and hake fisheries in the North Sea.

To address this imbalance it is proposed that the emergency measure allows Member States to offer additional funds for scrapping vessels that are severely impacted. A reduction of 25% or more in the fishing opportunities of the vessel concerned should be regarded as an objective indicator of ‘severe impact’. The owners of the vessels may be granted increased scrapping premiums (an extra 20%) if the vessel is impacted in such a way. The time frame for this measure is 2003-06 to encourage rapid fleet adjustment. The measure shall be available solely for Member States that have achieved both global and segment MAGP IV targets for their fleet.

⁵ Outlined in Article 14 “Exchanges of information”, COM(2002) 185 final

The Commission has used scientific advice on recommended reductions in fishing effort, linked to the perceived effect such reductions will have on Community fishing vessels in the fishing vessel register, to reach the approximations given in Table 4.1.

Table 4.1. Vessel scrapping proposal

	Vessel number	Total tonnage (GT)	€ million
Removal to achieve fishing mortality reduction under proposed MAMPs	8,592	351,791	-
Cost assuming 80% uptake	-	281,433	1,376
EU contribution	-	-	712
Funds currently available	-	-	663
Additional budget requirement*	-	-	271.6

Source: COM(2002) 190 final

Note: *Calculated on the basis of Member State requirements. FIGF funds show that some Member States will require extra funds whereas others do not

Regulation (EC) No 2792/1999 continues to be the framework for payments of scrapping premiums. Member States will need to present the Commission with a plan for expected scrapping expenditure, both under the emergency measure outlined above and under the ‘adjustment of fishing effort’ programme of Regulation (EC) No 2792/1999. The impact of MAMPs will also be assessed in order to reach agreement on contributions to be paid on a Member State basis.

4.6. Linking MAGP to new reference levels

Reference levels for the proposed capacity limitations will be directly based on the capacity objectives of MAGP IV outlined in Table 3.4 in Chapter 3. However, it is immediately unclear how MAGP objectives that have involved reductions in activity are interpreted. Clearly the programme set a series of capacity objectives for each fleet segment of each Member State. However, with some Member States deciding to use the activity reduction option to cut back fishing effort requirements, it is unclear whether their overall capacity objectives of MAGP IV were also lowered. If so, the new reference level proposals may require that the MAGP IV objectives are re-defined so they are in capacity terms only. It is pertinent that the newly defined reference levels are purely in capacity terms to allow for consistency and transparency of capacity measurements of Member State fleets.

5. Applying capacity analysis to the peer review process

As discussed in Section 4.4, the possibilities for reviewing the adjustment of fleet capacity of Member States in relation to fishing opportunities can be strengthened via the ‘peer review’ process. This could be carried out by the application of a range of capacity analysis methods under the guidance of the STECF. This would help to strengthen the appraisal process of fleet capacity adjustment of Member States.

Relatively simple approaches to analysing capacity exist. As outlined in the Commission’s Green Paper (DG Fisheries 2001a), the utilisation rate of capacity can be calculated by comparing the total number of days at sea actually recorded to the available capacity. Here it is assumed that available capacity is 265-days effort per vessel per year. Another simple indicator could be catch per unit of effort (CPUE) analysis. Also, where only basic catch and aggregated fleet data is available, the FAO (1998, 1999) propose that the peak-to-peak method be applied. An economic approach to analysing capacity should also be considered, and possible progress in this regard is outlined in Section 5.2. However, with economic data collection in the EU first becoming obligatory in 2004, applying economic analysis to the proposed peer review process is unlikely in the immediate future.

5.1. Data Envelopment Analysis

A possible tool for supporting the peer review process to help analyse capacity of the fleets is Data Envelopment Analysis (DEA). This tool allows for transparent capacity analysis on the Member State level, which would identify the current balance of fleet capacity and its respective productivity. Such an analytical framework could easily be introduced into the peer review process and compliment other analytical procedures that may be put in place. It should be stressed that the analysis would not serve to directly compare the performance of Member State fleets.

