

Please cite this paper as:

Cox, A. (2009-12-01), "Quota Allocation in International Fisheries", *OECD Food, Agriculture and Fisheries Papers*, No. 22, OECD Publishing, Paris.
<http://dx.doi.org/10.1787/218520326143>



OECD Food, Agriculture and Fisheries
Papers No. 22

Quota Allocation in International Fisheries

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Abstract

This paper explores issues relating to the process of allocating participatory rights in RFMOs, especially in those cases in which one or more fisheries remain unallocated, and is intended to stimulate discussion among policy makers on possible policy directions in such situations without directly or indirectly evaluating existing allocation schemes. The paper reviews the international legal framework governing international fisheries, the economic issues underlying allocations, and the current state of play in the allocation regimes in RFMOs. A broader perspective on the allocation issue is provided by examining the experiences of other resource sectors that have wrestled policy challenges similar to those confronting international fisheries in allocating participatory rights amongst current and potential participants - water resources; and greenhouse gases – to see if they offer any transferable insights on the issue.

This working paper does not necessarily reflect the views of all OECD member countries. This working paper has been released under the responsibility of the Secretary-General of the OECD.

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Executive Summary

Developing an allocation scheme for distributing rights amongst fishing nations is a key issue in the development of stable cooperative arrangements to exploit international fish resources. Allocation within regional fisheries management organisations (RFMOs) is generally based on the historical catches of parties to the RFMOs. However, as membership of RFMOs increases and pressure to allow additional countries, particularly coastal developing countries, to participate meaningfully in international fisheries intensifies, there is increasing policy attention being paid to the issue of allocation of rights in RFMOs.

A great deal of effort has been devoted to finding a durable solution to the allocation question, both at the theoretical and at the applied level. Some of this effort has focused on the insights from game theory to identify the key factors underlying cooperative solutions. The basic requirement to promoting agreement amongst States is to ensure that no State is worse off in acting cooperatively than in acting inconsistently within an international cooperation framework. In the case of international fisheries, agreements must be self-enforcing to be stable as there is no third party to ensure enforcement of the agreement. Issues such as perceptions of fairness and equity in the initial allocation, new entrants, free-riders, optimal resource management in a multilateral setting, enforcement, and side payments (or “negotiation facilitators”) have attracted much attention.

This paper explores issues relating to the process of allocating participatory rights in RFMOs, especially in those cases in which one or more fisheries remain unallocated, and is intended to stimulate discussion among policy makers on possible policy directions in such situations without directly or indirectly evaluating existing allocation schemes. The paper reviews the international legal framework governing international fisheries, the economic issues underlying allocations, and the current state of play in the allocation regimes in RFMOs. A broader perspective on the allocation issue is provided by examining the experiences of other resource sectors that have wrestled policy challenges similar to those confronting international fisheries in allocating participatory rights amongst current and potential participants - water resources; and greenhouse gases – to see if they offer any transferable insights on the issue.

The review of allocation experiences in other sectors provides a number of possible avenues that could be usefully explored in the debate on the allocation process in RFMOs. While, there is no unique solution due to the varied nature of RFMOs, there are sufficient common elements across RFMOs that allows some broad policy questions to be raised. Underlying these options is the question of whether there is a need for flexible mechanisms to achieve RFMO goals on participation and agreed processes for resolving disputes over allocations. There is also a need to examine the role of economic efficiency in international fisheries in order to maximise the potential advantages of cooperation to all parties, and hence the prospect for a stable regime. The increased use of market mechanisms (for example, the use of cap-and-trade systems to improve economic efficiency in combination with more traditional regulatory and planning approaches) to

better align the incentives faced by participants is highlighted as a possible policy direction among others that merits further analysis in order to highlight both advantages and challenges.

The paper raises a number of issues that governments may address when discussing how to improve the processes for allocating fishing rights in RFMOs. They include:

- understanding the advantages and limitations in the use of the historical basis for allocation and ways to address them;
- issues in separating the allocation decision from other decisions on conservation and management measures (such as total allowable catches and effort levels);
- how to create greater confidence in the process for determining fair and equitable allocations and a greater incentive to participate meaningfully in RFMO processes;
- options for new entrants and implications for existing Members;
- the role of efficiency in RFMOs in order to expand the expected advantages from cooperation and, as a result, the potential returns for existing and new Members;
- the potential roles for the tradability of rights and innovative rights structures that may facilitate economic efficiency and improve the flexibility of fishing fleets and Member countries to maximise the profitability of their operations, as well as the potential challenges in such approaches, particularly with respect to:
 - inequalities among states that may not have sufficient financial means to participate in the exchange mechanisms, especially coastal communities dependent on artisanal fisheries;
 - the potential for resistance to reductions in TACs once rights holders have had to – or anticipate – purchas(ing) quotas, which may compromise sustainable fisheries management; and
 - the potential for concentration of rights under such approaches.
- the role of monitoring, control and enforcement of rights in supporting allocation mechanisms, noting that the introduction of market based mechanisms (such as transferable rights systems) would require strengthened international control and enforcement systems.

1. Introduction

“Unlike most of its other activities, the negotiation of an RFMO’s allocation of participatory rights, and the outcome, is subjective and highly politicized. There are few quantifiable guiding principles for decisions about allocation, and the effectiveness of those decisions is measured largely by secondary means. ... The success or otherwise of an allocation process has the potential to permeate almost all other decisions taken by an RFMO, and thus has the potential either to secure or to undermine the primary conservation regime, but it remains one of the least objectively analysed and structured elements of an RFMO’s functions.” (Lodge *et al.* 2007, p. 34).

This statement from a major recent publication on best practices for RFMOs encapsulates the political and economic imperative attached to resolving the thorny issue of the allocation of rights¹ for States and entities to participate in international fisheries.² Identifying practical allocation schemes that are perceived as being fair and equitable by all parties potentially sharing a resource is necessary to ensure the long run sustainability of the fishery resource. For an allocation of resource rights to lead to a stable cooperative agreement between States, the distribution must leave no State worse off from acting cooperatively than it would be by acting individually. Easy resolution of the allocation issue remains elusive due to the potential problems of managing transitions that may arise following completion of negotiations on sharing highly migratory and straddling stocks.

The policy challenges in achieving a stable allocation are significant. Catch limitations negotiated at the international level have an impact on national fleets, raising domestic pressures (Hoel and Kvalvik, 2006). Issues of how to accommodate new members within existing allocation regimes and how to address the aspirations of developing states within an agreement are also major stumbling blocks to gaining agreement on changes in allocation processes. Perceived inequities in the allocation process have been highlighted as a factor in non-compliance with existing national allocations (Lodge *et al.*, 2007). There are also considerable divisions between distinct groups of parties to negotiations, each of which has separate priorities and agendas in any given negotiation (Willock and Cartwright, 2006).

The objective of this paper is to explore issues relating to the process of allocating participatory rights in RFMOs. The paper is designed to canvass a number of policy directions that could be usefully investigated by RFMOs, both current RFMOs and those

¹ . In this paper, the term “rights” is used in the same sense as in the UN Fish Stocks Agreement and refers to “participatory rights such as allocations of allowable catch or levels of fishing effort” (Article 10(b)). It is a more general concept than the more precisely defined concept of property rights because participatory rights do not necessarily that imply property rights are conferred.

² International fisheries are defined in this paper as fisheries that exploit highly migratory and straddling stocks. The stocks occur within the boundaries of one or more coastal states and on the high seas and are exploited by the fleets of one or more coastal nations as well as the fleets of distant water fishing nations.

in the process of being established. It is aimed at generating discussion among policy makers about the issue of allocation processes. The paper begins by briefly reviewing the international legal framework governing international fisheries, the economic issues underlying the allocations, and the current state of play in the allocation regimes in RFMOs. The paper then takes a broader perspective on the allocation issue and examines the experiences of other resource sectors that have wrestled with the problem of allocating participatory rights amongst current and potential participants in their respective sectors. Two areas, in particular, face policy challenges similar to those confronting international fisheries: water resources; and greenhouse gases. A number of insights for the fisheries sector from these experiences, and from the recent experience in RFMOs, are then discussed in the last part of the paper. The paper then concludes with a number of policy questions that may merit further investigation.

It should be emphasised at the outset that the high level of diversity amongst RFMOs with respect to mandated stock coverage, number and composition of participants, historical development, and so on, means that there is not a “one size fits all” solution to the allocation issue. However, it is the intention of this paper to provide insights on the structure, design and implementation of allocation processes that can assist in the debate on solutions to the allocation problem across RFMOs.

2. The international legal framework

The management of international fisheries is governed by UNCLOS and the UN Fish Stocks Agreement (UNFSA). Articles 63(2) and 64 of UNCLOS require cooperation, directly or through RFMOs, between coastal States and States who fish in the region with a view to ensuring conservation of stocks that occur in the EEZ(s) of coastal States and the area beyond or adjacent to the EEZ(s). In the case of highly migratory stocks, there is the additional requirement that cooperation should promote the optimum utilisation of such stocks throughout the region, both within and beyond the EEZ of coastal States. Article 87 of UNCLOS provides that all States have the freedom to fish on the high seas. But, as pointed out by Lodge *et al.* (2007), that freedom is not absolute, but is conditional on other treaty obligations, including obligations under constitutive treaties of RFMOs, the duty of members and non-Members of RFMOs to cooperate on conservation and management.

The UNFSA strengthened the position of RFMOs as the primary institutional mechanism for the adoption of conservation and management measures for international fisheries. Article 8 of the UNFSA imposes a duty to cooperate through RFMOs by providing that only members of RFMOs or non-Members which agree to apply the conservation and management measures adopted by RFMOs can have access to the fishery concerned. The UNFSA also allows any State having a “real interest” in the fishery to become a member of the RFMO. Real interest is not defined in the UNFSA and remains a source of contention. It can be argued that real interest is not limited to States with a fishing history in the area, but may also include a general interest in the common good of conservation and management of a resource, although this is no agreement on this (Molenaar 2000; MRAG 2006). It is also noteworthy that the UNFSA avoids any explicit linkage between real interest and the allocation of fishing opportunities.

The UNFSA defines the functions of an effective RFMO, one of which is to “agree, as appropriate, on participatory rights such as allocations of allowable catch or levels of fishing effort” (Article 10(b)). Beyond that simple statement, neither UNCLOS nor the UNFSA provide any further guidance on allocation principles or processes. However, it is clear that any allocation process adopted by an RFMO must take into account, and be compatible with, other principles and provisions of the UNFSA. The key principles include:

- Article 7 on the compatibility of conservation and management measures between the coastal States and those in RFMOs, which implies that RFMOs should take account of the coastal State catches (but cannot, without the agreement of the relevant State, fetter coastal States’ sovereign rights under UNCLOS to exploit living resources within their EEZs, providing those rights are exercised in accordance with UNCLOS).
- Article 11 which provides a non-exhaustive list of criteria which should be taken into account when determining the nature and extent of participatory rights for new members of an RFMO, including: the status of the stocks and the level of current fishing effort; the respective interests,

fishing patterns and fishing practices of new and existing members; the respective contributions of new and existing members to conservation and management of the stocks; the needs of coastal fishing communities which are dependent mainly on fishing for the stocks; the needs of coastal States whose economies are overwhelmingly dependent on the exploitation of living marine resources; and the interests of developing States from the region in whose areas of national jurisdiction the stocks also occur.

- Articles 24, 25 and 26 which call for recognition of the special requirements of developing States and set out the objectives to be achieved from enhanced forms of cooperation between developed and developing States to meet the requirements. The special requirements arise as a result of (but not limited to): the vulnerability of developing States which are dependent on the exploitation of living marine resources to meet nutritional requirements; the need to avoid adverse impacts on, and access to fisheries by, subsistence, small-scale and artisanal fishers and women fishworkers, as well as indigenous people in developing States; and the need to ensure that conservation and management measures do not impose a disproportionate burden on developing States. Assistance to developing States is aimed at capacity building to develop their own fisheries, enable them in participating in high seas fisheries, and to facilitate their participation in RFMOs. The assistance can take the form of (but is not limited to) financial assistance, human resources development, technical assistance, technology transfer through joint venture arrangements, and advisory and consultative services. Note that nothing in the UNFSA gives developing States a *prima facie* right to an allocation of high seas fishing opportunities (Lodge *et al.* 2007, p. 95).

3. An economic perspective on the allocation problem

A considerable amount of effort has been devoted to analysis of the economic issues underlying the problem of quota allocation in international fisheries. This section presents a brief summary of the key points from the literature.³

Much of the analytical effort has focused on the development and application of game-theoretic models to derive the conditions under which self-enforcing cooperative agreements for international fisheries can be developed. The basic premise underlying the game theory approach is that agreement amongst States will only be reached when no State is worse off in acting cooperatively than it would be by acting individually. In the case of international fisheries, this agreement would need to be self-enforcing to be stable as there is no third party to ensure enforcement of the agreement.

Building on this premise, the key findings from the literature can be summarised as follows:

- An essential condition for stability is the perceived fairness and equity in the initial allocation. This is because, in the absence of the ability to freely trade national allocations, it only takes one participant to believe that it has not received an equitable share of the possible returns from the agreement to make it optimal for them to defect and break the cooperative agreement.
- No matter how “fair” the allocation is, effective enforcement is required, otherwise it would be optimal for participants to defect before others cheat, and reap higher returns (the Prisoners’ Dilemma). So the existence of equitable allocation schemes is a necessary, but not sufficient, condition to ensure the stability of long term agreements on sharing fisheries resources. If the integrity of allocations is not supported by well developed monitoring, control and surveillance measures, there may be limited incentive to comply with the allocation and other conservation and management measures.
- Optimal resource management over time will help to maximise the cooperative surplus, which is defined as the difference between the sum of payoffs to participants under a cooperative arrangement and the sum of payoffs under non-cooperation. The greater the cooperative surplus, the more participants have to lose from any collapse in cooperation.
- Maximising the cooperative surplus would also allow for the use of side payments, or “negotiation facilitators”, in ensuring that all participants could share in the increased economic returns from optimal resource management.⁴
- The larger the number of players, the more difficult it is to achieve a stable cooperative arrangement due to greater enforcement problems and difficulties in reconciling conflicting

³ . For more extensive surveys of the economics of high seas fisheries, see FAO (2002), Munro *et al.* (2004), Munro (2006), Hannesson (2007), .

