Creating Incentives for the Ecosystem Approach to Fisheries Management:
A Portfolio of Approaches for Consideration in the Benguela Current Large Marine Ecosystem[1]

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1 INTRODUCTION

There is widespread agreement on the need to enlarge our fishery management "tool box"; thereby increasing the range of creative measures available to suit the panoply of fisheries that managers face. The ecosystem approach to fisheries management (EAF) provides a vehicle to accomplish this, but a key challenge lies in determining the right tools to utilize in specific situations. The idea in choosing suitable management tools is not to rely on *a priori* judgments of the rightness or wrongness of any given tool, which would be inappropriate, but rather to develop and build on an understanding of the biological, sociological, economic, and political context in question.

Discussion of the management "tool box" is influenced by current thinking in fisheries management, which is moving toward a set of understandings that include (but are not limited to) the following: (1) that tools used in isolation have less of a chance of being effective than a mix of complementary tools used in tandem; (2) that although managing people is complicated, managing fish and ecosystems is even more difficult if not impossible; (3) that new tools are necessary to help us manage in light of our recognition of the uncertainties we face; (4) that if people are included in the management process and understand why it is in their interest to do something, chances of successful implementation of the resulting management are increased; and (5) that something needs to change since, on the whole, fisheries management has been neither effective not efficient.

This paper attempts to broaden the tool kit discussion by presenting a certain sub-set of management mechanisms – the use of incentives. A brief introduction by means of a problem statement and the possible role of incentives in addressing these issues is followed by a description and discussion of incentives as categorized into legal, institutional, economic, and social incentives. In addition, concise examples are provided as starting points for further investigation. The ultimate goal of this paper is to stimulate discussion regarding the appropriateness and desirability of including the use of incentives as part of the toll box within Benguela Current fisheries strategies towards sustainable development.

2 WHAT ARE INCENTIVES MECHANISMS AND WHY DO WE NEED THEM IN FISHERIES MANAGEMENT?

An incentive in the broadest sense is any factor which affects an individual's choice of action – such factors could range from the price of an input (e.g., fuel) or final product (e.g., fish) to fines for breaking established rules, to social or peer pressure, and religious beliefs, etc. In any given situation, incentives of various kinds will already be in place, but these may not induce the sort of individual decisions that society may desire. This leads to a need to create or introduce more appropriate incentives – a need that

[1] The information contained in this brief is primarily based on De Young, *et al*., 2006.

arises in particular in marketplaces when the market price of a product does not fully reflect the impacts (either positive or negative) of its production or consumption on society.

This need for appropriate incentives is related closely to the existence of externalities. Examples of negative externalities include nutrient runoff from farms into water bodies (an action taken by farms that impact negatively on non-farming users of the water bodies) and carbon emissions from electricity production. Examples of positive externalities include those arising from education and health-care provision, which provide benefits beyond those specific sectors of activity. The lack of internalization of any of these costs and benefits by those choosing to produce or consume goods leads to socially suboptimal levels of such activities – i.e. too much of those producing negative externalities, and too little production of goods that provide positive externalities.

In capture fisheries, externalities have been classified into the following five categories of externalities (Seijo, *et al.*, 1998)[2]:

- **Stock externalities**. The impacts of one fisher's activities on the availability of the target species for other fishers in the fishery (i.e., the activity of each fisher reduces the fish stock available to other fishers).
- **Crowding externalities**. The impacts of vessel aggregation in the fishing grounds on marginal catch costs in the fisheries (i.e., the presence of any one fishing vessel increases the level of 'crowding', thus increasing the costs of fishing for all vessels).
- **Technological externalities**. Similar to stock externalities but relating to fishing gear impacts on population structures of by-catch species that are targeted species for other fisheries (so one fleet, targeting certain species, produces negative externalities for other fleets).
- **Ecologically based externalities**. Broadened concept of stock externalities that considers ecological interactions between various species targeted by different fisheries. This could include positive externalities (e.g., if one fishery harvests a species that is competing against the species targeted by another fishery), as well as negative externalities (e.g., if the species are part of the same food web [i.e., predator and prey]).
- **Techno-ecological externalities**. The impacts of fishing practices/gears on the broader ecosystem (e.g. habitats and biodiversity).

Where such externalities are not managed, over-capacity, over-fishing, and welfare losses are the predicted results; thereby impacting the ability of fisheries to 1) contribute to economic development, food security, and poverty prevention/alleviation and 2) maintain the wide range of services provided by fisheries ecosystems (e.g. income and employment, social, religious, and cultural identities, habitats and biodiversity regulation).

Other externalities impacting ecosystem productivity stem from non-fisheries activities, such as agriculture and aquaculture nutrient runoff, marine transport pollution, and tourism-related impacts. Depending on the level of integration within coastal and marine management systems, the fisheries sector may have varying degrees of influence on the management of non-fisheries externalities affecting fisheries ecosystems; however, it remains important that these links be identified and acknowledged as these external factors will certainly impact the effectiveness of any fisheries management system.

The first three categories of externalities mentioned above: stock, crowding, and technological, are those which would fall under the narrow definition of conventional fisheries management; while a consideration of the final two categories: ecological and techno-ecological, as well as extra-fisheries externalities, would be a broadening of the management concept to the ecosystem approach to fisheries

[2] The discussion focuses only on the physical capture of fish and other aquatic organisms.