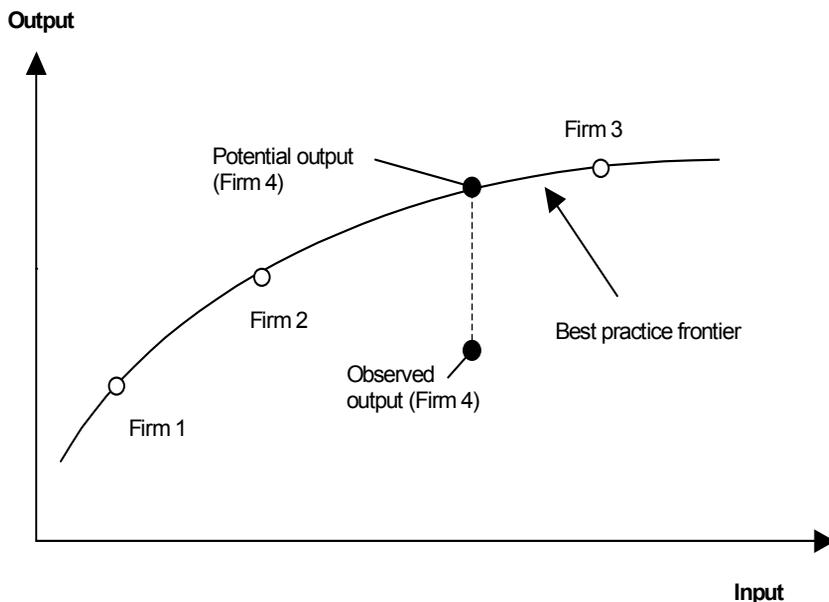
In follow-up work to the International Plan of Action for the Management of Fishing Capacity of 1999, the FAO set out a series of technical guidelines for measuring capacity during a technical consultation meeting in Mexico in 1999. Among other analytical tools, DEA was identified as a viable option to measure the potential output of a fishery given the current structure of the fleet. DEA was regarded as one of the more simple and robust approaches that could be readily adopted by member states, given that, as a bare minimum, information on aggregated catch and fleet data on a national level is readily available.

The DEA framework helps us assess fishing capacity, or production output from a fishery given the current level of production inputs, based on traditional efficiency analysis often undertaken in other industry sectors. The analysis concentrates on assessing capacity in relation to fleet structure and does not incorporate considerations of the underlying stock dynamics, as outlined in Chapter 2. Academic research has shown that this framework can be modified in order to estimate capacity, which is consistent with the FAO definition of capacity. It has also been applied to estimate optimal input utilisation, productivity, identify strategic groups, determine benchmarks and total quality programmes, and to estimate social and private costs of regulating undesirable outputs and capacity.

DEA is a non-parametric mathematical programming approach that uses the optimisation of an objective function given a series of constraints. It allows us to assess the efficiency of an existing technology relative to an optimal, ‘best practice’, frontier technology observed in a given fishing fleet. The frontier technology in this case resembles the optimal combination of inputs (e.g. tonnage, engine power) and outputs (e.g. catch, landings). The technique allows us to individually assess each input/output combination of each observation (e.g. vessel) and compare it to the ‘best practice’ producers in the same fishery. A simple one input one output scenario is portrayed in Figure 5.1 for a given set of firms. Here firms 1-3 form the ‘best practice’ frontier, or the production possibility frontier. Firm 4 resembles an individual who is not efficient, as it is not situated on the frontier.

The analysis helps us to identify the magnitude by which each firm or vessel should be able to expand its output production if it were as efficient as the ‘best practice’ vessel that uses the same level of inputs (as viewed in Figure 5.1). The possible output expansion measure can be translated into the level of current capacity utilisation, i.e. the observed output divided by potential output. We can observe that Firm 4, given its inputs, should be able to expand the output so it lies on the frontier. The level of overcapacity that exists in the fishery can thus be estimated based on this relative performance indicator for each firm. However, since the capacity utilisation score is a relative measure between vessels in a given fishery or fleet, it is not advisable to directly compare these scores to other fisheries or fleets in order to ascertain which is more efficient. For further information, comprehensive introductions to DEA can be found in Cooper et al. (2000) and Charnes et al. (1996).

