

# If science is not the answer, what is?

## An alternative governance model for the world's fisheries

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Worldwide, management of fisheries has repeatedly failed, despite substantial investment in scientific research, primarily in the natural sciences. We argue that the way in which ecosystems are viewed and the lack of explicit consideration of three key elements – corporate responsibility, social justice, and ethics – have contributed to this dismal history. Here, we turn classical ecosystem thinking on its head, proposing an alternative image of an “inverted trophic pyramid” that places humans at the bottom. The inverted pyramid encapsulates ecosystem-based management and the interdependent relationship between humans and the ecosystem. It requires business incentives, ethics, and a balance of power to prevent the pyramid from toppling and to avert a crisis.

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The dismal state of the world's fisheries is familiar news. Worldwide studies have demonstrated our failure to manage many fisheries sustainably (eg Pauly *et al.* 1998; Myers and Worm 2003; Pandolfi *et al.* 2005). Evidence from historical studies indicates that fisheries resources have been depleted over long timescales (Jackson *et al.* 2001; Butcher 2004; Rosenberg *et al.* 2005). Yet, regardless of the mounting evidence of poor resource management, we continue on this “march of folly” (Tuchman 1984). Why? Lack of scientific information is no longer a legitimate explanation; an assessment of presentations at the Fourth World Fisheries Congress revealed that we have plenty of natural science to address questions concerning sustainable fisheries (Chuenpagdee and Bundy 2006). More natural science may not make

much difference, although there is an encouraging shift toward multidisciplinary research (Table 1; Bundy *et al.* 2005). So if more science is not the answer, what is?

We suggest that there is a problem with the way ecosystems are viewed. Simply, an ecosystem consists of a biotic community (including humans), which interacts with the surrounding environment. The classic, conceptual model of an ecosystem is that of the trophic pyramid (Lindemann 1942). This paradigm places humans at the apex, benefiting from the various “goods and services” provided by the ecosystem and controlling its use (Figure 1). The strong, solid base of the pyramid gives the illusion that we are superior and safe at the top, and can heedlessly withdraw our “rightful” ecosystem goods and services. Hard experience has shown that this is not the case.

A new perspective is clearly needed. Ecosystems do not exist solely to provide unidirectional goods and services to humans. We have a moral obligation to sustain them for future generations, and from a biocentric viewpoint, for their intrinsic worth (Kennedy and Thomas 1995). This implies that the image of humans at the top of the trophic pyramid is no longer applicable. Instead, we propose that a more realistic way to view the trophic pyramid is to literally turn it on its head. The “inverted pyramid” (Figure 2) portrays an ecosystem that is inherently unsteady and cannot be maintained without the inclusion of supporting elements. Humans are the pivot point of this precarious balance, with the health of the ecosystem dependent on human behavior. Similarly, the well-being of humans is dependent on the balanced ecosystem. This view corresponds with increasing awareness and acknowledgement that human-in-nature systems are complex and unpredictable (Folke *et al.* 2002) and that an understanding of fisheries as social–ecological systems is required (Berkes 2003).

### In a nutshell:

- The current crisis in fisheries is not caused by lack of scientific information, but by lack of a holistic view of ecosystems
- A new conceptual governance model, the inverted trophic pyramid, turns classical ecosystem thinking on its head, placing humans at the pivot point
- The inverted pyramid model emphasizes the importance of explicitly including corporate responsibility, social justice, and ethics in ecosystem-based management
- Adopting this model can contribute to reversing the degradation of the world's fisheries resources

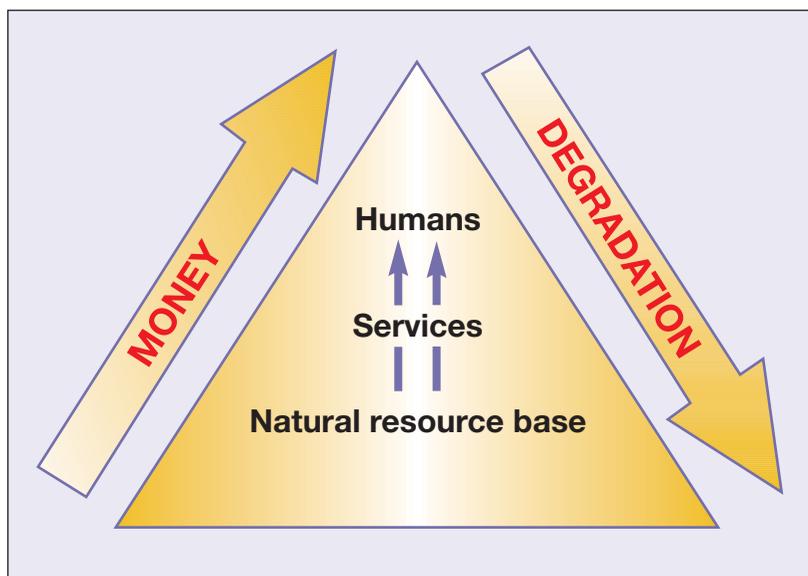
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## ■ The inverted pyramid for ecosystem governance