(EAF). And with this broadening, the scale and scope of benefits and costs related to applying the EAF will also expand. For example, minimizing turtle mortalities due to fishing activities through gear, spatial, and temporal adjustments may impose costs locally (i.e. to the fisherman) but create benefits globally (i.e. to those holding values for biodiversity). In addition, while the costs associated with EAF implementation are borne often in the short-term, benefits accrual may take place quite far in the planning horizon.

Hence, correcting for externalities is one of the major challenges of implementing the EAF. This brings the focus back to incentives, as it implies a need for additional measures of various sorts to induce fishery participants (and others) to change behavior in keeping with the EAF. Such measures supporting positive behavioral change could be social, economic, legal or institutional in nature; all of which involve the use of 'incentives' toward behavioral change, i.e. considerations that an individual will factor into their decision making and which will lead to a result more in keeping with desired societal directions (in this case, effective implementation of EAF). From an economics perspective, one might view incentives as influencing the profit-maximization of a fishery participant (i.e., increasing profits as a result of EAF-compatible actions, and conversely reducing profits for actions contrary to EAF objectives). From a sociologist's perspective, incentives might be social constraints on behavior (e.g., resulting from peer pressure and cultural institutions) that lead to more desirable outcomes.

This brief will present and discuss social, economic, legal and institutional incentives in support of the implementation of EAF, as understood as follows:

- **Legal incentives** (e.g., effective legislation creating positive 'carrots' as well as 'sticks' in the form of significant penalty structures with effective enforcement capability);
- **Institutional incentives** (e.g., fisheries management systems and participatory governance arrangements that induce support from stakeholders).
- **Economic/market-based incentives** (e.g., win-win measures that lead to outcomes that are better both for the fisher and for the fishery ecosystem, such as the use of some excluder devices in fishing gear, to increase profits by reducing fishing costs, broadening market access, while also reducing by-catch); and
- **Social incentives** (e.g., community-based institutions and social environments that create peer pressure on individuals to comply with agreed-upon community rules).

It is clear that incentives can take many forms – some being of quite general applicability, and others being very specific to particular circumstances. Similar to technical management tools, such as spatial restrictions and catch limits, no single incentive will be a panacea for management – a mix of incentives measures that are appropriate to the fisheries and their social-cultural settings will minimize unintended consequences and increase the likelihood of effective EAF management. The following sections will provide an array of incentive measures within fisheries (generally applicable to EAF management as well as conventional fisheries management, if deemed different), as well as a final section discussing extra-fisheries mechanisms that are in use to improve ecosystem performance and encourage sustainable development.

3 LEGAL INCENTIVES

Regulatory frameworks form the legal backbone of fisheries policies and management systems. These regulatory frameworks, which specify the requirements, rights, and responsibilities placed on fishery users so as to meet desired policy goals (such as EAF objectives), are usually enunciated within the fisheries legislation. These might include the requirement to hold a fishing license, to undergo environmental and other impact assessments, to develop fleet-specific or local-level management plans, or to use specified impact-minimizing gear. In addition, regulatory frameworks can provide the legal basis for EAF by, among other things:

- setting property rights systems;
- providing a framework for coordination and integration;
- defining roles and responsibilities;
- specifying international norms and requirements;
- providing a framework for management processes;
- providing legal mechanisms for conflict resolution;
- describing the penalty structures for violations of rules and laws; and
- providing for monitoring and control systems.

Such legal backing provides credibility and clarity to management systems, and hence provides incentives for compliance. In addition to direct incentive-promoting content within legislation, certain characteristics of regulatory frameworks would contribute to promoting positive change, including: (1) being flexible and responsive to various changes, for example to changes in the knowledge base, and biological, ecological and socio-economic changes; (2) being stable enough to provide continuity; and (3) being congruous – providing consistency between fisheries and other sectors and between local, national, regional, and international regimes.

4 INSTITUTIONAL INCENTIVES (INCLUDING FISHERY RIGHTS)

In moving from conventional fisheries management toward EAF management, some changes to current institutional frameworks are likely necessary in order to, *inter alia*, motivate stakeholder buy-in and participation in fisheries management. These changes will likely include providing ways of taking account of and dealing with the increased scope and demands of this management approach, including:

- A need for increased coordination, cooperation and communication within and among relevant institutions and resource users in the planning process as well as in implementation.
- A need for more information regarding the ecosystem and the factors affecting its health and productivity.
- A need for incorporation of uncertainties into the decision-making process due to the increase of factors (predator-prey relationships, nearby activities, such as agriculture, and their impact on the ecosystem etc.) causing uncertainties.
- A need for ways of truly involving the broadened definition of stakeholders in decision-making and management, such as capacity building and multi-directional information dissemination.

Although not incentive mechanisms *per se*, proper institutional arrangements may generate incentives to assist in the application of the EAF, such as buy-in, cooperation, and reducing the race to fish. One commonly-advocated institutional approach for creating incentives supportive of policy goals, such as the EAF, is that of rights-based approaches (i.e. assigning, or recognizing, rights over the use and management of a fishery). Two key elements of rights-based approaches are as follows (Charles, 2002):

Use rights - an institutional mechanism by which fishers, fisher organizations and/or fishing communities hold rights and some security of tenure over access to a fishing area, or the use of an allowable set of inputs, or the harvest of a quantity of fish. If use rights are well established, fishers will have greater security, as there will be increased clarity with respect to who can access the fishery resources and how much fishing each is allowed to do. This can encourage fishers to support conservation measures – since protecting 'the future' becomes more compatible with their own long-term interests. Examples of use rights include territorial use rights (TURFS), customary marine tenure (CMT), and individual transferable quotas (ITQ).