Figure 5.1. Estimating capacity using DEA



The analysis helps us to identify the magnitude by which each firm or vessel should be able to expand its output production if it were as efficient as the ‘best practice’ vessel that uses the same level of inputs (as viewed in Figure 5.1). The possible output expansion measure can be translated into the level of current capacity utilisation, i.e. the observed output divided by potential output. We can observe that Firm 4, given its inputs, should be able to expand the output so it lies on the frontier. The level of overcapacity that exists in the fishery can thus be estimated based on this relative performance indicator for each firm. However, since the capacity utilisation score is a relative measure between vessels in a given fishery or fleet, it is not advisable to directly compare these scores to other fisheries or fleets in order to ascertain which is more efficient. For further information, comprehensive introductions to DEA can be found in Cooper et al. (2000) and Charnes et al. (1996).

The data required to undertake DEA capacity analysis can either be aggregated fleet data or individual vessel data, although more disaggregated data is favoured. The Commission and the individual Member State Fisheries Directorates hold detailed

vessel data on recorded catch and landings and the associated physical inputs of vessels (e.g. tonnage, engine power, etc.). This data, if made readily available, would allow for this type of capacity analysis to be undertaken in support of the peer review process of capacity and fishing mortality reduction.

It is clear that the aggregation level of data may be an issue. It is hence important to consider the practical application of this type of analysis to a diverse range of datasets for individual Member States. There should be a process that considers the technical guidelines laid down by FAO, with particular reference to the application of DEA analysis under various levels of data aggregation. This issue is comprehensively discussed in the FAO report (1999). FAO note that DEA can be used to estimate current capacity and potential capacity at the species level by aggregating across fleet segments, and at the fleet level by aggregating across species. However, increasing the level of aggregation reduces the accuracy of the measure due to greater differences between fisheries at each level. Regard to discards and unrecorded catch must also be given. The methodology must be standardised in some manner as to allow consistency of capacity measurements among all Member States.

5.2. An economic approach to capacity analysis

The capacity issue could be viewed from the output side or from the input side. From the output side the potential catch volume is calculated with a given capacity. This potential catch volume is then compared to the actual (restricted) catch volume i.e. the total allowable catch (TAC). From the input side the minimum capacity required to catch a given volume is calculated and then compared to the actual capacity. From a pure economic point of view the definition of the minimum capacity is where the average long run variable costs are at minimum, and that would often entail that the capacity use in technical terms, e.g. production hours, is lower than 100%.

In fisheries one further aspect is of importance, and that is the fish resource that should be viewed as a production input parallel to the fleet capacity. It is necessary to distinguish between the long run and the short run. In the short run, with given fish stock biomasses and TACs, overcapacity, in terms of non-economic sustainability, can occur and is reflected in the magnitude of the net profit. In the short run situation it is not taken into account whether the fish stock size is at an optimal level or not. This is different from the long run situation because the long run sustainable stock size and hence the TACs could demand a different optimal capacity.

Costs and earnings compilations and calculations are published in the 2001 Annual Economic Report (AER)⁶ of selected European fishing fleets, and together with the associated EIAA model (Salz and Frost 2000) this information must be considered a useful instrument with respect to assessment of overcapacity and the distribution of overcapacity on fleet segments. The AER contains tables of the following format with the example taken from the Danish fishery.