⁴ . Maximising the economic returns from the fishery requires that the management preferences of the participant(s) placing the highest value on the resource predominate in decisions about resource use strategy.

management objectives. The role of sub-coalitions within a large number of participants is particularly important.

- The need for agreements to be “resilient” in terms of having the flexibility to respond to external shocks. This may require the use of side payments to keep participants from defecting in the face of external pressures on the resource stock (such as an El Nino event or climate variability; see Miller 2007). The resilience of many agreements may be hamstrung by the use of quantity allocations rather than proportional allocations (i.e. a share of a total allowable catch).

In the case of highly migratory, the issues raised above are exacerbated by there being a larger number of potential participants to an agreement, uncertainty over the nature of future participants (i.e. new entrants), the determination of “real interest” in a resource, and free-riding by non-participants to an agreement on the resource conservation efforts of participants.

The literature highlights the problem of new entrants is particularly vexing as there appear to be few viable options. Two options canvassed in Munro *et al.* (2004) were (1) setting aside quota for prospective new entrants when establishing an agreement, and (2) requiring proportional reductions in existing allocations to allow for new members. Both these options run into free-rider problems and can undermine the viability and stability of an agreement as States may rationally decide that the payoffs from non-cooperation exceed those from cooperation. An alternative option considered by FAO (2002) and Munro (2006) is to allow prospective new entrants to buy quotas from existing RFMO members in much the same way that quota is traded in a domestic fishery managed by individual transferable quotas (this is discussed further in Section 6), opening the door for the concept of tradable quotas in high seas fisheries.

4. Allocation in practice

MRAG (2006) provides a detailed survey of the experiences of established RFMOs in allocating fisheries resources under their purview. The key findings from the survey are shown in Table 1 and underscores the disparate ways in which quota is allocated in existing RFMOs. While this largely reflects the particular evolution of each RFMO, a number of common aspects emerge.

Basis for allocation

Historical catches provide the basis for allocations in most of the RFMOs, or participation in the fishery in the cases of IATTC and CCAMLR. This reflects the fact that, historically, a “fair” basis for allocation has often been regarded as zonal attachment to the stock or historical catch records of the coastal States and DWFNs. Historical catch is also easy to quantify objectively, compared to more subjective criteria such as those relating to the special interests of developing States.

Box 1. Criteria for allocation of total allowable catch or effort in the WCPFC

Article 10(3) of the WCPFC Convention states that “[i]n developing criteria for allocation of the total allowable catch or the total level of fishing effort the Commission shall take into account, inter alia:

- (a) the status of the stocks and the existing level of fishing effort in the fishery;
- (b) the respective interests, past and present fishing patterns and fishing practices of participants in the fishery and the extent of the catch being utilized for domestic consumption;
- (c) the historic catch in an area;
- (d) the needs of small island developing States, and territories and possessions, in the Convention Area whose economies, food supplies and livelihoods are overwhelmingly dependent on the exploitation of marine living resources;
- (e) the respective contributions of participants to conservation and management of the stocks, including the provision by them of accurate data and their contribution to the conduct of scientific research in the Convention Area;
- (f) the record of compliance by the participants with conservation and management measures;
- (g) the needs of coastal communities which are dependent mainly on fishing for the stocks;
- (h) the special circumstances of a State which is surrounded by the exclusive economic zones of other States and has a limited exclusive economic zone of its own;
- (i) the geographical situation of a small island developing State which is made up of non-contiguous groups of islands having a distinct economic and cultural identity of their own but which are separated by areas of high seas;
- (j) the fishing interests and aspirations of coastal States, particularly small island developing States, and territories and possessions, in whose areas of national jurisdiction the stocks also occur.”

An exception is the WCPFC Convention which is one of the first regional fisheries agreements to be adopted since the conclusion the adoption of the UNFSA. Article 10(3) of the Convention lists ten factors that must be taken into account in developing criteria for allocation of total allowable catch or total level of fishing effort (Box 1). These factors are, in fact, rather all-encompassing and include status of the stocks, level of existing effort, historical catches, the special needs of small island developing States, contributions of parties to conservation and management, compliance records, needs of coastal communities, the interests and aspirations of coastal States, and the special geographical situation of island States that dominate the region. Significantly, there is no guidance as to how these criteria are to be applied or their relative weightings. However, it is still early in the life of the WCPFC and the criteria are yet to be tested.

ICCAT has developed detailed allocation criteria following extensive consultation in 2000-01 (Box 2). These are very extensive and inclusive criteria and, on paper at least, provide a strong basis for determining allocation of fishing possibilities among existing and new members of ICCAT. However, the usefulness of the criteria is restricted by its very inclusiveness. No consensus has been reached within ICCAT on weighting and, as a result, the criteria have been used in a qualitative way to help inform allocation decisions on a stock by stock basis.

The criteria have been used since 2002 to help expand the membership of ICCAT, with most of the additional allocations being justified on the basis of existing fishing patterns and aspirations (MRAG, 2006). For example, in 2002, ICCAT made a 25t allocation of western Bluefin tuna to Mexico in recognition of its aspirations. Also in 2002, the rebuilding plan for northern swordfish included allocations not only to traditional parties but also to Morocco, Mexico, Barbados, Venezuela, Trinidad/Tobago, the UK, France, China and Chinese Taipei in recognition of their existing fisheries and aspirations. In the case of the eastern Atlantic and Mediterranean bluefin tuna stock, the multi-annual allocation exercise undertaken in 2002 included allocations for Libya and Morocco who had opted out of previous quota agreements on this stock due to dissatisfaction over initial allocation negotiations. It is worth noting that the total TAC for that stock was significantly in excess of the TAC recommended by the scientific body for ICCAT.

What is allocated

Allocations in existing RFMOs are quantity based, either in terms of tonnes or effort levels (number of vessels). No RFMO explicitly allocates rights as a proportion of a total allowable catch which might vary from year to year depending on environmental conditions; although a number of RFMOs (*e.g.* NAFO and NEAFC) operate with an informal proportional share system whereby the tonnages may vary from year to year but the relative country shares remain the same. While the allocation of a specific tonnage or effort allowance provides fleets with a degree of certainty regarding their fishing opportunities for the relevant fishing period, it may build in an element of rigidity in the allocation formula as member States seek to defend their allocations. It also tends to conflate the allocation decision with other conservation and management measures, in particular the total allowable catch (or effort level) for the fishery as a whole, and can result in tradeoffs occurring between decisions on individual country allocations and decisions on TACs and other conservation and management measures.

Frequency of allocations

Allocations are mostly done annually, although the IOTC has plans for a multi-year allocation program. There are also multi-year TACs and allocations for the rebuilding of stocks in some RFMOs. In NAFO, for example, there is a multi-year plan for Greenland halibut. In practice, the annual allocations do not vary significantly as changes have to be agreed by an RFMO's member States and, as a result, do not tend to move very far from year to year. In ICCAT, the eastern Bluefin tuna stock was subject to a multi-year plan in 2002, covering the period 2003-06. In general, however, there is a strong emphasis across RFMOs on the annual process of negotiating allocations for the coming year.

Box 2. ICCAT criteria for the allocation of fishing possibilities

I. Qualifying Criteria

Participants will qualify to receive possible quota allocations within the framework of ICCAT in accordance with the following criteria:

1. Be a Contracting or Cooperating Non-Contracting Party, Entity or Fishing Entity.
2. Have the ability to apply the conservation and management measures of ICCAT, to collect and to provide accurate data for the relevant resources and, taking into account their respective capacities, to conduct scientific research on those resources.

II. Stocks to Which the Criteria Would be Applied

These criteria should apply to all stocks when allocated by ICCAT.

III. Allocation Criteria

A. Criteria Relating to Past/Present Fishing Activity of Qualifying Participants

- Historical catches of qualifying participants.
- The interests, fishing patterns and fishing practices of qualifying participants.

B. Criteria Relating the Status of the Stock(s) to be Allocated and the Fisheries

- Status of the stock(s) to be allocated in relation to maximum sustainable yield, or in the absence of maximum sustainable yield an agreed biological reference point, and the existing level of fishing effort in the fishery taking into account the contributions to conservation made by qualifying participants necessary to conserve, manage, restore or rebuild fish stocks in accordance with the objective of the Convention.
- The distribution and biological characteristics of the stock(s), including the occurrence of the stock(s) in areas under national jurisdiction and on the high seas.

C. Criteria Relating to the Status of the Qualifying Participants

- The interests of artisanal, subsistence and small-scale coastal fishers.
- The needs of the coastal fishing communities which are dependent mainly on fishing for the stocks.
- The needs of the coastal States of the region whose economies are overwhelmingly dependent on the exploitation of living marine resources, including those regulated by ICCAT.
- The socio-economic contribution of the fisheries for stocks regulated by ICCAT to the developing States, especially small island developing States and developing territories⁵ from the region.

⁵ For the purposes of this document, the term “territories” refers only to the territories of those States that are Contracting Parties to the Convention in respect of those territories alone

- The respective dependence on the stock(s) of the coastal States, and of the other States that fish species regulated by ICCAT.
- The economic and/or social importance of the fishery for qualifying participants whose fishing vessels have habitually participated in the fishery in the Convention Area.
- The contribution of the fisheries for the stocks regulated by ICCAT to the national food security/needs, domestic consumption, income resulting from exports, and employment of qualifying participants.
- The right of qualified participants to engage in fishing on the high seas for the stocks to be allocated.

D. Criteria Relating to Compliance/Data Submission/Scientific Research by Qualifying Participants

- The record of compliance or cooperation by qualifying participants with ICCAT's conservation and management measures, including for large-scale tuna fishing vessels, except for those cases where the compliance sanctions established by relevant ICCAT recommendations have already been applied.
- The exercise of responsibilities concerning the vessels under the jurisdiction of qualifying participants.
- The contribution of qualifying participants to conservation and management of the stocks, to the collection and provision of accurate data required by ICCAT and, taking into account their respective capacities, to the conduct of scientific research on the stocks.

IV. Conditions for Applying Allocation Criteria

- The allocation criteria should be applied in a fair and equitable manner with the goal of ensuring opportunities for all qualifying participants.
- The allocation criteria should be applied by the relevant Panels on a stock-by-stock basis.
- The allocation criteria should be applied to all stocks in a gradual manner, over a period of time to be determined by the relevant Panels, in order to address the economic needs of all parties concerned, including the need to minimize economic dislocation.
- The application of the allocation criteria should take into account the contributions to conservation made by qualifying participants necessary to conserve, manage, restore or rebuild fish stocks in accordance with the objective of the Convention.
- The allocation criteria should be applied consistent with international instruments and in a manner that encourages efforts to prevent and eliminate over-fishing and excess fishing capacity and ensures that levels of fishing effort are commensurate with the ICCAT objective of achieving and maintaining MSY.
- The allocation criteria should be applied so as not to legitimize illegal, unregulated and unreported catches and shall promote the prevention, deterrence and elimination of illegal, unregulated and unreported fishing, particularly fishing by flag of convenience vessels.
- The allocation criteria should be applied in a manner that encourages cooperating Non-Contracting parties, Entities and Fishing Entities to become Contracting Parties, where they are eligible to do so.
- The allocation criteria should be applied to encourage cooperation between the developing States of the region and other fishing States for the sustainable use of the stocks managed by ICCAT and in accordance with the relevant international instruments.
- No qualifying participant shall trade or sell its quota allocation or a part thereof.

Source : ICCAT Recommendation 2001-25.

New entrants

There are three broad approaches taken in existing RFMOs to the issue of new entrants. First, in the long-established North Atlantic RFMOs, NEAFC and NAFO, the door has basically been closed to new entrants on the basis that stocks are fully allocated (although a minimal amount of quota is available for some stocks). In NAFO, for example, a resolution was adopted to guide the expectations of future new entrants with regard to fishing opportunities in the NAFO Regulatory Area. In essence, the guidelines state that, presently and for the foreseeable future, stocks managed by NAFO are fully allocated and that fishing opportunities for new Members are likely to be limited to new fisheries (stocks that are not currently allocated by TAC/quota control or by effort control) and the “Others” category under the NAFO Quota Allocation Table. In NEAFC, a small amount of redfish quota (0.3%) is set aside for cooperating non-contracting parties, otherwise the RFMOs resources are fully allocated.

Second, in some RFMOs, new entrants have been admitted without reductions in the quota allocated to existing Members. For example, Korea and Chinese Taipei were admitted to the CCSBT in 2001 and 2002, respectively, with existing Members retaining the previous level of quota. A quota pool of 900t was also set aside for non-contracting Parties in 2003, of which 800t was offered to Indonesia to encourage cooperation with the conservation objectives of the CCSBT. In the case of ICCAT, there has been a rapid expansion in the number of new members over the past decade with the number of parties doubling since 1995 (of which all are developing countries). In general, the expansion of the ICCAT membership has not been at the expense of quota allocations to existing Members. While in the case of IATTC, new developing country entrants are exempted from fleet capacity limits.

The third approach is exemplified by CCAMLR which simply discourages new entrants and restricts the allocation of fishing opportunities to existing Members of the agreement. This is achieved through the “catch 22” provisions of Article VII of the Convention which states that whilst any State can accede to the Convention, membership shall only be open to open whilst that acceding State is engaged in research or harvesting activities in relation to the marine living resources of the Convention area. However, only Members are able to undertake harvesting, thereby frustrating the ambitions of potential new Members.