Management rights – the right to be involved in managing the fishery – reflects the need, as noted in the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), to "facilitate consultation and the effective participation of industry, fishworkers, environmental and other interested organizations in decision-making with respect to the development of laws and policies related to fisheries management…". This has led notably to the emergence of co-management arrangements involving joint development of management measures by fishers, government, local communities, and other stakeholders.

Through use rights and management rights, it is hoped that incentives will be improved, increasing the possibility that participants will (1) adopt a longer-term perspective on the fishery, since their use rights are secure over a longer time frame, (2) comply with management regulations, since they have been involved in developing those regulations within the management process, and (3) engage in greater cooperation, since one's well-being may become more closely intertwined with that of others. Of course, introducing a rights system will have accompanying benefits and costs (and varying distributional impacts of each) so there is a need to assess these aspects (as well as monitoring any negative impacts of the measures).

While use rights and management rights have been well-discussed in the general fisheries literature, there are some specific considerations that need addressing with respect to EAF implementation. In particular, as EAF implies a broader scope of fisheries management (to include multiple species, the aquatic ecosystem, the range of societal objectives, and any interactions with other economic sectors, amongst other aspects), use and management rights within such a context will need to deal with other 'users' of the ecosystem beside the specific stakeholders in the fishery being addressed. Other capture fisheries, recreational fisheries, aquaculture, offshore oil and mining activities, eco-tourism and/or coastal tourism, shipping, urban development, coastal industries, and other aquatic-based human endeavours all vie for resources and impact the ecosystem along with fisheries. Just as rights may be allocated to use specific fishery resources and to be involved in managing those resources, so too may there be rights arrangements for others – perhaps in the context of integrated coastal and ocean management, or integrated watershed management. While this goes beyond EAF *per se*, clearly it is a reality that must be taken into account, and which bears very much on the broader goal of ecosystem health and necessarily involves more than just those within the fishery.

In summary, the judicious recognition or adoption of use rights and management rights can help align incentives to desired EAF policy, but this is not a simple task, and indeed taking the wrong approach can produce results contrary to the aims of EAF management. Thus it is important to understand the relationship between rights and incentives, which will vary from case to case.

Example: Multi-stakeholder management rights

An example of broad-based ecosystem-level *management rights* is that of the regional aquatic management board established on the west coast of Vancouver Island, on the Pacific coast of Canada, which was formalized in 2001, as a multi-stakeholder institution for community-based co-management of aquatic-based resources. It is a forum for shared decision-making, where coastal communities and others affected by aquatic resource management can work with governments on integrated management, on an ecosystem basis. The Board is made up equal numbers from governments (federal, provincial, regional and native) and non-governmental representatives (various economic sectors, communities, etc.). Its operation is based on several principles: Shared Responsibility (all participants are jointly responsible and accountable), Inclusivity (all should have the opportunity to participate in management decisions) and Flexibility (structures and processes should be flexible and expected to evolve). Key objectives are (a) to consolidate information relating to different aquatic resource uses and utilization, (b) to integrate expertise and knowledge from all sources, and (c) to ensure opportunities for coastal communities and others affected by the resource management to participate in integrated management, protection and restoration of aquatic resources.

Sources: Pinkerton et al. (2005) and http://www.westcoastaquatic.ca

5 ECONOMIC/MARKET-BASED INCENTIVES

Economic incentive mechanisms that are created outside of existing markets are based on the idea of establishing a situation in which economic actors/agents are convinced that it is in their private interest to make the socially desirable choices. In this brief, the discussion is separated into 'carrot' and 'stick' incentives categories – we refer below to "economic incentives" as the 'carrots' (positive incentives) that promote desired behavior, and "economic disincentives" as the 'sticks' (negative incentives) that penalize undesirable behavior. Such categorization is artificially derived to reflect how the mechanisms affect the benefits and costs structures of the economic agents. Therefore, benefit- and cost-sharing mechanisms have been inserted into these pre-defined categories although neither clearly carrots nor sticks.

5.1 Economic incentives (the carrot)

The use of positive incentives may be split into three categories: conservation price differentials, best-practice/conservation payments, and rights-based incentives. From an economic perspective, all of these seek to shift cost and revenue curves with the aim of attaining a level of fishing activity that is optimal from a societal perspective. In addition, positive economic incentive instruments would, in theory, allow actors to determine for themselves the least cost means of obtaining a given management objective.

Price differential payments occur when consumers demonstrate through the prices they pay the values they hold for ecosystem goods and services; such payments serve as market signals to industry and governments. For example, these payments may take the form of higher prices paid for 'ecolabeled' products, which establish a mechanism for identifying sustainably-produced products and may relate to price premiums or export certificates. The impact on the international market has begun to make itself felt as large retailers pick up on the movement and, perhaps, the price differentiation.

Other attempts to affect consumer choices include fair-trade labels, good fish guides[3], and fish fairs promoting artisanal and local products. Such instruments are geared towards the provision of information to consumers regarding the circumstances leading to the availability of the offered products (e.g. fishing practices, stock status/sustainability, and fishery management regimes).