Table 5.1. Denmark: Trawlers below 200 GT, economic indicators 1995-2000

	1995	1996	1997	1998	1999	2000
	Costs and earnings (€ million)					
1. Gross output	162	144	143	152	165	156
2. Fuel costs	13	13	12	11	13	22
3. Other running costs	22	19	19	20	21	21
4. Vessel costs	33	27	26	27	30	29
5. Crew share	70	66	63	68	74	72
6. Gross cash flow ^a	24	17	23	27	26	12
7. Depreciation ^b	23	20	17	20	20	21
8. Interest ^b	10	8	8	8	10	9
9. Net profit	-9	-11	-3	-1	-3	-18

a. Calculated as gross output minus item 2 to 5

b. Constitute the fixed costs

Source: AER for selected European fleet segments 2001. European Association of Fisheries Economists. The figures are retrieved from the Danish Account Statistics, prepared annually by FOI (www.foi.dk)

The gross cash flow (GCF), which is gross output (revenue) less all variable (operation) costs, is central in the sense that the fisher will stay in the fishery in the short run if the GCF is positive, but in the long run he will stay only if the fixed costs are covered by the GCF. The revenue at which the GCF exactly equals the fixed costs is defined as the 'Break Even' revenue.

It rests on the assumption that GCF per unit revenue is known, and then the Break Even revenue is calculated by use of the following expression:

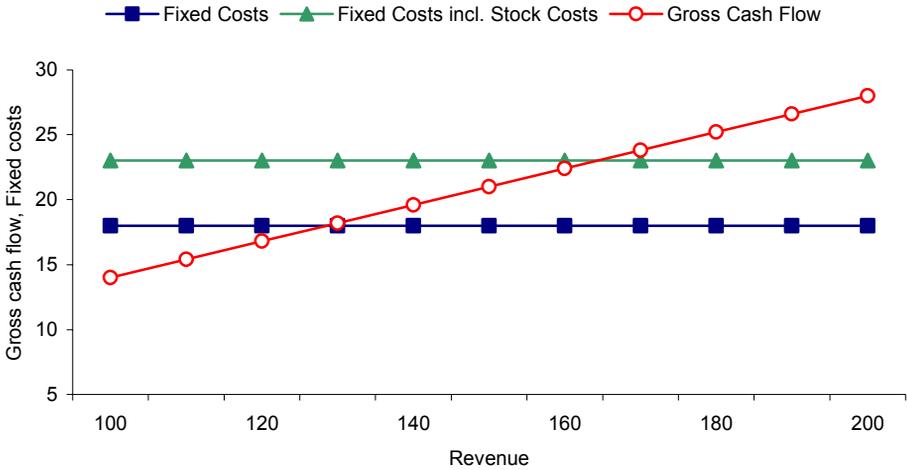
(E1) *Break Even revenue* = *fixed costs* / (*gross cash flow/revenue*), the same as:

(E2) *Break Even revenue* = *fixed costs* / (*1- variable costs/revenue*)

⁶ Economic performance of selected European fishing fleets: Annual Report 2001. Concerted Action FAIR CT-97-3541, Promotion of Common Methods for Economic Assessment of EU Fisheries.

Figure 5.2 shows the characteristics of the Break Even concept. Break Even is determined by the intersection between the total GCF curve, which is a function of the revenue and the fixed costs curves. The two fixed costs curves are included to describe two cases. The first case is where only vessel costs are considered, while the second case includes vessel costs and cost of access to use the fish stocks as explained further below.

Figure 5.2. Break Even revenue



If the revenue of a fleet segment, given a certain fish stock level, a certain species composition, a set of prices, a set of daily catch rates, and a certain cost structure, is below Break Even revenue we define it as a non-economic sustainable fishery, and *vice versa*. Looking at Figure 5.2 all the above-mentioned elements affect the level and the slope of the curves. Therefore it is argued that the calculation of economic sustainability of the segment should be made on a long run basis e.g. at least 5 years in order to even out variations. Further it is necessary to distinguish between the Break Even calculations about the adjustment to an economic sustainable fishery where the net profit is zero, and the adjustment to the situation that secures sustainable fish stocks and attempts to maximise the economic rent from the resources, which is in the interest of society.