The “inverted” trophic pyramid is a model for ecosystem governance. Ecosystem-based management (EBM), the latest and most comprehensive conceptual approach that seeks to keep the trophic pyramid intact (Hall and Mainprize 2004; McCloud *et al.* 2005; Pikitch *et al.* 2005), should form the pyramid’s core. EBM calls for meaningful stakeholder participation, integrated management of all ocean sectors, and an interdisciplinary approach to fisheries science. It includes some of the factors identified for success by Cunningham (2005), such as institutional capacity, policy frameworks, and holistic approaches to management. However, although EBM explicitly includes humans as part of an ecosystem, in practice, current interpretations of EBM fall short of any real consideration of the human dimension. We argue that this is due to two factors: the persistent lack of acceptance of humans as components of ecosystems and the challenge of including consideration of humans in ecosystem management. As such, the objectives of EBM are largely conceptual and we still need to work out how to put it into practice.

To prevent the inverted pyramid from toppling and to enable implementation of EBM, three linked supporting concepts that move beyond EBM are required: corporate responsibility, social justice, and ethics. Corporate responsibility shifts short-sighted, narrowly focused, profit-driven business practices toward greater balance (Kaptein and Wempe 2003). It takes into account the total costs of fishing, including externalities such as damage to ecosystems and local communities, and the distribution of costs and benefits among social groups and generations (Sumaila and Walters 2005). This is particularly important in an era of globalization, when powerful corporations can easily take advantage of trade and marketing of fisheries products. Profits made at the end of such chains of distribution are seldom returned to the localities where fish are extracted, to build more resilient coastal communities and industries.

Social justice, the second supporting element, refers to fairness in the distribution of benefits from, and access to, the resources of the oceans (Loomis and Ditton 1993; Hernes *et al.* 2005). However, social justice may be difficult to achieve, and may have different meanings for different people. Fisheries development policies aiming to improve social and economic well-being of coastal communities in reality often favor industrial, capital-intensive, large-scale fishing enterprises. Such development may



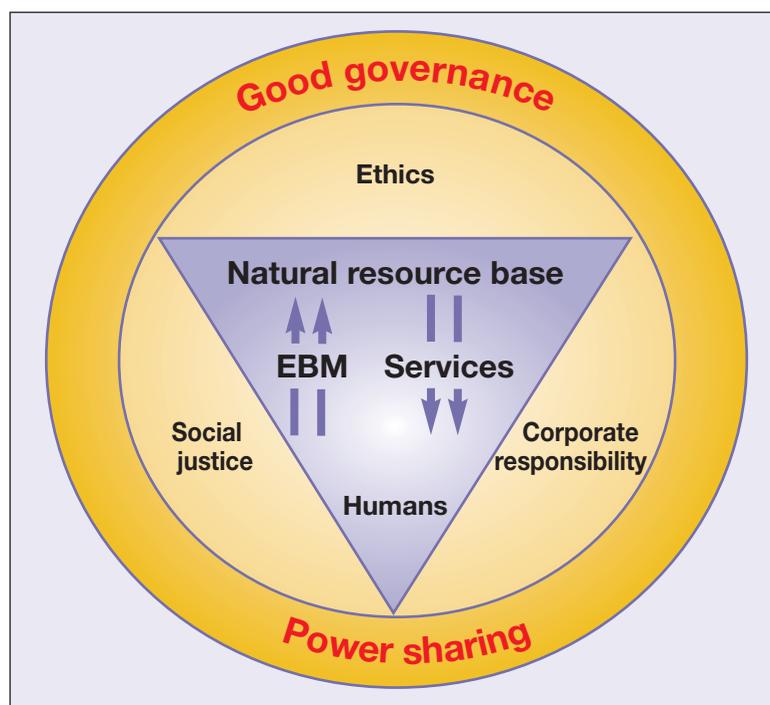
**Figure 1.** Classical system thinking.

increase short-term employment, but not necessarily in sectors where new jobs are most needed (ie in poor coastal communities; Bailey and Jentoft 1999). Development of large-scale industrial fishing also means increased resource competition with, and further marginalization of, the small-scale fishing sector (Pauly 1997). Importantly, fish, the staple source of protein for people in developing countries, are being removed from coastal waters by large-scale domestic and foreign fishing vessels to feed people in developed countries (Kaczynski and Fluharty 2002). Considering and improving social justice in fisheries in an EBM context would lead to more rational use of marine resources.