Compliance as a criterion

All RFMOs have the ability to use compliance by Members as a criterion for determining future allocations. For example, where quota over-runs are identified in CCSBT and NAFO, the quotas for the offending Members are reduced in the following years. In other cases, sanctions and penalties are applied to vessels that violate conservation and management measures. This can involve being placed on a vessel list (CCAMLR) or suspension from the vessel registry (IATTC). Where a Member has been at fault, quota reductions (CCSBT) or penalties (ICCAT) can be applied.

Trade or transfer of quota

The ability of member States to trade and transfer quota in RFMOs varies significantly. Trading or selling of quota is not allowed in any of the tuna RFMOs, although quota exchange is allowed in ICCAT. The issue of trading quota is under consideration in the CCSBT. In other RFMOs, the trade and transfer of quota is allowed but rarely used. This issue is discussed further in Section 6.

5. Experience from Outside the Fisheries Sector

As was noted in the introduction, other sectors have also struggled with the problem of allocating participatory rights to current and potential participants in their sectors. This section examines the allocations experiences in two areas: water; and carbon dioxide.⁶ These policy areas have characteristics and face policy challenges that have some resonance with the fisheries sector in relation to the allocation problem. It should be noted at the outset that it is not the intention in this paper to provide a detailed review of the allocation and distribution processes in each of these other areas.⁷ Rather, the key insights from the experiences will be used to draw some potential insights for allocation mechanisms in international fisheries. It should also be emphasised that the analogies between the cases is not perfect and that there are significant differences in the situations and challenges faced by each area. However, there is sufficient commonality in terms of policy challenges and approaches that there is benefit in examining whether any of the policy solutions can be useful in addressing the issue of allocating fisheries resources in current and future RFMOs.

In reviewing the experiences of the other sectors, the following key policy issues of particular relevance to the fisheries sector are addressed: basis for allocations; balancing of interests of various groups; dealing with new entrants or expansion; ensuring compliance; and tradability of rights.

⁶ . Other sectors such as timber, minerals, and oil and gas are not discussed in this paper. While they are also common property resources, they generally lack the multilateral dimension of international fisheries and are characterised by relatively well-defined and enforceable property rights that considerably simplify the allocation problem.

⁷ . More extensive discussions of these other sectors are provided in Annexes I and II to this paper.

Table 1. Summary of Major RFMO Approaches to Allocation

Issues	ICCAT	CCSBT	IOTC	IATTC	NAFO	NEAFC	CCAMLR
Data used in making allocation decisions	Stock assessment, historical catch, bycatch	Original allocation basis unknown. Currently based on stock assessment, historical catch.	Gross registered tonnage, but catch data being used to prepare allocation plans	Vessel carrying capacity	Stock assessment, historical catch	Historical catch (and stock distribution in some cases)	Based on applications to fish
Balancing interests of coastal States and distant water fishing nations	Negotiated allocation criteria (balance of interest on a stock by stock basis)	Negotiated on balance of historical catch	Capacity restricted to protect bigeye stock. Preparation of a multi-year plan for allocations.	Longline negotiated on basis of historical catch. Purse seine fish carrying capacities frozen at 2002 levels	Negotiated settlements.	Herring, mackerel and blue whiting are allocated first by coastal States which determine a high seas proportion given to NEAFC. NEAFC allocates this high seas portion to non-coastal States.	TACs are determined by CCAMLR for areas under national control, but allocation not specified. Coastal States have right of veto.
Accounting for new entrants and aspirations of developing country members	Set aside portion of quota for developing countries. Small unassigned albacore quota pool. BFT quota offered to UK and France to join ICCAT.	Small unassigned quota pool in 2003. Korea and Chinese Taipei offered allocation as Members.	Allowed smaller fleets to expand within a development plan submitted to IOTC	Exemption for developing fleets from capacity limits on major fleets.	Quotas fully allocated, but non-Members can accede to NAFO. Limited fishing opportunities for new members within "Others" categories. ^a	Small quota (0.3%) for redfish (the only fishery primarily controlled by NEAFC) set aside for cooperating non-contracting parties	Harvesting restricted to current Members. New entrants discouraged.
Cases where compliance is used to determine allocations	Allocations for non-Contracting Parties to join or gain cooperating status. Notifications and sanctions for violators. Penalties for violating Members.	South African allocation reduced due to non-compliance. Japanese allocation reduced for 5 years following overcatch.	Compliance committee reviews applications for cooperating status	Removal of a vessel from register of fishing vessels, affecting the fishing capacity of a nation.	Quota reductions in subsequent periods to deal with over-runs. ^b	Nation can become cooperating non-contracting party if compliance record is good and has not engaged in IUU fishing.	List of IUU vessels. These cannot participate in exploratory fishery. Poor compliance by existing vessel may lead to being placed on IUU list.
Tradability or transferability of allocations between Parties	No Member may sell or trade quota. Exchanges are allowed.	No trade or transfer allowed. Under consideration.	No trade or transfer allowed. ?	No trade allowed.	Quota transfer allowed.	Quota transfer allowed.	Trade or transfer of quota not explicitly prohibited, but not undertaken.

Source: a. The "Others" category is also used by those Contracting Parties that do not have a specific quota for that particular stock. b. The NAFO Conservation and Enforcement measures do have this provision but it has not been used to date. Source: Based on MRAG (2006, p. 29) and Serdy (2007).

5.1 Water resources

The allocation of water resources between users has many similarities with the allocation of rights to exploit fish stocks. Water is a highly mobile, renewable (but potentially exhaustible) resource that often crosses international or legislative borders, raising complicated issues of control, jurisdiction and sovereignty. Water availability is often subject to a degree of uncertainty due to external factors and there is a growing scarcity of, and increasing competition for, water in many countries. The search for an equitable and efficient solution to allocation within and between user groups (such as farmers and towns) is hampered by the existence of historical usage rights that are often deeply embedded in the political systems of countries. It is also hampered by the problem of directional externalities within a water system whereby the activities of one user (individual, group, or country) will have an impact on other users elsewhere in the system. In addition, countries that access the water flow first may fear that an agreement to share the water may limit their political and economic options in the event of a water shortage (Giannias and Lekakis, 1997).

There are also some crucial differences. For example, it is much more technically feasible to measure water stocks and flows (at least for surface water, less so for groundwater) than it is to measure fish stocks. At the national level, rights and allocations can be legally enforced through a country's judicial system (similar to domestic fisheries within EEZs). In contrast, at the international level, there is a need to develop self-enforcing agreements as there is no international enforcement agency. At the same time, the problem of new entrants does not arise at the international level as the number of States sharing a water system is fixed (although it may well be an issue at the national level). The policy solutions to the allocation problem therefore differ significantly between the international and national levels.

International level

At the international level, the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses, adopted in 1997, provides a framework for negotiations between countries sharing an international water resource. Although the Convention is not yet in force (it has only 26 of the necessary 35 signatures), it provides an indication of how the international community approached the allocation challenge in this case. The Convention defines the obligation not to cause appreciable harm and the right to reasonable and equitable use as co-equal criteria for the allocation of water between riparian countries. As is the case with UNCLOS, UNFSA and the RFMO conventions, these criteria have to be translated into an operational algorithm through negotiations between countries. In principle, the main criteria advocated for allocating water are based on either country's relative shares of the catchment area or the relative size of their populations (van der Zaag *et al.* 2002). This is similar to the historical catch and zonal attachment criteria that predominate in the case of international fisheries.

In practice, international water resources tend to be managed on a bilateral or multilateral basis through the establishment of treaties between countries sharing the water system, almost all of which were established prior to the adoption of the UN Convention.⁸ Examples of countries developing agreements to allocate water resources

⁸ The externality problem has eclipsed the allocation problem in some cases, leading to a completely different strategic game being played between countries sharing a water catchment area. Downstream countries can use their

are largely confined to the world's major river systems (Giannias and Lekakis, 1997; Kliot *et al.* 2001). Some of these treaties and agreements are designed to allocate water between States (*e.g.* the Indus, Nile, Ganges and Jordan). The agreements tend to be very general and call for the optimum use of shared water resources without providing practical guidance on allocation which is then decided in political negotiation. The allocation of water between countries is generally a negotiated outcome based on geographical, political and historical criteria and do not vary significantly from year to year.

One of the features of negotiations on these agreements and treaties is the strong emphasis on an equitable distribution of resources. However, there is little agreement on what is meant by equity. Moreover, the international law on international watercourses contains a number of different and conflicting principles which are espoused by watercourse states depending on their position on the watercourse.⁹ The establishment and assignment of rights is then inevitably bound up with the distribution of power among states along the watercourse. Indeed, in most cases, the basis for allocation between countries is mired in political and social history and reflects a political outcome rather than anything based on measurable criteria (Just and Netanyahu 1997). As a result, their main functions of these agreements tend to be maintaining the status quo, avoiding conflict, and providing a dispute settlement venue (Kliot *et al.* 2001).

National level

There is a great deal more experience of dealing with the allocation problem in the water sector at the national level. As in the case of international water resources, the distribution of water amongst users and user groups within each country is often embedded in existing social, political and industrial structures. The emphasis in the initial allocation of water rights has generally been on the existing historical patterns of usage and riparian rights of users, reflecting a need to ensure a perception of equity in distribution among user groups. However, many governments are placing an increasingly greater premium on making the most efficient of scarce water resources. This requires that institutional structures be found that create incentives for users to allocate water resources to where they have the highest value to society.

The development of market-based instruments to complement or replace existing regulatory and planning based management systems are making a significant contribution to achieving this in a number of countries (Productivity Commission 2006; Weber 2001). Water markets are well-established in Australia, South Africa, the western states of the United States and Chile and are under consideration or being trialled in other countries. Market mechanisms are broadly defined as instruments that encourage behaviour through market signals rather than through explicit directives. Compared with traditional regulatory approaches, where suitable, they offer greater flexibility to participants, and have the potential to lower compliance costs and provide dynamic incentives to reduce

political power to thwart developments in upstream countries that may have an impact on the quality and quantity of water they receive. This is particularly the case, for example, for international water courses in the Middle East (Yetim 2002).

9. Different principles can be used as a basis for determining international water rights: absolute territorial sovereignty in which that each state has absolute sovereignty over the water located in its territory; absolute territorial integrity in which an upper watercourse State is under an obligation to not cause a change in the natural integrity of the resource without the consent of downstream users; and optimal and equitable utilisation in which each watercourse state has a right to use the waters of international watercourses without causing significant harm to other watercourse state. This latter principle is most widely advocated within the international community and is reflected in the UN Convention.

future costs. The use of market mechanisms also helps to improve the transparency of the tradeoffs being made between various uses, and sharpens the incentives for efficient use.

Australia is arguably the most advanced in terms of developing sophisticated water markets to improve water management, having first established a permanent water trading scheme in 1983 in South Australia. During the 1990s, national and state government attention increasingly focused on the problems of water resource degradation, security of supply for irrigators and population centres, costs of enhancing or refurbishing water supply infrastructure, and environmental flows (Quinlivan, 2006). Australia has done a lot of thinking about how to achieve improved conservation and use of its scarce water resources. The 2004 National Water Initiative provides a blueprint for a cooperative national approach to water management with the objective of developing “a nationally-compatible, market, regulatory and planning based system of managing surface and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes” (COAG 2004).

The key features of the Australian experience can be summarised as follows:

- Markets for trading water entitlements (a prescribed, defined right to an amount of water, sometimes known as permanent water) and seasonal allocations (a volume of water that an irrigator is allowed to access in a particular season, or temporary water) are well-established within major irrigation areas and expanding into other areas, including a pilot scheme to allow trading between States.
- Statutory provision for environmental and other public benefit outcomes, including the use of markets to help allocate water use towards environmental outcomes through the purchase of entitlements and seasonal allocations to address over-allocation of water resources.
- Attempts to improve the clarity around the assignment of risk arising from future changes in the availability of water for the consumer groups (irrigators, towns, etc)
- Unbundling of the water entitlements, particularly the separation of water rights from land title, in order to remove barriers to the more efficient use of water, increase transparency, reduce transactions costs, and allow the development of more sophisticated trading mechanisms (such as option rights).
- Shift towards a holistic “whole of river” approach to matters such as water allocation, operational management, and monitoring of trends in river health, as well as to ensuring that institutions are coordinated, accountable and responsive.

The western states of the United States have also had a long history of using water markets to improve the allocative efficiency of water use (National Research Council 1992). When water trades in the western United States, either a water right is sold or use of the right is leased for a period of time. Ownership of a water right conveys access to a specified quantity of water in perpetuity, subject to conditions such as priority, timing and location. The doctrine of prior appropriation underlies most water laws across the western United States (Brown 2006). Under the prior appropriation doctrine, water rights are based on “first in time, first in right”.¹⁰ This provides for clearly defined and transferable water rights in which the concept of “priority date” is significant, although the states differ in how they implement the doctrine and administer the water rights systems.

¹⁰. In the eastern United States, in contrast, water rights are based on riparian rights, derived from English common law.

One outcome of prior appropriation is a lack of homogeneity in the rights assigned to water users. In order to deal with the stochastic nature of water flows and, priorities are assigned to water rights from junior rights up to senior rights, with water deliveries to holders of senior rights having priority. In some cases, such as mutual ditch companies and water conservancy districts, a different approach based on proportional rights is used within the prior appropriation doctrine (Brown 2006). With such rights, all users have equal priority to a water entitlement according to their quota of the total water availability which will vary from year to year. Organisations based on proportional rights manage nearly half the water in the western United States.

Several features of the Australian and western United States experience are potentially relevant to the fisheries sector. First, a two-tier approach to the allocation of rights in some jurisdictions in Australia and the United States provides a mechanism for combining certainty with an element of flexibility. For example, in New South Wales in the southern Murray-Darling Basin, irrigators hold entitlements that define access rights to a specific quantity of water each irrigation season (Peterson *et al.* 2004). The supply reliability of these entitlements varies and depends on storage capacity and the volume of entitlements distributed. In New South Wales, entitlements are for 15 years and are either “high security”, which are likely to be met between 96 and 99 years in 100, or “general security”, which are likely to be met around 75 years in 100 and only after high security entitlements have been met. In each year, therefore, the total volume of water available is shared among water entitlement holders according to their priority and entitlement to the resource.