Example: Certification of Red Rock Lobster, Baja California, Mexico

In April 2004, the Marine Stewardship Council certified the Red Rock Lobster fishery on the Pacific coast of Baja California, Mexico, as a sustainable fishery. The trap fishery "is currently exploited by about 500 fishermen belonging to nine fishing co-operatives and spread over ten villages. Fishing legislation for the fishery was first drawn up in the 1940's as a result of which fishing rights were allocated to co-operatives… Management involves a combination of limited entry, strict delineation of co-operatives fishing areas and community-based self-regulatory measures." The fishery is heavily export-oriented, with 90% of the catch going to markets in Asia, France and the United States. There is thus a clear economic incentive for certification, which provides the potential for better global access to markets, and a higher market price (if a 'price differential' develops relative to non-certified lobster).

Source: Marine Stewardship Council (http://www.msc.org)

Best-practice/conservation payments are transfers to the fishing industry, fishing communities and/or fishers directly, from governments, nongovernmental organizations (NGOs) or other institutions, to

[3] These guides present lists of fish products ranked by some measure of biological sustainability and are usually focused on specific markets to assist consumers in their consumption choices of fish products commonly found in local markets or supermarkets.

compensate for some or all costs of implementing sustainable fishing practices. Such practices may include the use of best-available technologies (e.g. turtle exclusion devices and vehicle monitoring systems [VMS]) or restrictions on fishing patterns (e.g. no-take zones or seasons, and buyback programmes). These transfers may be considered as payments from those who benefit from conservation or best-practices to those who bear the direct costs of their implementation. If the transfers are made by governments, they may be equivalent to environmentally-positive subsidies, made on behalf of society as a whole, while if originating with nongovernmental organizations, foundations, etc., such conservation payments would typically reflect the focus of those bodies.

One form of best-practice/conservation payments are competitions to engage and reward the fishing industry in the design of fishery-specific technology. These can complement regulatory mechanisms (that involve the requirement of technological change), allowing industry participation through the design of the most appropriate and low cost options – they have met with certain success as creativity from within the industry is rewarded and the process tends to increase acceptance of use (see, for example, Annex 1).

Conservation payments can occur when the non-use/existence benefits of certain resources are higher than the extractive use benefits. In these cases, the opportunity costs of not using the resources need to be compensated, either through direct or indirect transfers. This is especially important in small-scale fisheries that depend on the extractive uses for their livelihoods. Direct payments have been used by specific conservation projects in which fishing communities are paid to maintain a given habitat or not to use a resource. Unfortunately, such payments are usually linked to the longevity of the given project and, therefore, once the project has finished, so have the conservation payments. Ferraro and Kiss (2002) present a review of current debates regarding direct payments to conserve biodiversity.

Other conservation payments have focused on indirect transfers focusing on training or other livelihoods diversification methods based on the thesis that reducing fishing communities' vulnerability will naturally increase their ability to sustainably use and management fisheries resources (SFLP, 2006).

Another market-based conservation mechanism is that of eco-tourism development, involving shifts from extractive uses of resources to non-extractive uses. Essentially, the idea is that payments from tourism compensate for lost fishing revenues and may provide for alternative or diversified livelihood sources. However, as is often the case for substitutes, negative impacts on ecosystems may occur (e.g. pollution, crowding, and noise from boats and divers); thereby warranting caution in their use. In addition, the demand for eco-tourism may not be sufficient and stable enough to guarantee conservation of habitats and commercial species and this demand may only pertain to highly valued species, such as sharks, whales, and turtles.

Example: Valuation of whale sharks

Graham (2004) studied this matter, comparing the Taiwan market price for a (dead) whale shark – between US$7,116 and US$21,400 – with the (live) value derived from tourism estimates. She notes that "Using the 2002 Belize whale shark tourism survey results, each shark is worth at least US$34,906 annually. A similar annual value of US$33,500 for each grey reef shark…was recorded in the Maldives. If whale sharks live to at least 60 years old, then an individual might be worth US$2,094,340 over its lifetime providing it repeatedly visits the tourism site." She concludes that "the economic argument for protecting whale sharks is undeniable". This in turn implies the potential for conservation payments to encourage such practices.

Source: Graham (2004)

Rights-based incentives are the third form of 'carrot' – such incentives, as discussed earlier, typically address the implementation of user rights within a fishery; thus removing, to a greater or lesser extent, the

condition of open access and providing an incentive for long-term sustainability. With an effective mix of user rights, the remaining fishing actors may be able to maximize the net present value of the resources, if any future streams of benefits and costs are either integrated into the price/value of the use right (e.g., a permit or a quota), or into the choices made by the 'owners' of the resources. For a review of experiences in the use of property rights and the implementation of transferable quota rights in fisheries management, see FAO (2000a) and (2001), respectively. FAO (1982) provides a discussion on the conditions affecting the successful creation and maintenance of TURFs. Examples of TURFs may be found across the globe (e.g. Argentina, Chile, Japan, Peru, Philippines, South Africa, the U.S., and Vanuatu) and have usually, but not always, developed in situations with historic roots of community-based management of natural resources.