Finally, ethics concerns principles that guide people in their day-to-day behavior. While seemingly fundamental, ethics are rarely emphasized in discussions about fisheries; they are either too obvious or too evasive. In fisheries, ethical concerns cover a wide variety of issues related to social dimensions, management, and the impacts of fishing and other anthropogenic activities on ecosystems (Coward *et al.* 2000). Examples include issues related to procedural

**Table 1.** Distribution of 223 papers presented at the Fourth World Fisheries Congress, showing that almost 60% of the papers were multidisciplinary (Chuenpagdee and Bundy 2006)

	Natural systems	Policy	Social	Economic
Natural systems	64	–	–	–
Policy	43	23	–	–
Social	6	19	1	–
Economics	6	3	2	9
	Natural systems	Policy	Natural systems/ policy	
Policy/social	21	–	–	
Policy/economics	3	–	–	
Social/economics	3	2	18	



**Figure 2.** The inverted pyramid for ecosystem governance.

justice (ie the process by which allocation and management decisions are made; Daigle *et al.* 1996), such as the inclusion of stakeholders in management and democratic decision making, and the reliance of coastal communities on fisheries resources. Furthermore, ethics influence how power is employed and manifested in the governance of ecological and social systems.

### ■ Good governance model

As in the interactive governance approach (Kooiman *et al.* 2005), the inverted pyramid model explicitly recognizes the complexity, diversity, and dynamics of ecosystems and the importance of interactions among stakeholders at civil, market, and state levels, throughout the fish supply chain (harvest, post-harvest, and distribution). Implementing EBM using the inverted pyramid model requires several measures. First, we must acknowledge that we cannot afford to wait for market forces or incentives alone to affect our decisions; active intervention at the political level is required. This calls for an understanding of power, and how it can be used by different actors, positively (productive power) or negatively (destructive power), to affect decisions (Sinclair and Ommer 2006). Interestingly, the positive use of power is most commonly seen when power is shared, as in the fisheries co-management regimes that have been successfully practiced in many parts of the world (Wilson *et al.* 2003). As in other governance systems, co-management comes with risks. For example, power may end up in the hands of local elites (Davis and Bailey 1996) and meaningful involvement requires commitment in terms of time and effort that might not be feasible (Rutherford *et al.* 2005). While it is not a panacea, co-

management has potential for creating legitimacy, responsibility, and empowerment (Jentoft 2004), and is worthy of consideration.

In parallel with a political approach, an examination of the incentives that will work best to induce corporate and state responsibility is necessary, together with an effort to “shift the burden of proof” by establishing and mandating a framework for industry-funded environmental impact assessments of fishing activities. Corporate responsibility can be encouraged through incentive programs, such as eco-labeling, or through regulatory measures, such as environmental impact assessment, full-cost accounting, and more effective monitoring, surveillance, and control at local to global scales. These are not simple solutions. Eco-labeling, for example, can be subject to abuse and uncertainty; some have questioned to what degree the Marine Stewardship Council (MSC) eco-labeling program takes into consideration the socio-economic impacts of a fishery (PCCFFA 2003). Although the MSC recognizes the importance of social and economic considerations, it is not

clear how these are incorporated into their evaluation process. Environmental impact assessments may take years to pass through court systems, and objectives such as full-cost accounting require strong political support, which is currently lacking. Other incentives include rights-based systems, as seen in the Pacific halibut (individual rights) and Namibian hake fisheries (vessel user rights), and in two fishing villages in Andhra Pradesh, India (community rights; Cunningham 2005). However, in the case of individual rights and vessel user rights, fairness and distributive justice are issues of considerable concern (Davis 1996; Pålsson 1999).

Awareness of social justice and ethical issues in fisheries can be raised by increasing public information, encouraging public debate, and promoting consumer awareness of the business of fishing and the overall value of natural ecosystems. For example, in addition to rating fish based on stock status and fishing methods, the *Fish list* (Blue Ocean Institute *et al.* nd) scoring system, developed by a group of environmental organizations, could also take into account where fish are caught and marketed, and whether these choices are made in a just way. Government support to sustain small-scale fisheries can be adjusted to at least match the support provided to the large-scale fisheries sector. Systematic data collection of catches and other statistics related to small-scale fisheries, as well as an assessment of their contributions to food security and livelihoods, are a few first steps (Chuenpagdee and Pauly 2004).

Approaches to halt and reverse the degradation of marine ecosystems, particularly through EBM, are gaining support. Many fisheries policies are made, but their implementation is often constrained by bureaucracy, fund-

ing, and politics. Without political and social commitment to marine ecosystem conservation and the governance to back it up, the health and integrity of the oceans will continue to deteriorate. The struggle to implement EBM and other initiatives is a reality everywhere; inaction is not an option. The inverted pyramid model graphically demonstrates that humans are dependent on healthy ecosystems, vulnerable in the event of their demise, and at the same time pivotal to their health. By adopting this as our model, we can begin the process of reversing the dreadful state of the world's fisheries resources.

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