Second, the efficiency of water use is clearly enhanced by the trading of water rights. Trades can occur on both a permanent and temporary (or lease) basis. In the western United States, considerably more rights are leased on a short term basis than are sold permanently. Between 1990 and 2003, around 27.8 million ML of water was traded on a lease basis while 1.4 million ML was sold (Brown, 2006). This is largely because of the lower transactions costs generally involved in leasing and the fewer legal and administrative constraints that apply relative to permanent sale. In Australia, irrigators trade primarily with other irrigators in their irrigation district and the trade is predominantly in seasonal water allocations. Markets for trade are well-established with electronic exchanges and brokers facilitating trade. In 2000-01 to 2002-03, aggregate trade in seasonal allocations in the three major irrigation districts represented, on average across the three districts, 11-20% of allocations (Peterson *et al.* 2004, p. 8).¹¹ In contrast, trade in permanent entitlements represented around 1-2% of annual total allocations, averaged across the three districts.

Third, the separation of water entitlement from land title has, in the case of Australia, lowered the transactions costs of trading water, increased transparency, and improved the flexibility of entitlement in managing their business operations (Pigram and Musgrave 2006). Further unbundling of water entitlements to allow for separate rights for each of the components of the water entitlement (*e.g.* water allocations, delivery capacity rights, site-use licences) is being pursued where feasible (Quinlivan 2006; Thompson 2006; Productivity Commission 2006).

Finally, the issue of new entrants within each user group (*i.e.* irrigators, towns, etc) is dealt with almost entirely through the market in both Australia and the United States, with

¹¹. The three districts are the Murrumbidgee Irrigation Area, the Murray Irrigation district and the Goulburn-Murray Water district.

new entrants being required to acquire water entitlements through purchase from existing holders. However, the case of shifting allocations between user groups or of allowing new user groups to access a water system is less straightforward. In particular, the increasingly politically sensitive issue of ensuring environmental flows is somewhat (but not perfectly) analogous to the new entrant problem in international fisheries.¹² Providing environmental flows to a river or lake system in times of water shortage requires that the allocations of other users be reduced, at least temporarily. Environmental flows can be met either through direct command and control mechanisms, investing in infrastructure to gain additional environmental flows, or purchasing entitlements through the market.

5.2 Carbon allocation and trading

The challenge of developing international agreement for limiting greenhouse gas emissions has many parallels with policy challenges inherent in managing international fisheries. Both require international collective action in order to address an international common property resource dilemma. Both are therefore multilateral environmental problems, involving large numbers of players, each of whom has different objectives, development strategies and resource endowments. As in the case of international fisheries, any international agreement to limit greenhouse gas emissions must be self-enforcing in the face of a lack of a supra-national body to coerce countries to provide an efficient level of environmental protection. Coupled to this, there are uncertainties over the size and timing of the costs and benefits of abatement and the strong incentive for free-riding. The key difference lies in the dimension of the problem as there are no truly global fish stocks; even highly migratory fish stocks are confined to a corner of the world's oceans. Greenhouse gases, in contrast, are a uniformly mixed air pollutant and will affect the global atmosphere irrespective of the location of the emissions.

Policies to reduce emissions of the main greenhouse gas, carbon dioxide (CO₂), have been debated at length in many national and international forums over the past couple of decades. There has emerged a strong recognition that market-based mechanisms are likely to provide more efficient means for achieving reductions in CO₂ at least-cost than command and control regulation (see, for example, Ekins and Barker 2001; Stern 2007). Much of the debate in the theoretical literature, in applied analysis and in international negotiations (such as Kyoto) has focused on the use of carbon taxes and carbon emissions trading programs. The concept and practice of carbon trading schemes has particular relevance to international fisheries in that a cap on emissions (or, in fisheries, catches) is put in place, and rights to emit (or catch fish) are allocated by some means amongst parties to any agreement. However, as was seen in Section 4 above, there is very little trading undertaken in fishing entitlements at the international level. The parallels are stronger at the domestic level where fisheries based on individual transferable quotas are essentially cap and trade systems, as in the case of carbon trading.

International level

At the global level, the Kyoto Protocol provides the international framework for a world greenhouse gas trading scheme, although the scheme has not been fully

¹². An environmental flow is defined as a water regime provided within a river, wetland or estuary to improve or maintain ecosystems and their benefits where there are competing water uses and where flows are regulated (Productivity Commission 2006, p. xviii).

implemented as yet (the treaty itself came into force in 2005). In broad terms, the treaty allows nations that emit less than their quota of greenhouse gases to be able to sell emission credits to other nations who require additional quota. This applies only to Annex 1 countries (composed primarily of developed countries) that have ratified the Kyoto Protocol.

The initial allocation of greenhouse gas emission targets was done on the basis of mandatory targets ranging from -8% to +10% of the countries' individual 1990 emissions levels (UN Framework Convention on Climate Change n.d.). The objective is to reduce overall emissions of such gases by at least 5% below existing 1990 levels in the commitment period 2008-2012, with the target reductions varying from nation to nation. Under the Protocol's system for the accounting of targets, the amount to which an Annex 1 Party (with a commitment inscribed in Annex B of the Kyoto Protocol) must reduce its emissions over the five year commitment period (known as its "assigned amount") is divided into units each equal to one tonne of carbon dioxide equivalent. These assigned amount units provide the basis for emissions trading. Trade in the assigned amount units are supplemented by trade in other carbon credits generated under the additional flexibility mechanisms developed under the Kyoto Protocol: Emission Reduction Units from Joint Implementation projects, Certified Emission Reductions from Clean Development Mechanisms, Removal Units from Sinks projects in Annex 1 countries.¹³

The Kyoto Protocol represents the outcome of long negotiations over, amongst other things, the respective roles of developed and developing countries in addressing climate change. Balancing the interests of these two broad groups in achieving an agreement has required careful balancing of targets, commitments and institutional mechanisms. The use of flexible instruments such as Joint Implementation and the Clean Development Mechanism helped to provide an incentive for countries to participate in the agreement. Indeed, some mechanisms of the Protocol had sufficient support that they were set up even before the Protocol entered into force. This was the case, for example, with the Clean Development Mechanism through which developed countries can partly meet their binding emissions targets through credits earned by sponsoring greenhouse gas reducing projects in developing countries. The effect of such flexible instruments is that they better align incentives towards the desired objectives through the effective and innovative use of side payment-type mechanisms.

Incentives to maintain the agreement are aided by the Kyoto Protocol compliance mechanism which is designed to strengthen the Protocol's environmental integrity, support the carbon market's credibility, and ensure transparency of accounting by Parties to the Protocol. A dual approach is taken to ensuring compliance. On one hand, advice and assistance is provided to parties in order to promote compliance and provide an early warning system for potential non-compliance with emissions targets and methodological and reporting commitments (particularly the carbon accounting system that has been agreed by Parties). At the same time, non-compliance where it has been determined that a Party's emissions have exceeded its assigned amount attracts penalties in the form of a declaration that the party is in non-compliance and the Party having to make up the difference between its emissions and its assigned amount, plus an additional deduction of 30%. The Party must also submit a compliance action plan and is not eligible to participate in emissions trading until it is reinstated.

¹³. The value of the project-based transactions in 2005 was USD 2.8 billion, with 95% being generated through the Clean Development Mechanism (Capoor and Ambrosi 2006).

In summary, while the Kyoto Protocol is in its relatively early stages and many of the mechanisms (especially trading and compliance) are yet to be fully implemented and tested, the fact that agreement was reached on a number of key issues provides a few insights for the fisheries sector. In particular, allocation of emission allowances and setting of targets meets only part of the challenge. The focus on using flexible mechanisms to meet the targets in a cost-effective way, through trading, joint implementation, etc, helped to encourage Parties to come to agreement and improve the range incentives to join the agreement. The use of more flexible mechanisms in international fisheries agreements may hold similar attractions in trying to find innovative ways to expand the cooperative surplus and allow for side payments to be made in one way or another. A prime example would be the use of trading mechanisms in fishing rights allocations between nations that are party to an international fisheries agreement. At the same time, strong compliance measures linked to sanctions on access rights and backed up by a credible transparent reporting system are required. Such sanctions would have even greater effect if the rights themselves had a market value attached, as would be the case if they were traded.

National/regional level

An increasing number of national and regional carbon trading schemes have been implemented or are planned. Active carbon trading schemes are in place in Australia (New South Wales Greenhouse Gas Abatement Scheme), the United States (Regional Greenhouse Gas Initiative), the United Kingdom (UK Emissions Trading Scheme), and the European Union, with the latter's Emissions Trading Scheme being by far the largest and most ambitious scheme. Many other countries are in the process of considering, planning or implementing carbon trading schemes, including New Zealand, Canada, Japan, China, Korea and Norway. Companies such as BP and Shell have undertaken voluntary emission reduction through the use of internal trading schemes. The US Chicago Climate Exchange runs a voluntary cap-and-trade for all six greenhouse gases.

Each of the current and proposed schemes differs in a wide range of operational details, but the broad thrust and conceptual mechanics are the essentially the same. The predominant method for allocation of allowances used in schemes currently in place is one of free allocation based on historic emissions (known as "grandfathering"). Auctions are able to be used for part of the allocation process in some schemes. For example, countries have this option under the European Union Emissions Trading Scheme (EU ETS), although only Denmark and the United Kingdom have taken it up. It is also feasible that some allowances could be allocated directly to groups that are disproportionately affected by the costs of a cap-and-trade system (Kruger, 2005).

The issue of new entrants to the carbon market is problematic. For example, should a company wishing to develop a project that emits greenhouse gases (such as a new power station) be required to purchase carbon allowances in the market? Or should it have a free allocation of carbon allowances, as other established companies had received? It can be argued that the denial of free allowances to new sources discriminates against the new sources, even if they may be less-greenhouse gas intensive than existing sources.

Within the EU ETS, there is a set-aside of allowances specifically for new entrants and allowances from these reserves are usually provided on a first-come, first-served

basis.¹⁴ Some EU member States (*e.g.* Poland and Italy) plan to purchase allowances from the market for new entrants if their new entrant reserves are oversubscribed. There is, however, scope for companies in some countries to generate carbon credits through national level schemes similar to Joint Implementation and the Clean Development Mechanism under the Kyoto Protocol. The EU is currently considering how to ensure that such mechanisms available within its scheme can be efficiently linked to its Kyoto obligations.¹⁵

In summary, national and regional efforts to cap greenhouse gas emissions have focused on creating flexible mechanisms to enable emission targets to be met at least cost. The allocation of emission allowances, while important in altering the pattern of wealth distribution, is only one part of the policy package. Allocation goes hand in hand with the use of emissions trading schemes in order to shift the incentives of firms in meeting targets, and equating the marginal cost of abatement across the (regulated) economy. Capping emissions without allowing trade in emissions would represent no gain in efficiency over command-and-control regulation.

5.3 Summary

It is clear that the international and national experiences in designing institutional mechanisms to efficiently and equitably allocate water resources and cut greenhouse gas emissions have parallels with many of the policy challenges facing the allocation of rights in international fisheries. These experiences can inform the debate on international fisheries arrangements; not only in the way in which rights are allocated, but also in the way those rights are then able to be used within the arrangement to improve the prospects for a stable cooperative outcome. Table 2 provides an overview of the key findings from the review of experiences in the other sectors in sections 5.1 and 5.2.

The fundamental lesson from the experiences in the water and greenhouse gas policy areas is that a cooperative agreement is more likely to be stable and successful if it contains flexible mechanisms that help to better align incentives of participants with the desired outcomes. Expanding the scope of the negotiations to encompass a wider range of possible institutional arrangements can enlarge the potential for agreement to be reached. Importantly, these other policy areas rely heavily on a combination of regulatory approaches and market mechanisms, in particular cap-and-trade systems, to ensure that objectives are met. In contrast, market mechanisms have not been a feature of negotiations on international fisheries to date. Rather, decisions on the initial allocation of participatory rights have been the focus of negotiations, with less emphasis on the need to design flexible institutional mechanisms that allow the optimum use to be made of the resource once it is allocated amongst participants.

^{14.} The most common allocation method for a new entrant is to base allocation on general emission rates for a sector or product type, and forecasted activity of the new entrant.

^{15.} In contrast, the United States SO₂ program has a very limited new-entrant set-aside and allows retiring entities to retain their allowances.

Table 2. Summary of Allocation Principles in Other Sectors

Issue	International water resources	National water resources	Greenhouse gases (Global)^a	Greenhouse gases (National/regional)
Basis for allocation	Negotiated bilateral or multilateral agreements, generally based on historical and geographical criteria	Generally historical riparian rights initially, then traded amongst participants within the water system	1990 emission levels in Annex 1 countries	1990 emission levels, some auctioning of allowances
Balancing interests of various groups	Political negotiation, equity concerns primary factor	Initial allocation tends to be based on historical rights, rights traded thereafter. Emphasis on efficiency of water use	Currently subject to global debate, particularly between developed and developing countries	Initial allocation on historical emissions, trade thereafter
Dealing with new entrants or expansion	Not necessary as fixed number of countries in a water system	Generally through buying water rights in the market, otherwise administrative allocation (e.g. for environmental flows)	Generally through purchase of allowances or allocation of credits under Clean Development Mechanism, Joint Implementation.	Allocations for new entrants set aside under EU ETS. Some States to buy allowances for new entrants. Also possibility to purchase allowances in market.
Using allocation mechanisms to improve compliance		Rights generally conditional on maintaining good compliance record. Compliance eased as enforcement is undertaken through legal system.	Problem of designing a self-enforcing agreement as there is no international enforcement agency. Kyoto compliance mechanism of transfer of 1.3 times the shortfall plus suspension from trading	Primarily financial penalties. Compliance eased as enforcement is undertaken through legal system.
Tradability	Undertaken in limited cases, no pricing involved	Generally fully tradable within the water system	Fully tradable	Fully tradable
Examples	Major river basins; Colorado/Rio Grande, Great Lakes,	Australia, western United States	Kyoto Protocol	Australia, United States, EU, United Kingdom

a. As no international systems are in place for carbon allocation and trading, the summary here is based on recent analysis of the design and implementation of potential global carbon allocation and trading schemes.