Example: Territorial Use Rights in Fisheries

When fishers hold use rights, there is more secure access to the fishery, and potentially greater incentives for compliance with management – particularly when there are accompanying management rights. Castilla and Defeo (2001), in a review of management practices in Latin American shellfish fisheries, examined the role of TURFs, concluding that the examples studied "illustrate the strong potential that the apportionment of TURFs has, when accompanied by a co-management approach. In Chile, the allocation of TURFs among communities that extract benthic shellfish is an efficient tool to cope with overexploitation concerns… Allocation of TURFs to fisher organizations ameliorated the weaknesses of enforcement regulations and the high transaction costs in a country with more than 4,200 km of coastline… [and] improved the status of shellfisheries… The formal allocation of TURFs to fisher organizations such as the collectively managed spiny lobster fishery of Punta Allen (Mexico) constitutes another sound example…"

Source: Castilla and Defeo (2001)

5.2 Economic disincentives (the stick)

Economic disincentives within an EAF context mirror the polluter-pays and user-pays principles (PPP and UPP, respectively) used in the allocation of costs of pollution prevention and control measures and sustainable development paradigms.[4] These principles attempt to correct for existing market failures by internalizing into the production function the costs of using natural resources and of negative impacts on the ecosystem. Such principles have become standard policy in treating water, air, and hazardous chemicals/waste issues; while their application to the fisheries sector has been slower to materialize. Coffey and Newcombe (2001) have provided a nice analysis of the current and potential use of PPP in European fisheries and the generalized results are presented below. In their work, one can identify several objectives for the use of economic instruments (e.g. taxes, charges, and levies[5]) in line with the PPP/UPP: (i) cost recovery for fisheries management, (ii) paying for resource use, and (iii) paying for environmental damage prevention or alleviation.

Cost recovery for fisheries management, generally through taxes/levies, while not really a 'stick' incentive measure, will change the private profit functions of fishing activities and should instil a sense of ownership of the results of management as a direct link is made between the benefits of management and their costs (Cox, 2000).[6] However, while explicit research on applying cost-recovery mechanisms

[4] The polluter pays principle means that the polluter bears the expenses related to any pollution prevention and control measures; meaning that these costs are reflected in the cost of goods and services which cause pollution in production and/or consumption. The user pays principle is a variation on the polluter pays principle that "calls upon the user of a natural resource to bear the cost of running down natural capital" (UNSD, undated).

[5] The word taxes will be used interchangeably in the text for taxes, charges, fees, and levies.

[6] The OECD has proposed further that including industry in the decisions about and in the provision and payment of management services is highly likely to create incentives to improve the fishery's performance and to increase the cost-effectiveness of management services (OECD, 2003).

elsewhere and implicit use within fisheries co-management regimes are occurring,[7] It must be noted that use of cost recovery mechanisms has, for the most part, been applied only within the OECD countries, and indeed in cases where revenues are collected from fisheries activities, more often than not these revenues go directly to the central government budget. In such cases, the link between benefits and costs of management services cannot be made and fisheries authorities continue to base their management activities on governmental appropriations.

Example: Fisheries management cost recovery in Australia

In Australia, cost recovery for fisheries management "means that the commercial fishing industry pays for those costs directly related to fishing activity, while the Commonwealth government pays for management activities that may benefit the broader community (as well as the industry) and that satisfy a range of specific community service obligations". In line with the Australian national cost recovery policies, the State of Victoria has proposed their *Fisheries Regulations 2006*, amending the amount paid for fisheries management services (FMS) levies by the capture fisheries sector. The rationale of the FMS levy increases was to continue the phased introduction of the recovery (to 100%) of the attributable costs associated with the delivery of FMS and to link each beneficiary to these costs. Attributable fisheries management costs are defined as the costs associated with FMS that benefit private beneficiaries belonging to a particular fishery sector or class of access licence.

Sources: Cox (2000); DPI (2005)

Paying for resource use, often through license/access fees, taxes, and tradable or auctioned quotas, is an acknowledgement within the fisheries sector of the value of natural resources, much as in the use of land, water, or other natural resources. Historically, access to fisheries resources was free and all profits from the use of these resources were either dissipated, in the case of open access fisheries, or kept by the fishing industry. Governments and, hence, societies, had not insisted on payments for the use of these natural resources. However, with the onset of the Law of the Sea in 1982[8] and the idea of national ownership/stewardship of marine resources, the idea of private individuals paying society for the use of natural resources has gained ethical acceptance and jurisdictional backing.

The level of such payments would depend on the particular fishery and the economic concept of rent, which is the 'bonus' profit[9] from using a natural resource. In an open access fishery, there would be no rent to be had; so no rent extraction is possible. Moving from an open access fisheries to a socially optimal fishery, would increase the rent value of the fishery to the private users and, by consequence, those remaining in the fishery would pay for this privilege.

Third country access agreements (i.e. foreign fleets paying for the right to fish in another country's EEZ) have been used in cases where national fishing fleets do not have the capability of exploiting certain stocks and could benefit from rent extraction through fees and taxes. These agreements have been wrought with criticisms (e.g. IEEP, 2003) but as information sharing[10], experiences, and monitoring capabilities[11] are increased, such agreements may benefit national economies while ensuring sustainable harvest levels.

[7] See, for example, Keizire (2001) analysis of the fisheries management financing in Uganda and the Asia-Pacific Fishery Commission (APFIC, 2005) work regarding the implementation of fisheries co-management.