In cost and earning studies it is not always easy to distinguish whether costs for access to the fish resource is included or not. If there are no costs of access to the fish resource this could be embodied in a higher value of the vessels, because the value of the vessels reflects future earnings, which are then higher compared to the situation where the fish stock owner demands a return. In Figure 5.2 the lower fixed cost curve reflects the cost of one input factor i.e. the vessel, whereas the upper curve reflects the costs of the vessel and access to the resource.

The economic sustainability and over/under-capacity of a fleet segment is calculated taking the relation between the Actual revenue and the Break Even revenue, taking into account whether there is a charge for access to the resource or not. Table 5.2 shows the results for the Danish trawler fleet below 200 GT. The fleet segment targets mainly cod, plaice, sole and Norway lobster, which are subject to different yield curves. These yield curves are aggregated by use of fish prices.

By use of the above-mentioned Break Even revenue expression (E1) on the “Average” figures in Table 5.2 for calculation of overcapacity, the following Break Even revenue result is obtained using fixed costs that include access costs: $24.8/(21.5/153.7) = 177.2$. When the Break Even revenue is related to the Actual revenue ($177.2/153.7 = 1.15$) the result shows how much the actual revenue should be increased to break even, i.e. secure exactly zero net profit after interest payments, depreciation and an appropriate salary to the skipper/owner. In this case revenue should be increased by 15% and hence indicates an overcapacity of 15%.

Similarly, to calculate economic sustainability we use fixed costs that exclude access costs, and the following results are obtained: $18.2/(21.5/153.7) = 129.9$. Relating the Break Even revenue to the Actual revenue we obtain $129.9/157.3 = 0.85$. This represents an undercapacity of 15%.

In order to manage and restrict capacity an extra stock-related cost in terms of an admission fee could be introduced. The fish stock access could be dependent on the level of overfishing. The higher the overfishing, the higher the access costs, in order to take into account the increasing scarcity of the resource. However, this topic needs to be investigated further. Taking into account fish stock access costs gives an indicator of over/under-capacity, which in the example above, is radically different from the measure of short run economic sustainability (see the two bottom rows in Table 5.2). It should be emphasised that for illustration purposes, the fish stock access costs in

this example are arbitrarily fixed at 4% of the invested vessel capital. It would be possible to calculate more appropriate access costs.

Table 5.2. Estimate of economic sustainability level and over/under-capacity based on Break Even revenue. Danish trawler fleet below 200 GT

	1995	1996	1997	1998	1999	2000	Average
	Costs and earnings (€ million)						
Gross output (revenue)	162	144	143	152	165	156	153.7
Cash flow	24	17	23	27	27	12	21.5
Invested capital (IC)	200	166	146	152	159	168	165.4
Fixed costs (FC) at 11% of IC	22	18	16	17	18	19	18.2
Fixed costs (FC) at 15% ¹ of IC	30	25	22	23	24	25	24.8
Break Even revenue at 11% FC	147	155	102	95	109	244	129.9
Break Even revenue at 15% FC	201	211	139	129	149	332	177.2
Economic sustainability ²	9%	-8%	29%	38%	34%	-56%	15%
Overcapacity ³	24%	47%	-3%	-15%	-10%	100%	15%

1. Costs are estimated as 11% of invested vessel capital and further 4% of invested vessel capital is used as an estimate of the costs of access to the fish resource

2. Positive numbers show that the fleet segment is economically sustainable, negative numbers show that the fleet segment is not economically sustainable