Source: OECD

6. Options for improving allocation in international fisheries

The review of existing policies and challenges in the allocation of fishing rights within RFMOs and the review of allocation experiences in two other sectors provides a number of avenues that could be usefully explored in debating ways to improve the allocation process in RFMOs. While, as noted in the introduction, there is no unique solution due to the varied nature of RFMOs, there are sufficient common elements across RFMOs that allows some broad policy questions to be raised and discussed. Underlying these issues is the role of flexible mechanisms in achieving RFMO goals on participation and processes for resolving disputes over allocations. There is also a need to understand the role of economic efficiency in international fisheries as this will fundamentally alter the potential gains to all parties from cooperation. This has not been discussed at any length in previous work on allocations and RFMOs more generally.

This section raises a number of issues that may help the dialogue on allocating fishing rights, especially in those cases where rights in one or more fisheries remain unallocated. They cover: how to address limitations in the use of the various bases for allocation; any potential role for independent review of allocation decisions and disputes; options for new entrants; improving economic efficiency in RFMOs; tradability of rights, innovative rights structures; and durability of rights. Many of these are inter-linked, and there may be benefit in understanding how they may together promote potential avenues to improve the incentives for stable cooperative arrangements. For example, economic efficiency in international fisheries may be considerably enhanced if some form of tradability of rights was introduced.

Addressing the limitations in the historical basis for allocation

It is clear that historical criteria are the easiest to use as a basis for allocation because it is the simplest measure to objectively quantify, relative to more subjective criteria. It is also clear that it is politically difficult to move beyond the use of historical criteria as a basis for determining the initial allocation of resources or emissions, especially where allocations are already entrenched. This is reflected in the fact that international negotiations on water use, greenhouse gases or fish resources actually take place at two levels: between countries at the multilateral level; and between users within the individual countries. These two levels of negotiations are inextricably linked and, as a result, criteria such as riparian rights or prior appropriation in the case of water, or historical greenhouse gas emission levels, or catch history in fisheries, tend to carry more weight when considering other possible allocation options.¹⁶

¹⁶. Alternative allocations based on output or population have not realistically been considered in the context of water, greenhouse gases or fisheries. The concept of water as a human right has been enshrined in the Millennium Development Goals, which may shift the focus to other criteria such as the needs of disadvantaged communities..

However, using the historical basis as the key criterion (even implicitly) in allocating fishing rights can create perverse incentives for potential new members. Experience has shown that potential Members to an RFMO may delay or defer discussions about joining the RFMO until they have developed a capacity to participate in the fishery that is commensurate with their aspirations and their perceptions of what might be a fair share of the TAC. (Lodge *et al.* 2007, p. 41).

The use of lists of qualitative criteria for allocation in RFMO convention texts is expanding and there may be a need for these to be elaborated upon with the development of explicit, transparent and quantitative allocation criteria. Otherwise, the default allocation position will inevitably be historical catch, irrespective of the other criteria in the lists. Attaching weightings to the criteria is one way forward. However, this would require extensive negotiations on the actual weightings and would need to be supported by a process for eliciting, modifying and reconciling countries' preferences.

Caddy (1996) develops such a framework based on multi-objective decision-making techniques. A key feature of the framework is the distinction between the proposal of technical factors (i.e. criteria) by parties to the negotiations, their quantification for each party (best accomplished by an independent review panel), and the relative weightings given to each technical factor, decided by negotiation. Such a separation of tasks may help to improve the integrity and acceptance of the outcome, provided all interested parties agree on the process at the outset. The issue of an independent evaluation of factors helps to focus attention on the weightings rather than the degree to which particular countries meet particular criteria.

Separating allocation from other conservation and management measures

One of the key features of the allocation experiences from both water and greenhouse gases is that there is a clear separation between allocation decisions on one hand and other conservation and management measures on the other hand. In particular, the total allowable drawdown of water (total water entitlement) or the cap on greenhouse gas emissions is determined separately and independently from decisions about shares allocated to individual countries.

In the fisheries context, this equates to a separation between the determination of the TAC or total allowable effort in an RFMO and the allocation of quota or effort rights across contracting parties. Introducing proportional allocations as the explicit basis for distributing quota amongst Members of an RFMO would be a step in this direction. As noted above, a focus on negotiating over allocations of tonnages risks lock in of specific TACs for contracting parties and RFMOs, making it difficult for countries to shift in response to exogenous changes. Such a reduction in flexibility and responsiveness could be critical when timely decisions are required to address resource concerns.

Ensuring that the process for determining the TAC or total allowable effort level was sufficiently independent would be a necessary prerequisite for such a separation to be effective. There is a range of models for the development and implementation of scientific advice across the RFMOs. Many RFMOs employ a "national scientist model" of scientific assessment and advice. Such a model can replicate many of the outcomes of an independent review as the national scientists act as an internal peer review on the research that is carried out within the scientific arm of the RFMO.

Some RFMOs have instituted mechanisms designed to improve the independence of the scientific advice and better manage the risks associated with stock evaluations and

advice. In the CCSBT, for example, it was recognised that there is a need to separate the technical evaluation and advisory roles of its Scientific Committee. A subcommittee (the Stock Assessment Group) undertakes the technical work of stock assessments while the Scientific Committee operates as an advisory body to the Commission, including making recommendations on the conservation, management and optimum utilisation of SBT. In addition, both the Stock Assessment Group and the Scientific Committee have independent Chairs drawn from outside the Parties to the CCSBT (currently both Chairs are from the US), and an Advisory Panel to the Scientific Process of CCSBT provides external input to the stock assessment and scientific processes (and is comprised of nationals from non-CCSBT nations (currently Argentina, UK and US)).

Independent review of allocation decisions

At the moment, no RFMO has in place a specific procedure for allowing an independent review of allocation decisions. Some RFMOs, such as ICCAT, have Review Panels that decide on allocations for specific stocks, but these are constituted of Member country representatives and are an extension of the general ICCAT decision-making arrangements.

Independent review of allocation decisions would also require Members to agree on the review process. There already exist objection and dispute settlement mechanisms in RFMOs, albeit with varying mechanisms and mandates. Disputes over allocations are generally outside the mandates of dispute settlement procedures, which are usually focused on addressing concerns over conservation and management measures. However, it may be worth exploring the extent to which such mechanisms could be used to address allocation disputes without inadvertently creating perverse incentives for participants to use the procedures to undermine the conservation objectives of the RFMOs. For example, as part of its recent reforms, NAFO instituted a dispute settlement mechanism under which a Contracting Party is able to file an objection to a conservation or management measure and must provide an explanation for the reasons for the objection and state what alternative measures it proposes to take. The objection can then be referred to an independent ad hoc panel which will then review the objection and the alternative measure and make a recommendation to the NAFO Commission on whether or not the explanation provided by the Contracting Party is well founded. The dispute settlement mechanism places an extra burden on individual parties that do not want to implement Commission decisions and uses impartial review panels and dispute settlement procedures, thus preserving the sovereign rights of Contracting Parties, while ensuring that the processes for resolving objections and disputes do not undermine either the objectives or the functioning of the Convention.

Rights tend to be distributed free of charge

In the three sectors discussed in this paper, the participatory rights that are allocated are generally given away free of charge. The selling or auctioning of rights is generally favoured by economists as a means of extracting information on willingness to pay for access and identifying and extracting expected resource rent. However, such options have not been seriously considered in the negotiation of either domestic or international fisheries agreements. Rights are assets which alter the distribution of wealth, and participants in an international negotiation on fisheries are unlikely to find it optimal to come to a cooperative agreement on buying rights in a fishery that they have been using

free of charge beforehand.¹⁷ In this case, the gains from the non-cooperative outcome are highly likely to outweigh the gains from the cooperative outcome, making an agreement difficult to obtain or maintain. Providing fishing rights free of charge may be the price of obtaining buy-in to a cooperative international agreement based on tradable quotas.

Options for new entrants

How to effectively deal with new entrants remains a difficult problem and one which has not been adequately solved by any of the existing RFMOs. International discussions and agreements enjoin all fishing interests to join or cooperate with RFMOs, and this would be an essential first step in determining the size and magnitude of the allocation issue facing particular RFMOs.

If there are under exploited stocks or stocks that have never been exploited, then the new entrant problem is relatively straightforward and is solved by providing the new entrants with a share of the quota for those stocks (provided the new entrant meets other criteria relating to compliance, etc). Even here, however, there are complications. It is effectively restricted to those RFMOs where there are new or under-exploited stocks or stocks that are under recovery, countries willing to join the RFMO to exploit those stocks, and a relative lack of interest by existing Members to exploit the gains if the stocks are recovered. Unfortunately, this combination is fairly rare and so this may not be a viable option for most RFMOs. NEAFC and NAFO represent limited exceptions as quotas for managed stocks are fully allocated but there are criteria for allowing States to join to exploit stocks that are not yet managed.

The real policy challenge arises when stocks are fully exploited or overexploited by existing members. Admitting new members would inevitably have an impact on the fishing opportunities by existing Members, either in the short term (through reductions in quotas) or long term (through overexploitation of the stock). In practice, there are limited options available to RFMOs for dealing with new entrants. The main mechanisms for allowing new entrants to participate in a fishery and accommodating the aspirations of developing States within an agreement seemingly include the following options:

Increase the total quotas above existing levels of quota

Such an option may be a short term measure in order to entice potential new members to join an RFMO, perhaps with the intention of tightening the TAC in future years. Such an approach has been followed by CCSBT and ICCAT, although the TAC for key stocks has not been reduced (but has for some stocks in ICCAT). In general, the benefits from bringing new members into the regulatory regime are likely to be considerable: for example, with respect to improving enforcement, better tracking of catch data, reduced incentives for IUU, improved management of bycatch, etc. However, such an option would also be counter to the conservation goals of an RFMO agreement if the TAC was already at or above the long-term sustainable yield. It would therefore tend to de-stabilise the agreement over time if a stock decline began to affect profitability of participant fleets.

In essence, whether the benefits outweigh the costs from the long-term negative impacts on stock sustainability would depend on the discount rate applied in weighing the

¹⁷. In principle, the initial distribution of rights does not matter in terms of economic efficiency provided the rights, once allocated, can then be traded so that they reach their highest value uses.

short term benefits and the long-term costs. It may also turn on whether it is believed, *ex ante*, that improved resource management and enforcement arising as a result of enlarged membership could result in an increase in the maximum sustainable yield over time, and hence an improvement in economic returns. Given that both the existing and new members would be fully aware that the higher allocation is not sustainable in the longer term, the incentive to cooperate in the short to medium term might be severely compromised.

Accommodate new Members within existing allocations

This option would be theoretically possible as there would generally exist an allocation that would allow existing and new parties to be better off cooperating than not cooperating, even if existing parties relinquished part of their quota to accommodate new members. In practice, however, the “endowment effect” tends to work against such an outcome being realised. The endowment effect recognises that countries are likely to place a greater value on the certain current allocation than on an uncertain future allocation, even if the expected value of the future allocation was greater than the certain value of the current allocation (Kahnemann *et.al.* 1990). Thus, existing Members would be reluctant to voluntarily surrender some quota with the prospect of uncertain future gains and being required to do so might undercut their incentives to maintain a cooperative agreement.

Mechanisms to reduce the uncertainty over potential gains from surrendering quota might thereby help reduce inherent resistance from existing Members. Improving the enforcement of management measures, reducing the incidence and impact of IUU fishing, improving transparency on catch data and trade flows, and the development of robust and agreed dispute settlement mechanisms will all serve to strengthen the rights of existing and future members and may reduce the actual and perceived risk associated with reaping future benefits from the fishery.

Allow for quota to be traded

Allowing quota to be traded (either permanently or temporarily), is one option to pave the way for new entrants to buy their way into the agreement or for existing member States to expand their quota holdings. This is discussed more extensively in the section below.

Set aside a proportion of quota as part of the initial allocation

A set-aside could provide a proportion of the quota that could be used by new participants or developing Member States at some stage in the future. The use of new entrant set-asides (as used in the EU ETS) could be more attractive to existing members if the set-aside quota could be leased on a short term basis by existing participants. The set-aside quota could then be perceived as being “put to productive use” rather than being seen as a non-working asset. Munro (2006) argues that a set-aside may reduce the incentive for countries to join a cooperative agreement as there may be benefits to free-riding on the conservation efforts of Parties to an agreement before taking advantage of the new entrant set-aside at a later date. However, such an incentive may be mitigated to some extent by the ability to lease out quota and make a return on the investment.

Unfortunately, this option is not likely to be feasible for the established RFMOs as the quota regimes are well-entrenched. However, it may be worth considering for those RFMOs that are in the early stages of determining allocations, such as the WCPFC and SPRFMO (the latter is still under development).

Annual surrender of a proportion of quota for redistribution

This option is used in a number of domestic ITQ and tradable effort quota fisheries (for example, in Norway, Latvia and some fisheries in the US) and involves an across-the-board reduction in the quota of all existing quota holders. The surrendered quota is then distributed either to new entrants, both existing and new members, or to a specific category of member (such as young fishers).¹⁸ Such a system may be attractive for RFMOs, especially if the surrendered quota was redistributed both to existing members and to any new entrants. While existing members would have a reduced quota, it would be offset to some extent by receiving some of the redistributed quota. The new members would then become part of the future redistributive arrangements after an agreed number of years in order to allow them to build up their quota holdings through the redistribution process.