[8] The United Nations Convention on the Law of the Sea of 10 December 1982. See http://www.un.org/Depts/los/convention_agreements/convention_overview_convention.htm

[9] "In relation to fisheries, a 'rent' is generally thought of as the difference between total revenues obtained from the fishery and the total costs (estimated at their opportunity costs) of employing the various factors of production that together make up the enterprises participating in the fishery." FAO (2000b)

[10] To this aim, WWF has created a "Handbook for negotiating fishing access agreements" (Martin et al, 2001).

[11] See FAO (2002) for guidelines on monitoring, control, and surveillance (MCS) aspects within access agreements.

Paying for ecosystem damage prevention or alleviation, either through bearing the costs of appropriate technology or through paying fines for damages inflicted, is probably the most politically palatable use of economic incentives as it relates to a given 'bad' action. The fining of actions that have negatively affected ecosystems is quite common; however, these cases tend to involve actors outside of the fishing sector who have damaged habitat, such as through oil spills or dock building.[12] Fishing activities that have harmed the ecosystem (e.g. dynamite fishing, destructive anchoring, discarded by-catch, and incidental fishing of marine mammals) tend to be controlled through regulations, such as no-take zones, gear restrictions, and by-catch limits.

One economic disincentive in use with respect to harmful fishing activities is the use of trade barriers, such as the blocking of export permits under the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)[13]. CITES was developed to minimize the effect of international trade on commercial species either threatened with extinction (Appendix I species) or exploited unsustainably (Appendix II species). Trade in Appendix I species is all but prohibited; while trade is permitted for Appendix II-listed species if the related fishing practices are proved sustainable (i.e. the species "was legally obtained and if the export will not be detrimental to the survival of the species"). If the potential exporter is unable to prove the sustainability of the fishery, exportation rights are not granted; hence representing a change in the burden of proof. In theory, sustainable management of fisheries should keep the commercial species from being placed on the CITES listing; however, such trade measures are an acknowledgement of the impacts of market forces on our ability to manage resources.

Example: CITES and Queen Conch in Jamaica

The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) represents an international legal mechanism that has the effect of creating incentives for positive EAF-related behavior, particularly through the provision of export permits. As Cascorbi (2004) reports:

"Until 1999, Jamaica was the world's largest producer of queen conch. Most of this was fished on the Pedro Banks, a large undersea area that is the habitat for one of the Caribbean's largest and most important queen conch stocks. In the early 1990s, Jamaica's landings of Pedro Banks conch topped 3 000 metric tons per year. Jamaica also conducted its first conch stock assessments in the early 1990s. Recognizing a decline in the resource, the Jamaican government introduced annual catch and export quotas, implemented in 1994 in Jamaica's first conch fishery management plan. MSY for queen conch was calculated at 700-1 300 mt/year. Unfortunately, illegal fishing is now rampant on the Pedro Banks, much of it by foreign vessels that simply ignore Jamaican law. In the years 1999-2002, illegal harvest was estimated to account for 40% of the conch fishing on the Pedro Banks. Jamaica conducted its third conch stock assessment in 2003. Although this stock assessment suggested a total allowable catch of 900 mt, Jamaica set its conch export quota at 500 mt to allow for some inevitable losses to illegal fishing… Based upon the findings of its September 2003 Significant Trade Review, CITES considers Jamaica to have an adequate conch management regime and relatively healthy queen conch populations. Jamaica is one of only two Caribbean conch-exporting nations to earn the CITES designation of 'least concern' for its queen conch resources."

Source: Cascorbi (2004)

Other trade barriers at the national level, such as the U.S. dolphin-safe tuna policy, create incentives to implement sustainable fishing practices as defined by the importing country. However, such measures may prove ineffective in creating more sustainable practices if substitute markets are available for the given products.

[12] See the discussion below on extra-fisheries mechanisms.
[13] See http://www.cites.org/

Although the PPP concept may now be found in more and more national fisheries' legislations, and is applied in relation to the impacts of non-fisheries activities on fisheries habitats, it is difficult to claim a wide-spread use of such economic instruments. Coffey and Newcombe (2001) presented a few considerations as to why the use of economic disincentives with respect to environmental damage/control may prove difficult. Implicit in the shift toward PPP is the removal of perverse incentives (minimizing 'harmful' subsidies) as, without doing so, fishing effort will continue to rise; making ineffective and inefficient any attempts to internalize the environmental costs of fishing.

6 SOCIAL INCENTIVES

Just as economic and/or market mechanisms can induce individuals to make choices compatible with societal objectives, so too can social factors produce similarly desirable behavior. Thus, developing and implementing successful EAF strategies requires understanding and working with the social mechanisms surrounding access to resources, institutional organization and decision-making, local management and power structures, and attitudes and perceptions towards authorities and institutions. In other words, attention is needed to *social incentives*.

Indeed, much of what has been mentioned in earlier sections might be termed social incentives: providing alternative livelihood opportunities or transparent and participatory management approaches, for example, both impact and are impacted by the social framework surrounding the fishery. Properly implemented management systems, from inception to monitoring and control, will affect people's incentives to comply with regulations as well as the strict economic gains and losses related to these regulations. Peer pressure within fishing communities can be harnessed as a social incentive producing more socially-desirable choices (e.g., improved compliance). Moral and religious codes, whether fishing is considered a right or a privilege, and knowledge about the ecosystem, will certainly involve social incentives that influence individual and group behavior (even though these are rarely captured in conventional decision-making models).