3. Positive numbers show overcapacity, negative numbers show undercapacity

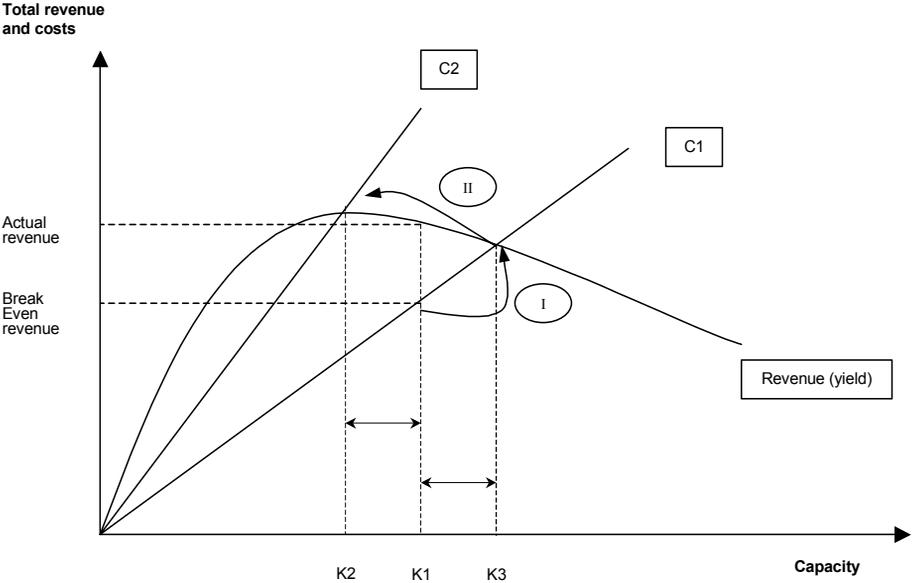
Source: AER for selected European fleet segments 2001. European Association of Fisheries Economists. The figures of invested capital are retrieved from the Danish Account Statistics, prepared annually by FOI (www.foi.dk), while the other figures are calculated by the Working Group

Furthermore, it can be seen that the overcapacity varies quite substantially between years because it is affected by a number of factors, such as catch composition, fish prices, cost change, etc. Therefore, the figures in the column “Average” are of particular interest as they display an estimate of the long run average situation.

The use of the Break Even concept to calculate economic sustainability and overcapacity, and how the two different adjustments take place, is further elucidated in Figure 5.3 below, which aims to explain bio-economic reference points of capacity. If the fleet segment is in an initial position at K1 the first adjustment calculated by the Break Even revenue is from K1 to the intersection between the cost curve C1 and the revenue curve (step I), which also reflects the yield curve of a fish species. This movement could be defined as a movement towards long run economic sustainability. The movement from K1 to K3 will occur as the excess profit (or part of it) will be invested in new capacity, or new capacity is being attracted because of the excess profit.

The difference between K1 and K3 represents the 15% undercapacity estimate in terms of economic sustainability given in Table 5.2.

Figure 5.3. Economic sustainability and long run overcapacity



The second movement is towards K2 (step II), which represents the situation where the fish stock has recovered. This situation could be defined as the long run socio-economic sustainable situation, and the movement towards the position is induced in the calculation by the introduction of the costs of the access to the fish resource. In-currence of such costs will raise the slope of the cost curve to C2, and the calculated overcapacity is the difference between capacity levels K1 and K2. Similarly, this represents the 15% overcapacity estimate given in Table 5.2, for the case where access costs are taken into account.

To identify overcapacity of a fleet segment from society’s viewpoint, the Break Even method is considered operational on a wider EU level and sufficiently robust, although not necessarily theoretically optimal. Further the method is supported by its transparency and acceptability in the industry caused by the use of well-known business-economics principles. The method can handle many species subject to different

yield curves by weighting them together using prices. The method takes into account a number of the economic elements the fisher would face and need to include when deciding on whether to leave the industry or remain. Furthermore, because the method is based on remuneration of production factors, be it only vessel capital or both vessel capital and fish stocks, the method could be used independently of TAC and quota settings. Finally, the calculation is based on well-justified costs and earnings statistics produced in the industry.

Although the method is based on output it could be applied on the input side as well; in the most simple form, by proportionally changing the fishing capacity in terms of potential number of fishing days (number of vessels times vessel fishing days) with the required change in output. By using models that explicitly take into account a number of capacity and effort variables, e.g. in particular the number of vessels and fishing days categorised in homogenised fleet segments, an estimate of overcapacity could be obtained. Using an optimisation procedure where profit is maximised either on a fleet segment level or the fishery as a whole, will indicate the optimum fleet composition and number of fishing days required to catch a given TAC.

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