The role of economic efficiency in RFMOs

As mentioned above, the strong focus on the equity of initial allocations in international fisheries arrangements may have been at the expense of considerations of how to improve the efficiency of resource use once the initial allocation is complete. This is in contrast to the cases of water use and greenhouse gas abatement where economic efficiency is a major objective in the design of institutional mechanisms to manage the resource or emissions following the initial allocations. Optimal management of resources can create a larger cooperative surplus that can improve the potential returns to all parties and hence improve the prospects of a stable cooperative outcome (Munro 2006). Increasing the size of the pie, in addition to sharing the pie among recipients, can be achieved a number of ways. Improving economic efficiency in international fisheries would help to improve the resource rent generated by the fishery. It is also the case that improving management would also improve returns to the fishery, but to a lesser extent than if economic efficiency was a focal point.

The UNFSA lists the optimum utilization of straddling and highly migratory fish stocks as one of its general principles (Article 5(a)). While there is mention made within the regulations of many RFMOs about trying to ensure the resource is used efficiently, this is normally taken to refer to the technical efficiency with which the resource is harvested, rather than to trying to maximise the resource rent from a fishery. However, economic efficiency is very important if one of the objectives of an arrangement is to maximise the economic returns from shared resources and thereby contributing to a general increase in social welfare. It would also make the use of side payments or negotiation facilitators more feasible if the fishery actually generates resource rents.

¹⁸. Some Danish fisheries distribute surrendered quota to young fishers as a way of encouraging younger generations to join the sector, and is a response to the aging profile of the fisheries workforce.

Tradability of rights can improve economic efficiency and the prospects for cooperation

A necessary, but not sufficient, condition for maximising economic efficiency would be the ability to transfer quota to those States that valued it most highly. In each of the sectors considered, an essential feature of improving economic efficiency is the ability to trade or transfer rights among participants through cap-and-trade systems.¹⁹ In principle, this would assist in shifting resources to their highest value uses, thereby increasing resource rents. This has certainly been the case for water use and greenhouse gas abatement where the ability to trade entitlements and allowances has been a central factor in the success of the schemes to date. It has also been demonstrated in the case of domestic fisheries where tradable rights have been introduced.

While such trading is (arguably) feasible under UNCLOS, UNFSA and the regulations of most RFMOs, it has not been used to any great extent to date (Serdy 2007).

Currently, international fisheries have implemented just the “cap” part of cap-and-trade systems. This may address the sustainability issue, but leaves out any consideration of maximising the resource rent from a fishery and reduces the flexibility of users to maximise resource rent. The trading of quota rights in international fisheries is gaining more attention in policy discussions and is actually being undertaken on a very minor scale in some RFMOs. The option of trading rights was briefly canvassed in both the MRAG (2006) report for the WCPFC and the guidelines for a model RFMO (Lodge *et al*, 2007).

The ability to trade rights in an agreement would likely improve the prospects for a stable cooperative agreement. Once participants had begun trading and transparent prices for the quota asset become well known, the costs of breaking any agreement would be more transparent. Countries potentially would have more to lose from breaking the agreement. The asset price of quota would be higher under trading, further increasing the cost of defecting from the agreement. As has the case in the other sectors, and in domestic implementation of rights based fisheries management systems, there would be many ways to design institutional mechanisms to address particular objectives and concerns in a tradable rights system. Such concerns include, for example, the potential for concentration of quota holdings and the need to ensure the setting of total allowable catch levels independently from allocation decisions. Further work is required to analyse the characteristics of particular international fisheries and countries’ objectives to design such mechanisms.

Tradability does not remove the initial allocation problem, especially if the rights were given away free of charge. The holders of the initial rights would receive a windfall gain when they trade the rights. This would then be capitalised in the value of the right, but subsequent trades would not realise the gains. However, tradability does improve the potential co-operative surplus, and hence would improve the incentives for co-operation.

Depending on its design and implementation, the introduction of tradable rights within an RFMO may exacerbate existing conflicts between developed and developing countries over the allocation of resources managed by an RFMO. One of the issues

¹⁹ . In brief, cap and trade systems refer to management regimes where the total allowable emissions or catches are set, shares of the total are allocated among participants, and then trading of shares by the participants is allowed. This type of system ensures that the rights for emissions or catches go to the parties who value them most highly.

commonly expressed by both existing and potential developing country members of RFMOs is that the lack of flexibility to increase catches in most RFMOs has been a result of developed country actions in the past. The introduction of tradable rights may be seen as an additional barrier to their participation in an RFMO, especially for those states without sufficient financial means to participate in the exchange mechanisms. However, the extent to which this may be the case would depend on the design of any tradable rights scheme as well as the initial allocation of rights within the scheme.

Another potential issue that arises in the use of tradable rights schemes is the potential for rights holders to resist any reductions in the TAC as this will reduce the value of their rights. Although such resistance to the reduction in TACs is already evident in most RFMOs, the fact that rights holders may have had to purchase their rights as a means of expanding their fishing opportunities may make it even more difficult to reduce the TAC. This underscores the point made above about the need to separate the decisions about allocation from other conservation and management decisions. This applies under any system, both the current arrangements and under any potential tradable rights system.

Innovative rights structures can improve flexibility and efficiency

Fishing rights in RFMOs are generally regarded as a unique and singular entitlement. However, as was seen in the case of water entitlements in the western United States and Australia, it is feasible to have different classes of rights for the resource, depending on the riskiness and duration of the right (e.g. permanent and seasonal entitlements, senior and junior rights, high security and low security entitlements).

A two-tier approach to entitlements has potential application to the allocation of rights in international fisheries. In broad terms, an example of such an approach might involve a certain proportion of the total quota rights being allocated as base quota to the founding members of an RFMO on a permanent basis. The remaining quota could be classified as flexible quota and could be distributed on an annual basis to either RFMO members or non-members through a mechanism such as an auction. The proceeds of the auction could then be used to run the secretariat for the RFMO, undertake monitoring and surveillance, or be distributed as a “dividend” to RFMO members. Such an approach could improve the economic efficiency of RFMO operations, increasing the possible cooperative surplus and the incentive for cooperation, as well as provide a mechanism for new entrants to enter the fishery. It is, in effect, a mechanism to provide a type of side payment to improve the prospects for cooperation.

A two-tier approach to quota rights reflects ideas that have been advocated by some commentators for domestic fisheries as a means of improving the flexibility and resilience of individual fisheries in the face of uncertainty over stock dynamics, changes in economic conditions, and cope with natural fluctuations. For example, Pontecorvo and Schrank (2001) advocated the development of a core fishery concept in fisheries management encompassing a dual layer of rights. In this approach, a small core fishery would be maintained to catch the quantity of fish that could be safely taken over the long term as a stock approaches the lower limits of its natural cycle: when fish are abundant, the excess would be allocated or auctioned off to fishers who may or may not necessarily have long term rights in the fishery.

Different rights structures could also be used to partially address concerns over equity, concentration and the aspirations of developing states that are party to an agreement. For example, following the two-tier approach discussed above, the proportion

of rights that might be classed as base quota might be restricted from trading, while flexible quota could be fully tradable. This approach could, to some extent, alleviate the concern of developing countries that developed countries may accumulate allocations through the system, although some additional mechanisms may be necessary to address this concern. There are, of course, a myriad number of ways to organise rights and trading mechanisms to meet equity concerns.

There are also several corporatist models of RFMOs that have been proposed and that contain very innovative approaches to the issue of managing RFMOs. For example, Crothers and Nelson (2006) developed a “think piece” to prompt discussion on alternative governance arrangements for high seas fisheries. They suggested the establishment of a management organisation in which nations are beneficial owners (shareholders) and the aim of which would be to maximise shareholder wealth by managing the high seas through a corporate structure (involving shareholders, board of directors, managers, auditors, etc, each with roles and responsibilities) and traded shares. Trondsen *et al.* (2006) propose a similar concept in the form of a Multinational Resource Cooperative.

Unbundling of fishing rights, as has been done in segments of the water sector in Australia, may also be beneficial in improving the flexibility that rights owners have in international fisheries. In principle, a fishing right actually contains two separate features: a right to access, which is long term and is a right to receive allocations in the future; and a right to exploit the allocations. Access (or ownership) and exploitation rights are generally bundled together, which may reduce the incentive to transfer rights temporarily and increasing the costs. Separating, or unbundling, the right to ownership and the right to exploit may improve the flexibility of any trading system, while maintaining sovereignty over resource shares. This could help to improve flexibility, economic efficiency and the generation of resource rent in an international fishery. Such a dual property rights structure has been used successfully in some domestic fisheries. For example, New South Wales in Australia established a fishery share system in 1994 in which there was a clear distinction between shares (the long term interest) and specific quota allocations. Both could be traded freely, but separate registers are maintained for both types of transactions (Young 1999).

A major challenge in unbundling rights in RFMOs lies in ensuring that a high level of enforcement be maintained if exploitation rights become widely dispersed. It is a sovereign country’s responsibility to ensure that the vessels that exploit their quota operate in accordance with all the relevant rules and regulations of the RFMO. Enforcing regulations on foreign-flagged vessels that are using a country’s quota may create challenges. It is similar, in principle, to chartering that occurs within domestic fisheries and these arrangements are handled effectively through licensing requirements and due diligence processes by the host country.²⁰ The use of innovative enforcement mechanisms such as performance bonds could be considered. In addition, the rapid evolution in enforcement mechanisms such as port state controls, flag state controls, catch and trade documentation schemes, etc provides a greater degree of confidence in the ability to monitor activities within RFMOs.

²⁰

The issue of chartering also arises where countries seek to gain access to an RFMO, but have no intention to actually fish their quota, which may be leased out. From an efficiency perspective, such an arrangement may be optimal. However, it does raise concerns over whether the country has the necessary institutional capacity to effectively enforce its RFMO obligations on the chartered vessel(s).

Strengthen rights, transparency and compliance

Strengthening the rights in international fisheries would help improve the efficiency of the fishery as well as the prospects for a stable agreement. Improving transparency and the enforcement of RFMO regulations are also necessary steps to enhancing the quality of participatory rights, without which there would be no incentive for countries to meaningfully engage in negotiations about allocations. The recent report on a model RFMO model concluded that “[c]ooperative arrangements will only succeed if there are strong negative and positive incentives to comply” with any allocation decisions: agreeing on the allocation process itself is only half the battle (Lodge *et al.* 2007, p. 43).

However, achieving these aims in international fisheries is difficult. The compliance mechanism built into the Kyoto Protocol provides some guidance for the fisheries case. The monitoring and reporting of compliance needs to be supported by a credible, transparent mutually agreed accounting system. In the case of greenhouse gases, considerable effort went into developing monitoring and reporting mechanisms, with strong penalties for inadequate reporting agreed within the Kyoto Protocol. Similar reporting requirements would be necessary in international fisheries under similar regimes. One of the main functions of RFMOs is as a statistical clearing house for the stocks under their control and there is a need to ensure the robustness of such functions. The use of strong financial sanctions to enforce regulations would be necessary. The Kyoto Protocol levies a penalty of 30% on the errant country, which is a relatively sizable penalty. An additional benefit of introducing tradability into RFMOs would be the ability to suspend violators from partaking in quota trading.

7. Conclusion

This paper has presented a number of possible considerations for improving the process of allocating participatory rights in RFMOs, drawing on the theoretical insights from game theory and experiences in the fisheries sectors and other sectors that have wrestled with similar policy challenges. It is intended to generate discussion and debate among policy makers about options for improving allocation processes. The key challenge in designing a durable and effective allocation scheme is to ensure that no State is worse off in acting cooperatively than in acting inconsistently within an international cooperation framework. Issues such as perceptions of fairness and equity in the initial allocation, new entrants, free-riders, optimal resource management in a multilateral setting, enforcement, side payments (or “negotiation facilitators”), potential concentration of rights holdings, and resistance to TAC reductions will all influence the choice, design and implementation of allocation schemes.

The analysis highlights the diversity of approaches to allocation in existing RFMOs and recognises that there is no “one size fits all” solution due to the varied nature of RFMOs. However, there are sufficient common elements across RFMOs that allows some broad policy issues to be raised and discussed. A key result of the analysis is the need to develop flexible mechanisms to achieve RFMO goals on participation and agreed processes for resolving disputes over allocations. The analysis also highlighted the need to examine the issue of economic efficiency in international fisheries in order to maximise the potential gains to all parties from cooperation, and hence the prospect for a stable regime and to better accommodate new entrants. The use of tradable rights and innovative rights structure is worth further exploration as, in combination with the traditional regulatory and planning approaches, it may better align the incentives faced by participants. Such policy directions may merit further analysis. A central element of any such analysis is the issue of how to manage transitions in any changes to international fisheries arrangements.

Annex I. Allocation of water resources

The allocation of water resources between users has many similarities with the allocation of rights to exploit fish stocks. Water is a highly mobile, renewable (but potentially exhaustible) resource that often crosses international or legislative borders, raising complicated issues of control, jurisdiction and sovereignty. Water availability is often subject to a degree of uncertainty due to external factors and there is a growing scarcity of, and increasing competition for, water in many countries. The search for an equitable and efficient solution to allocation within and between user groups (such as farmers and towns) is hampered by the existence of historical usage rights that are often deeply embedded in the political systems of countries. It is also hampered by the problem of directional externalities within a water system whereby the activities of one user (individual, group, or country) will have an impact on other users elsewhere in the system. In addition, countries that access the water flow first may fear that an agreement to share the water may limit their political and economic options in the event of a water shortage (Giannias and Lekakis 1997).

There are also some crucial differences. For example, it is much more technically feasible to measure water stocks and flows (at least for surface water, less so for groundwater) than it is to measure fish stocks. At the national level, rights and allocations can be legally enforced through a country's judicial system. In contrast, at the international level, there is a need to develop self-enforcing agreements as there is no international enforcement agency. At the same time, the problem of new entrants does not arise at the international level as the number of States sharing a water system is fixed (although it may well be an issue at the national level). The policy solutions to the allocation problem differ significantly between the international and national levels.