Recognizing and/or developing social incentives requires suitable understanding of why people act in certain ways, as well as an understanding of the socio-economic context of a given fishery (e.g. employment and livelihood opportunities, fishing traditions, local ecological knowledge, changing demographics). Such an understanding will assist in the identification of potential impacts of management interventions (e.g. where would displaced effort go) and will assist in promoting wanted change – without such knowledge, much information regarding the motivations, interests, and priorities of the resources users will be lost and management misguided.

7 EXTRA-FISHERIES INCENTIVE MECHANISMS

The discussion above has focused mainly on mechanisms falling within the conventional management sphere of influence. However, as the EAF requires a broader approach to resource management, negative and positive externalities stemming from outside of the fisheries sector are increasingly being incorporated into management, whether promoted by the industry itself or by government instigation. Therefore, a brief description of mechanisms to internalize the benefits and costs of extra-fisheries activities and values is presented below.

7.1 Non-fisheries "Polluter pays"

Financing EAF implementation through a "polluter pays" approach involves collecting revenues from those using the natural resource and/or causing ecosystem damage, and using those funds to finance positive moves to EAF management. In addition to the polluter-pays and user-pays incentive mechanisms described above, governments and fisheries associations have begun reclaiming the restoration costs in dealing with ecosystem damage inflicted by actors outside of the fishery sector (e.g. upstream activities,

changes to habitats, pollution, and destructive practices). Individuals convicted of damaging the ecosystem are required to either pay fines, which may or may not be directly related to damage costs, or more directly to repair the damage or pay for work related to the conservation and protection of the affected habitat. Examples of trust funds established within fishing associations to manage funds collected for such restoration work are providing institutional precedence for the transfer of funds into the fisheries sector.

Example: Non-fisheries polluters paying for fishery ecosystem damages

Canada – Under the Federal Fisheries Act, the Department of Fisheries and Oceans (DFO) Canada uses fines from habitat violations to restore damaged fish habitat. The convicted offender pays money directly to repair fish habitat or enhance fish stocks, often through local non-profit environmental groups. For examples of such convictions, see DFO (2004).

United Kingdom – the Anglers' Conservation Association (ACA) represents its members in court cases against private and public entities polluting British lakes and rivers. Money collected is kept within member fishing clubs and used in rehabilitation trust funds. See http://www.a-c-a.org/whatwedo.html for examples.

United States - The Columbia River Estuarine Coastal Fund was established in 2004 through the collaboration of the Foundation, the Service and the U.S. Attorneys for Oregon and the Western District of Washington from fines imposed on shipping companies that illegally discharged oily waste into the Pacific Ocean near the mouth of the Columbia River. Conservation and restoration projects will be funded with $1.2 million in community service payments from polluters. See http://www.nfwf.org.

7.2 Extra-fisheries "Beneficiary pays"

Note that related to "polluter pays" is the idea of "beneficiary pays", in this case implying that those receiving the benefits of EAF implementation should pay the costs required to achieve those goals. Extra-fisheries benefits that can accrue from application of the EAF are being acknowledged through a global increase in environmental awareness (i.e. the recognition of the goods and services provided by ecosystems and the need to minimize damaging impacts on these ecosystems), a desire to improve human conditions (i.e. decreasing hunger and poverty, improving livelihoods), and the hopes of holistic, decentralized natural resource management (i.e. through good governance, participatory processes, community-based management, and integrated resource management).

The possibilities for garnering funding from international sources to support EAF are numerous (e.g. donor countries, international trust funds, development banks, funding facilities). Combined, these possibilities may lead to initiatives for the global community to financially support EAF efforts, particularly in jurisdictions that otherwise might be unable to afford such efforts.

However, understanding the various and appropriate sources of funding requires a large and, perhaps, daunting investment on the part of fisheries managers. For example, some funding sources may target sectoral-specific activities, while others may target specific issues, such as biodiversity or marine protected areas. Accounting systems and even vocabulary may vary significantly across sources and funding sources may or may not be tied to certain conditions, economic or otherwise.

In addition, as EAF management is likely to comprise both development and conservation components, no one source of funding is likely to cover all EAF needs. Hence, a portfolio approach to funding will be necessary; increasing the time and energy devoted to developing and using these funds.

Furthermore, there is a crucial issue of institutional sustainability to consider when utilizing external funds – i.e., ensuring that long-term arrangements are in place so that EAF implementation is not jeopardized when the specific funding period ends.

In recognition of these complexities, guides to finding relevant financing sources have been developed. Importantly, some of these guides provide detailed business planning for marine protected areas and other skills to assist fisheries managers in planning their financial needs assessments and donor funding requests. The major categories of international funding described in these guides[14] are:

- Bilateral & Multilateral donors
- Biodiversity Enterprise Funds,
- Debt for nature/environment swaps,
- Environmental Funds and Conservation facilities,
- the Global Environmental Facility, and
- Foundations.

In any case, an evaluation of the potential benefits from EAF application, whether at the local, national, regional, or international level, would assist in organizing efforts at the appropriate levels.

Example: Financing coastal resource management in the Philippines

Salamanca and Luna (2002) presented an historical perspective of coastal resource management (CRM) in the Philippines and discussed "the factors that are thought to have played crucial roles, the formal institutions that underpin its development, and the issues that need to be addressed for CRM to fully succeed." Within this report and a related background article (Salamanca, 2003), the authors estimated the financial needs and sources of funding for 290 coastal resource management projects and activities from 1974 to 2000. Over this period, approximately US$230 million were spent on activities undertaken to manage the coastal zone and its resources through various implementers (i.e. integrated, multi-sectoral, government-led, NGO-initiated, and fisherfolk-led) and various focuses (i.e., livelihood, education, research, advocacy, conservation, population, etc.). The authors estimated that approximately US$9 000 per km^2 of coral reef was spent over the sixteen-year period to protect the nation's 26 000 km^2 of reefs. While studying the financial investments, the authors also investigated the sources of funds and found that 63 percent of the funding came from 44 international sources (i.e. bilateral and multilateral sources, debt for nature swaps, the international NGO community, and international philanthropic organizations); 36 percent from the Filipino government, and one percent from local donors; thus, highlighting the importance of international sources of funding.

Sources: Salamanca and Luna (2002); Salamanca (2003)

8 CONCLUDING REMARKS

In this paper, we have addressed four forms of incentives: legal, institutional, economic, and social for use in fisheries management frameworks following the ecosystem approach. Many of the incentive measures presented fit in quite naturally with existing conventional management strategies (e.g. participatory approaches, good governance, and well established rights systems); however, other measures adjust for the broader understanding of the values that societies have for ecosystem goods and services (e.g. polluter and user pays principles, extra-fisheries externalities, and garnering support for globally distributed benefits with localized costs).

[14] WWF Guides - http://www.worldwildlife.org/conservationfinance/pubs.cfm;
Conservation Finance Alliance Guide - http://guide.conservationfinance.org/;
Debt for nature/environment swaps guide - http://biodiversityeconomics.org/finance/topics-42-00.htm;
GEF funds guides - http://www.gefweb.org/Partners/partners-Nongovernmental_Organ/ngo_guide/ngo_guide.html;

While incentive mechanisms have been presented in this paper because of our belief in their usefulness for fisheries management, a few caveats are, nevertheless, warranted. The risk of relying on one tool or one sub-set of tools is, as always, high – unfortunately, there is no such panacea and the broader scope of EAF will require a broader mix of the tool kit. In the same vein, while economic incentives received considerable attention in this paper, in reality - given the nature of externalities - a reliance on the market to fix all ills may well disappoint. This is why it is also important to work with legal, institutional and social incentives, and furthermore, to recognize that the potential role of government remains strong in implementing EAF management. The use of resources, whether natural, human, or financial, will require societal choices and the need to understand the trade-offs among the various choices involved.

This paper has been based on the concept that understanding human behaviour is at the core of fisheries management. This would include considering both demand and supply sides of fisheries (i.e. markets and trade) – the incentives they create and the impacts they have on our ability to manage – as well as the extra-fishing variables that affect human behaviour.

The mechanisms discussed in this paper are not new concepts; although, perhaps, there has been relatively little application to the fisheries sector. However, examples exist (within fisheries and among other sectors) that may provide us with some guidance on their use and, like most borrowed tools, creativity may be required to adapt them to the context at hand.

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Annex 1 Win-win by-catch possibilities in Australian's Northern Prawn Fisheries

With the required introduction of turtle exclusion devices (TED) and by-catch reduction devices (BRD) within the Northern Prawn Fisheries in 2000, concerns regarding the economic impact of this conservation-based management tool were voiced within the fisheries. Therefore, industry and scientists worked together to assess these impacts and to improve locally used designs.

While commercial prawn catches were decreased by approximately 4-6 percent, damage to prawns by heavy animals was decreased by over 40 percent, representing from one to three percent of their catches; thereby increasing the catch value. Further reductions in commercial losses are expected with increased familiarization and fine-tuning of the devices. In addition, other benefits such as increased ease in handling and sorting and reduced danger to the crew were associated with the exclusion of larger animals.

Large by-catch reductions were identified for sea turtles, sharks, rays, and large sponges; while by-catches of sea snakes and small by-catch left much room for improvement.

Percentage changes in catches due to the effects of TEDs and BRDs

Catch group	Treatment						
	TED + BRD	TED net	BRD only	Upward-excluding TED	Downward-excluding TED	Bigeye BRD	Square-mesh panel BRD
Sea turtles #	-100	-99	ns	-99	-100	–	–
Sea snakes	-5	ns	ns	–	–	ns	ns
Elasmobranchs #							
Sharks	-18	-13	-17	-20	-9	–	–
Rays	-36	-31	ns	-27	-35	–	–
Sawfish	ns	ns	ns	ns	ns	–	–
Large sponges #	-85	-86	ns	-82	-96	–	–
Small bycatch	-8	-8	ns	ns	-9	ns	ns
Prawns							
Total prawns (all commercial species)	-6	-6	-4	ns	-6	-4	ns
Tiger prawns	-7	-7	-4	-6	-6	-4	ns
Tiger prawns (soft and damaged)	-42	-55	ns	-36	-63	ns	ns
Endeavour prawns	-5	ns	ns	ns	ns	ns	ns
Endeavour prawns (soft and damaged)	-41	-44	ns	ns	ns	ns	ns
Byproduct							
Thenus spp.	ns	ns	ns	ns	ns	ns	ns
Teuthoidea spp.	ns	ns	ns	ns	ns	ns	ns
Amusium pleuronectes	ns	ns	–	–	ns	–	–

Notes: # = species groups where the 'TED net' analyses included any net with a TED (TED + BRD or TED only;
ns = no significant difference between comparisons; –, no comparison made.

Source: Brewer *et al*, 2006.