International level

At the international level, the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses, adopted in 1997, provides a framework for negotiations between countries sharing an international water resource. Although the Convention is not yet in force (it has only 26 of the necessary 35 signatures), it provides an indication of how the international community approached the allocation challenge in this case. The Convention defines the obligation not to cause appreciable harm and the right to reasonable and equitable use as co-equal criteria for the allocation of water between riparian countries. As is the case with UNCLOS, UNFSA and the RFMO conventions, these criteria have to be translated into an operational algorithm through negotiations between countries. In principle, the main criteria advocated for allocating water are based on either country's relative shares of the catchment area or the relative size of their populations (van der Zaag *et al.* 2002). This is similar to the historical catch criterion that predominates in the case of fisheries.

In practice, however, international water resources tend to be managed on a bilateral or multilateral basis through the establishment of treaties between countries sharing the water system, almost all of which were established prior to the adoption of the UN Convention.²¹ Examples of countries developing agreements to allocate water resources are largely confined to the world's major river systems (Giannias and Lekakis 1997; Kliot *et al.* 2001). Some of these treaties and agreements are designed to allocate water between States (*e.g.* the Indus, Nile, Ganges and Jordan). The agreements tend to be very general and call for the optimum use of shared water resources without providing practical guidance on allocation which is then decided in political negotiation. The allocation of water between countries is generally a negotiated outcome based on geographical, political and historical criteria and do not vary significantly from year to year.

One of the features of negotiations on these agreements and treaties is the strong emphasis on an equitable distribution of resources. However, there is little agreement on what is meant by equity. Moreover, the international law on international watercourses contains a number of different and conflicting principles which are espoused by watercourse states depending on their position on the watercourse.²² The establishment and assignment of rights is then inevitably bound up with the distribution of power among states along the watercourse. Indeed, in most cases, the basis for allocation between countries is mired in political and social history and reflects a political outcome rather than anything based on measurable criteria (see Just and Netanyahu 1997). As a result, their main functions of these agreements tend to be maintaining the status quo, avoiding conflict, and providing a dispute settlement venue (Kliot *et al.* 2001).

For example, the International Boundary and Water Commission has responsibility for applying the rights and obligations contained in the boundary and water treaties that have been agreed between the United States and Mexico (primarily the *1906 Border Convention* and *Treaty for the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande of 3 February 1944*, commonly known as the *1944 Water Treaty*) (IBWC 2007). Those rights and obligations include: distribution between the two countries of the waters of the Rio Grande and the Colorado River; regulation and conservation of the waters of the Rio Grande by joint construction, operation and maintenance of international storage dams and reservoirs and plants for generating hydroelectricity; regulation of the Colorado River waters allocated to Mexico; construction of flood mitigation and prevention measures; solution of border sanitation and water quality problems; and demarcation of the international boundary. The Commission also settles disputes that may arise in the application of the treaties. The allocations of water between the United States and Mexico were fixed in the *1944 Treaty* and have not been altered since (see Box 1). The base of the allocations is obscure and difficult to determine in the mists of time. The institutional structure governing the basin

21. The externality problem has eclipsed the allocation problem in some cases, leading to a completely different strategic game being played between countries sharing a water catchment area. Downstream countries can use their political power to thwart developments in upstream countries that may have an impact on the quality and quantity of water they receive. This is particularly the case, for example, for international water courses in the Middle East (Yetim 2002).

22. Different principles can be used as a basis for determining international water rights: absolute territorial sovereignty in which that each state has absolute sovereignty over the water located in its territory; absolute territorial integrity in which an upper watercourse State is under an obligation to not cause a change in the natural integrity of the resource without the consent of downstream users; and optimal and equitable utilisation in which each watercourse state has a right to use the waters of international watercourses without causing significant harm to other watercourse state. This latter principle is most widely advocated within the international community and is reflected in the UN Convention.

(including resource allocation policy) has been criticised for its lack of responsiveness to changing conditions and the inadequate attention paid to sustainability, equity and participation concerns (Schmandt 2002).

Box I.1. Water Allocations between the United States and Mexico

The waters of the Colorado River and Rio Grande river systems are allocated between the United States and Mexico according agreements under a number of treaties. Mexico receives:

- 60 000 acre feet annually of the waters of the Rio Grande;
- all the waters reaching the main channel of the Rio Grande from the San Juan and Alamo rivers;
- two-thirds of the flow in the main channel of the Rio Grande from the measured Conchos, San Diego, San Rodrigo, Escondido and Salado Rivers, and the Las Vacas Arroyo, subject to certain provisions;
- One-half of all other flows occurring in the main channel of the Rio Grande downstream from Fort Quitman;
- A guaranteed annual quantity of 1.5 million acre feet of water from the Colorado River, delivered in accordance with schedules formulated in advance by Mexico within specified limitations;
- any other waters arriving at Mexican points of diversion under certain understandings.

The United States receives:

- all of the waters reaching the main channel of the Rio Grande from the Pecos and Devils Rivers, Goodenough Springs and Alamito, Terlingua, San Felipe and Pinto Creeks;
- one third of the flow reaching the main channel of the Rio Grande from the six named measured tributaries from Mexico and provides that this third shall not be less, as an average amount in cycles of five consecutive years, than 350 000 acre feet annually; and
- One-half of all other flows occurring in the main channel of the Rio Grande downstream from Fort Quitman.

Source: IBWD 2007.

Other treaties and agreements are designed for the joint management of internationally shared waters (*e.g.* Colorado and Rio Grande, Mekong, Senegal, Niger). These joint management organisations are largely confined to ensuring water quality and to developing and maintaining infrastructure (such as dams, flood mitigation measures, sewage treatment plants, etc) and do not generally engage in allocation of waters. For example, the International Joint Commission administers Great Lakes under the *Boundary Waters Treaty of 1909* between the United States and Canada. The role of the International Joint Commission is to: prevent and resolve disputes between the two countries; approve projects that affecting boundary or transboundary waters; assist in the protection of the transboundary environment (both air and water; and to alert governments to emerging issues along the boundary that may give rise to bilateral disputes (IJC 2006). Another example is the European Union's Water Framework Directive which sets goals for the condition of Europe's water and introduces new institutional structures to manage water at the level of the river basin district rather than at the level of individual Member States. The focus of the Water Framework Directive is primarily on improving water quality, rather than allocation of water resources, although it does move towards the use of cost recovery and water pricing to provide adequate incentives for efficient use of water (Kallis and Butler, 2001).

National level

There is a great deal more experience of dealing with the allocation problem in the water sector at the national level. As in the case of international water resources, the distribution of water amongst users and user groups in each country is often embedded in existing social, political and industrial structures. The emphasis in the initial allocation of

water rights has generally been on the existing historical patterns of usage and riparian rights of users, reflecting a need to ensure a perception of equity in distribution among user groups. However, many governments are placing an increasingly greater premium on making the most efficient of scarce water resources. This requires that institutional structures be found that create incentives for users to allocate water resources to where they have the highest value to society. Market mechanisms such as the establishment of water markets that allow trading in entitlements can have advantages over traditional regulatory approaches in improving the economic efficiency of water use (Productivity Commission 2006; Weber 2001).

The development of market-based instruments to complement or replace existing regulatory and planning based management systems are making a significant contribution to achieving this in a number of countries. Water markets are well-established in Australia, South Africa, the western states of the United States and Chile and are under consideration or being trialled in other countries. Market mechanisms are broadly defined as instruments that encourage behaviour through market signals rather than through explicit directives. Compared with traditional regulatory approaches, where suitable, they offer greater flexibility to participants, and have the potential to lower compliance costs and provide dynamic incentives to reduce future costs. The use of market mechanisms also helps to improve the transparency of the tradeoffs being made between various uses, and sharpens the incentives for efficient use.

Australia is arguably the most advanced in terms of developing sophisticated water markets to improve water management, having first established a permanent water trading scheme in 1983 in South Australia. During the 1990s, national and state government attention increasingly focused on the problems of water resource degradation, security of supply for irrigators and population centres, costs of enhancing or refurbishing water supply infrastructure, and environmental flows (Quinlivan 2006). Australia has done a lot of thinking about how to achieve improved conservation and use of its scarce water resources. The National Water Initiative, which was agreed amongst the Commonwealth and state and territory governments in 2004, provides a blueprint for a cooperative national approach to water management and builds on the previous water reform initiatives that have been undertaken in the various jurisdictions (Thompson 2006). The objective of the National Water Initiative is “a nationally-compatible, market, regulatory and planning based system of managing surface and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes” (COAG 2004).

The key features of the Australian experience can be summarised as follows:

- Markets for trading water entitlements (a prescribed, defined right to an amount of water, sometimes known as permanent water) and seasonal allocations (a volume of water that an irrigator is allowed to access in a particular season, or temporary water) are well-established within major irrigation areas and expanding into other areas, including a pilot scheme to allow trading between States.
- Statutory provision for environmental and other public benefit outcomes, including the use of markets to help allocate water use towards environmental outcomes through the purchase of entitlements and seasonal allocations to address over-allocation of water resources.
- Attempts to improve the clarity around the assignment of risk arising from future changes in the availability of water for the consumer groups (irrigators, towns, etc)

- Unbundling of the water entitlements, particularly the separation of water rights from land title, in order to remove barriers to the more efficient use of water, increase transparency, reduce transactions costs, and allow the development of more sophisticated trading mechanisms (such as option rights).
- Shift towards a holistic “whole of river” approach to matters such as water allocation, operational management, and monitoring of trends in river health, as well as to ensuring that institutions are coordinated, accountable and responsive.

The western states of the United States have also had a long history of using water markets to improve the allocative efficiency of water use (National Research Council, 1992). When water trades in the western United States, either a water right is sold or use of the right is leased for a period of time. Ownership of a water right conveys access to a specified quantity of water in perpetuity, subject to conditions such as priority, timing and location. The doctrine of prior appropriation underlies most water laws across the western United States (Brown, 2006). Under the prior appropriation doctrine, water rights are based on “first in time, first in right”.²³ This provides for clearly defined and transferable water rights in which the concept of “priority date” is significant, although the states differ in how they implement the doctrine and administer the water rights systems.

One outcome of prior appropriation is a lack of homogeneity in the rights assigned to water users. In order to deal with the stochastic nature of water flows and, priorities are assigned to water rights from junior rights up to senior rights, with water deliveries to holders of senior rights having priority. In some cases, such as mutual ditch companies and water conservancy districts, a different approach based on proportional rights is used within the prior appropriation doctrine (Brown 2006). With such rights, all users have equal priority to a water entitlement according to their quota of the total water availability which will vary from year to year. Organisations based on proportional rights manage nearly half the water in the western United States.

Several features of the Australian and western United States experience are potentially relevant to the fisheries sector. First, a two-tier approach to the allocation of rights in some jurisdictions in Australia and the United States provides a mechanism for combining certainty with an element of flexibility. For example, in New South Wales in the southern Murray-Darling Basin, irrigators hold entitlements that define access rights to a specific quantity of water each irrigation season (Peterson *et al.* 2004). The supply reliability of these entitlements varies and depends on storage capacity and the volume of entitlements distributed. In New South Wales, entitlements are for 15 years and are either “high security”, which are likely to be met between 96 and 99 years in 100, or “general security”, which are likely to be met around 75 years in 100 and only after high security entitlements have been met. Within an irrigation season, each entitlement holder can (for a charge from utilities that operate the supply infrastructure) access a percentage of their entitlement (called a seasonal allocation). Irrigation utilities determine the seasonal allocations according to the availability of water supplies from storages and entitlement holders can call on all or part of their allocations at any time during an irrigation season. In each year, therefore, the total volume of water available is shared among water entitlement holders according to their priority and entitlement to the resource.

²³. In the eastern United States, in contrast, water rights are based on riparian rights, derived from English common law.

Second, the efficiency of water use is clearly enhanced by the trading of water rights. Trades can occur on both a permanent and temporary (or lease) basis. In the western United States, considerably more rights are leased on a short term basis than are sold permanently. Between 1990 and 2003, around 27.8 million ML of water was traded on a lease basis while 1.4 million ML was sold (Brown 2006). This is largely because of the lower transactions costs generally involved in leasing and the fewer legal and administrative constraints that apply relative to permanent sale. There are remaining concerns, however, about the competitiveness of some of the water markets, the availability of information for participants, and administrative and legal constraints inhibiting trade. Nevertheless, the potential economic gains can be substantial. The Australian Bureau of Agricultural and Resource Economics has estimated that the more widespread use of water trading in the Murray-Darling Basin would increase output by around AUD 48 million annually.

In Australia, irrigators trade primarily with other irrigators in their irrigation district and the trade is predominantly in seasonal water allocations. Markets for trade are well-established with electronic exchanges and brokers facilitating trade. In 2000-01 to 2002-03, aggregate trade in seasonal allocations in the three major irrigation districts represented, on average across the three districts, 11-20% of allocations (Peterson *et al.* 2004, p. 8).²⁴ In contrast, trade in permanent entitlements represented around 1-2% of annual total allocations, averaged across the three districts. A recent inquiry by the Productivity Commission into rural water use found that water trade has facilitated the continual movement of water to its highest valued uses, but that a number of regulatory and administrative constraints on water trade remain that impede efficiency (Productivity Commission 2006, p. 67). These constraints include inadequate market information, restrictions on who can participate in water markets, restrictions on trade out of irrigation districts, and the speed and transparency of approvals for water trades.

Third, the separation of water entitlement from land title has, in the case of Australia, lowered the transactions costs of trading water, increased transparency, and improved the flexibility of entitlement in managing their business operations (Pigram and Musgrave 2006). Further unbundling of water entitlements to allow for separate rights for each of the components of the water entitlement (*e.g.* water allocations, delivery capacity rights, site-use licences) is being pursued where feasible (Quinlivan 2006; Thompson 2006; Productivity Commission 2006).

Finally, the issue of new entrants within each user group (*i.e.* irrigators, towns, etc) is dealt with almost entirely through the market in both Australia and the United States, with new entrants being required to acquire water entitlements through purchase from existing holders. However, the case of shifting allocations between user groups or of allowing new user groups to access a water system is less straightforward. In particular, the increasingly politically sensitive issue of ensuring environmental flows is somewhat (but not perfectly) analogous to the new entrant problem in international fisheries.²⁵ Providing environmental flows to a river or lake system in times of water shortage requires that the allocations of other users be reduced, at least temporarily. Environmental flows can be met either through direct command and control mechanisms, investing in infrastructure to

^{24.} The three districts are the Murrumbidgee Irrigation Area, the Murray Irrigation district and the Goulburn-Murray Water district.

^{25.} An environmental flow is defined as a water regime provided within a river, wetland or estuary to improve or maintain ecosystems and their benefits where there are competing water uses and where flows are regulated (Productivity Commission 2006, p. xviii).

gain additional environmental flows, or purchasing entitlements through the market. In the western United States, 113 out of a total 718 lease transactions between 1990 and 2003 were for environmental purposes, representing a total volume of 4.8 million ML (or 17% of the total volume of water leased) (Brown 2006, p. 5). A further 0.2 million ML were sold on a permanent basis, representing 16% of the total volume of water entitlements sold over the period. In Australia, the Productivity Commission recommended that environmental managers and service providers be encouraged to participate in water markets, markets for river capacity be developed, and that environmental managers be allowed to develop portfolios of water and related products (such as entitlements and seasonal allocations, leases, option contracts, river capacity shares).

Annex II. Carbon allocation and trading

The challenge of developing international agreement for limiting greenhouse gas emissions has many parallels with policy challenges inherent in managing international fisheries. Both require international collective action in order to address an international common property resource dilemma. Both are therefore multilateral environmental problems, involving large numbers of players, each of whom has different objectives, development strategies and resource endowments. As in the case of international fisheries, any international agreement to limit greenhouse gas emissions must be self-enforcing in the face of a lack of a supra-national body to coerce countries to provide an efficient level of environmental protection. Coupled to this, there are uncertainties over the size and timing of the costs and benefits of abatement and the strong incentive for free-riding. The key difference lies in the dimension of the problem as there are no truly global fish stocks; even highly migratory fish stocks are confined to a corner of the world's oceans. Greenhouse gases, in contrast, are a uniformly mixed air pollutant and will affect the global atmosphere irrespective of the location of the emissions.

Policies to reduce emissions of the main greenhouse gas, carbon dioxide (CO₂), have been debated at length in many national and international forums over the past couple of decades. There has emerged a strong recognition that market-based mechanisms are likely to provide more efficient means for achieving reductions in CO₂ at least-cost than command and control regulation (see, for example, Ekins and Barker 2001; Stern 2007). Much of the debate in the theoretical literature, in applied analysis and in international negotiations (such as Kyoto) has focused on the use of carbon taxes and carbon emissions trading programs. The concept and practice of carbon trading schemes has particular relevance to international fisheries in that a cap on emissions (or, in fisheries, catches) is put in place, and rights to emit (or catch fish) are allocated by some means amongst parties to any agreement. However, as was seen in section 2 above, there is very little trading undertaken in fishing entitlements at the international level. The parallels are stronger at the domestic level where fisheries based on individual transferable quotas are essentially cap and trade systems, as in the case of carbon trading.

There is a huge literature on the theory and practice of carbon trading schemes and it is well beyond the scope of this paper to provide a thorough survey. Rather, attention will be focused on drawing some insights from the literature and experiences at the international and national/regional levels that may be relevant to the quota allocation issue in international fisheries.

International level

At the global level, the Kyoto Protocol provides the international framework for a world greenhouse gas trading scheme, although the scheme has not been fully implemented as yet (the treaty itself came into force in 2005). In broad terms, the treaty allows nations that emit less than their quota of greenhouse gases to be able to sell

emission credits to other nations who require additional quota. This applies only to Annex 1 countries (composed primarily of developed countries) that have ratified the Kyoto Protocol.

The initial allocation of greenhouse gas emission targets was done on the basis of mandatory targets ranging from -8% to +10% of the countries' individual 1990 emissions levels (UN Framework Convention on Climate Change n.d.). The objective is to reduce overall emissions of such gases by at least 5% below existing 1990 levels in the commitment period 2008-2012, with the target reductions varying from nation to nation. Under the Protocol's system for the accounting of targets, the amount to which an Annex 1 Party (with a commitment inscribed in Annex B of the Kyoto Protocol) must reduce its emissions over the five year commitment period (known as its "assigned amount") is divided into units each equal to one tonne of carbon dioxide equivalent. These assigned amount units provide the basis for emissions trading. Trade in the assigned amount units are supplemented by trade in other carbon credits generated under the additional flexibility mechanisms developed under the Kyoto Protocol: Emission Reduction Units from Joint Implementation projects, Certified Emission Reductions from Clean Development Mechanisms, Removal Units from Sinks projects in Annex 1 countries.²⁶

The Kyoto Protocol represents the outcome of long negotiations over, amongst other things, the respective roles of developed and developing countries in addressing climate change. Balancing the interests of these two broad groups in achieving an agreement has required careful balancing of targets, commitments and institutional mechanisms. The use of flexible instruments such as Joint Implementation and the Clean Development Mechanism helped to provide an incentive for countries to participate in the agreement. Indeed, some mechanisms of the Protocol had sufficient support that they were set up even before the Protocol entered into force. This was the case, for example, with the Clean Development Mechanism through which developed countries can partly meet their binding emissions targets through credits earned by sponsoring greenhouse gas reducing projects in developing countries. The effect of such flexible instruments is that they better align incentives towards the desired objectives through the effective and innovative use of side payment-type mechanisms.

Incentives to maintain the agreement are aided by the Kyoto Protocol compliance mechanism which is designed to strengthen the Protocol's environmental integrity, support the carbon market's credibility, and ensure transparency of accounting by Parties to the Protocol. A dual approach is taken to ensuring compliance. On one hand, advice and assistance is provided to parties in order to promote compliance and provide an early warning system for potential non-compliance with emissions targets and methodological and reporting commitments (particularly the carbon accounting system that has been agreed by Parties). At the same time, non-compliance where it has been determined that a Party's emissions have exceeded its assigned amount attracts penalties in the form of a declaration that the party is in non-compliance and the Party having to make up the difference between its emissions and its assigned amount, plus an additional deduction of 30%. The Party must also submit a compliance action plan and is not eligible to participate in emissions trading until it is reinstated.

In summary, while the Kyoto Protocol is in its relatively early stages and many of the mechanisms (especially trading and compliance) are yet to be fully implemented and

²⁶ The value of the project-based transactions in 2005 was USD 2.8 billion, with 95% being generated through the Clean Development Mechanism (Capoor and Ambrosi 2006).

tested, the fact that agreement was reached on a number of key issues provides a few insights for the fisheries sector. In particular, allocation of emission allowances and setting of targets meets only part of the challenge. The focus on using flexible mechanisms to meet the targets in a cost-effective way, through trading, joint implementation, etc, helped to encourage Parties to come to agreement and improve the range incentives to join the agreement. The use of more flexible mechanisms in international fisheries agreements may hold similar attractions in trying to find innovative ways to expand the cooperative surplus and allow for side payments to be made in one way or another. A prime example would be the use of trading mechanisms in fishing rights allocations between nations that are party to an international fisheries agreement. At the same time, strong compliance measures linked to sanctions on access rights and backed up by a credible transparent reporting system are required. Such sanctions would have even greater effect if the rights themselves had a market value attached, as would be the case if they were traded.

National/regional level

An increasing number of national and regional carbon trading schemes have been implemented or are planned. Active carbon trading schemes are in place in Australia (New South Wales Greenhouse Gas Abatement Scheme), the United States (Regional Greenhouse Gas Initiative), the United Kingdom (UK Emissions Trading Scheme), and the European Union, with the latter's Emissions Trading Scheme being by far the largest and most ambitious scheme (Box II.1). Many other countries are in the process of considering, planning or implementing carbon trading schemes, including New Zealand, Canada, Japan, China, Korea and Norway. Companies such as BP and Shell have undertaken voluntary emission reduction through the use of internal trading schemes. The US Chicago Climate Exchange runs a voluntary cap-and-trade for all six greenhouse gases.

Each of the current and proposed schemes differs in a wide range of operational details, but the broad thrust and conceptual mechanics are the essentially the same. The predominant method for allocation of allowances used in schemes currently in place is one of free allocation based on historic emissions (known as "grandfathering"). Auctions are able to be used for part of the allocation process in some schemes. For example, countries have this option under the European Union Emissions Trading Scheme (EU ETS), although only Denmark and the United Kingdom have taken it up. It is also feasible that some allowances could be allocated directly to groups that are disproportionately affected by the costs of a cap-and-trade system (Kruger, 2005).

The issue of new entrants to the carbon market is problematic. For example, should a company wishing to develop a project that emits greenhouse gases (such as a new power station) be required to purchase carbon allowances in the market? Or should it have a free allocation of carbon allowances, as other established companies had received? It can be argued that the denial of free allowances to new sources discriminates against the new sources, even if they may be less-greenhouse gas intensive than existing sources. Ahman *et al.* (2005) argue that, under perfectly competitive conditions, investment decisions should not be affected by whether free allocation is given to new entrants or not. However, such conditions do not always prevail and distortions may arise.

Box II.1. The European Union Emissions Trading Scheme

The European Union Emissions Trading Scheme (ETS) is a mandatory and binding cap-and-trade system that began in January 2005 and includes the 27 countries of the EU. The program is run in two phases: Phase 1 is a trial period and runs from 2005-2007; Phase 2 coincides with the Kyoto commitment period and runs from 2008-2012. The cap covers CO₂ although other greenhouse gases may be added in the future. The ETS regulates downstream about 12 000 emissions sources, accounting for half of all EU emissions. The scheme covers the following “trading sectors”: iron and steel; cement, glass and ceramics; pulp and paper; electric power generation; and refineries. Because half the EU’s emissions remain outside the trading program, the EU’s Kyoto cap must be met by a combination of efforts by sources in the trading sector and by controls on sources in the non-trading sectors.

The ETS has a decentralised structure and each country submitted plans for the allocation of allowances for Phase 1 and Phase 2 for approval by the European Commission. Within the EU-wide Kyoto target, each Member State has its own national emissions target as determined under the EU burden-sharing agreement that defines each Member State’s emissions reduction obligation. Each country is required to develop a National Allocation Plan which, among other things, addresses national emissions in two steps. First, it allocates the country’s total emissions targets between the trading and non-trading sectors. Second, it specifies how the permits will be distributed among individual companies.

Allowances are to be distributed free of charge although, Under Phase 1, countries were allowed to auction an upper limit of 5% of their allowances. The upper limit for auctioning will be raised to 10% in Phase 2. Emissions sources covered by the ETS may satisfy their commitments by surrendering allowances in an amount equal to their emissions or may supplement ETS allowances with credits available under Kyoto protocol rules, including Joint Implementation and Clean Development Mechanism credits.

Allowances under the ETS are fully tradable. In 2005, USD 8.2 billion of trades took place, accounting for a volume of 324.3 MtCO₂. By the end of the first three quarters of 2006, trading had increased to value of trade in allowances had increased to USD 18.8 billion (volume of 763.9 MtCO₂) (Capoor and Ambrosi 2006). In contrast, the value of the New South Wales Greenhouse Gas Abatement Scheme grew from USD 59 million in 2005 to USD 184 million in the first three quarters of 2006.

Within the EU ETS, all 25 member States have set up provision for a guaranteed volume of allowances to be available to new entrants free of charge. This has been done by creating a set-aside of allowances specifically for new entrants and allowances from these reserves are usually provided on a first-come, first-served basis.²⁷ Some EU member States (e.g. Poland and Italy) plan to purchase allowances from the market for new entrants if their new entrant reserves are oversubscribed. There is, however, scope for companies in some countries to generate carbon credits through national level schemes similar to Joint Implementation and the Clean Development Mechanism under the Kyoto Protocol. The EU is currently considering how to ensure that such mechanisms available within its scheme can be efficiently linked to its Kyoto obligations.²⁸ It has also been suggested that new entrant allocations be tied to the achievement of certain performance standards (Kop 2007, p.6). For example, new power stations might be required to meet particular emission levels or employ particular technologies in order to qualify for a new entrant reserve.

The remaining issues of particular interest to the development of allocation rules for international fishing agreement – compliance and balancing the interests of various groups – are of less relevance to national and regional carbon schemes. Compliance is ensured through the domestic legislative and enforcement systems of countries. In terms

27. The most common allocation method for a new entrant is to base allocation on general emission rates for a sector or product type, and forecasted activity of the new entrant.

28. In contrast, the United States SO₂ program has a very limited new-entrant set-aside and allows retiring entities to retain their allowances.

of dealing with the interests of competing groups, the carbon schemes clearly apply to the larger emitters within a country. In the case of the EU, this was restricted to just six broad sectors covering about half of the total greenhouse gas emissions of the EU. The remaining emissions will be dealt with through more standard regulatory means. The key to ensuring support from the more concentrated and political group of large emitters is to ensure that there is a range of flexible mechanisms for ensuring efficiency and that the market information is clear and transparent.

In summary, national and regional efforts to cap greenhouse gas emissions have focused on creating flexible mechanisms to enable emission targets to be met at least cost. The allocation of emission allowances, while important in altering the pattern of wealth distribution, is only one part of the policy package. Allocation goes hand in hand with the use of emissions trading schemes in order to shift the incentives of firms in meeting targets, and equating the marginal cost of abatement across the (regulated) economy. Capping emissions without allowing trade in emissions would represent no gain in efficiency over command-and-control regulation.

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