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[Home](#) > September - November 2007 (1:1)

Issue PDF archive:  [MEAM1.pdf](#) <sup>[1]</sup>

## **Experts Describe Challenges Facing Marine EBM** <sup>[2]</sup>

Ecosystem-based management (EBM) is gaining acceptance around the world as a more holistic approach toward coastal and marine resource management. At the same time, agreement on the scope and implications of EBM remains elusive. We asked selected experts for their views on the challenges facing the EBM field:

### **EBM as a buzzword**

By Tundi Agardy, Executive Director, Sound Seas, Bethesda, Maryland, U.S.  
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We've made great advances in marine management. This has been along a trajectory that began with management of single stocks as if they were agricultural crops, and has progressed toward recognition of the dynamics of marine ecosystems and attempts at thinking at ever-larger scales and acting in ways that are not merely replicas of the way we manage lands. Having said that, I think we in the marine management/conservation community have over-exaggerated the progress we've made toward true EBM. In most cases, EBM is merely a buzzword - and it hasn't moved too far beyond the state we were in 15 years ago, when I remarked that ecosystem management was like the joke that everybody laughs at but nobody really gets.

So I'd ask: "What is EBM?" To that, I'd answer that EBM is first and foremost a recognition of connections - quite obviously the connectivity between different components in large-scale marine ecosystems, but also the connections between land, freshwater and the sea, and the very real but oft-ignored connections between human well-being and marine-ecosystem condition. We've gotten better at recognizing the connections in the first way of looking at it, but we're still dismally bad at the latter two.

In my opinion, CCAMLR [Convention on the Conservation of Antarctic Marine Living Resources] remains the best example of a framework that gets us toward true EBM. But the Antarctica case is, of course, unique where neither the freshwater/terrestrial connections nor the human ones apply. I also believe multiple-use zoned MPAs can move us toward EBM if the scales are appropriate and management measures are tailored to address the real threats to ecosystem productivity and health. But I think we'll make a significant leap toward EBM if and when we are able to manage strategically at the regional scale using complementary ocean and coastal/watershed zoning. Therefore, the greatest challenges will be to highlight those broader connections, scale up management to scales appropriate to these vast, interconnected ecosystems, and bring communities of fisheries managers, coastal managers, tourism operators, developers, community leaders, etc., together to articulate common goals and work toward them - ignoring uncertainties and bravely experimenting with new ways of managing ourselves and our impacts.

### **Progress at a slow pace**

By Ussif Rashid Sumaila, Associate Professor and Director, Fisheries Economics Research Unit, University of British Columbia Fisheries Centre, Canada.  
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EBM is still in the conceptualization, modeling and experimentation stage. There are a number of ongoing efforts - at the level of research, modeling and practical management in universities, research institutions, among government and non-governmental organizations - to find ways and means of implementing EBM. Progress is being made, but only slowly.

A key challenge stems from the fact that ecosystems are geographically specified, with the implication that many of the world's 64 large marine ecosystems are shared by two or more countries. This means that policies that are transboundary in nature are required to manage them successfully. For example, to effectively apply EBM to the management of the Benguela Current Large Marine Ecosystem in the Southeast Atlantic Ocean, policies need to be crafted and adopted by the three countries bordering the ecosystem - namely Angola, Namibia and South Africa. In terms of policy, getting countries with diverse societal objectives to agree on and implement joint EBM regimes is certain to be a challenge that must be addressed if EBM is to gain universal applicability.

To know EBM has been successful, I will need to see joint management institutions put in place by countries sharing a given ecosystem. These institutions should be given the authority, responsibility and mandate, by the relevant countries, to manage the ecosystem using EBM. Given the insurance value of marine protected areas, and their ability to protect slow-growing fish from market forces as dictated by market interest rates, any EBM system that hopes to be successful in ensuring the long-term sustainability of marine resources will have to include them in their management toolkit.

### **A need for implementation clarity**

By Francisco Arreguin-Sanchez, Senior Professor, Center of Interdisciplinary Marine Sciences, Polytechnic Institute, La Paz, Baja California, Mexico.  
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EBM has been adopted as a concept by governments in most Latin American countries - which also have adopted the Code of Conduct for Responsible Fishing and which recognize the necessity of sustainable use of ecosystems.

However, it appears to be unclear how it can be implemented. Most countries practice a top-down management scheme with institutional arrangement focused on single-

species administration and an ad hoc decision-making process. Fisheries scientists explore the EBM testing hypothesis under modeling and simulation experiments, fitting models to observed data and trying to provide realistic scenarios focused on particular problems.

Currently, when such EBM approaches are considered, associated knowledge about ecosystems (i.e., interdependences between species or climate drivers) is considered as a framework within which single-stock decisions are made. Even when this approach is better than single-stock-based management, EBM is not really implemented.

The main challenge here is that institutional arrangements must change at least in their operative form to permit multiple decisions even if they are of a different nature - i.e., fishing and conservation, or decisions over two or more fisheries at the same time. Currently institutions do not have this ability. In contrast, there are a few examples in which a bottom-up or mixed-decision process appears to be a good approach to EBM because shared responsibility for resource management implies an ecosystem perspective to maintain local economies. Unfortunately, social constraints (i.e., equity vs. sharing criteria) make this process difficult.

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## Solving three EBM riddles

By Jeff Ardron

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I think the basic challenges of EBM are similar all over the world. Here are three general EBM "riddles":

1. How can we reconcile holistic generalists with detailed specialists? Ecosystems are multi-faceted, and no one person can be expected to integrate all current knowledge. Thus, we find ourselves with a few generalists (who know a bit about most things but not much about any one thing) and a lot of specialists (who know little or nothing about most things but know a lot about one thing). Imagine these people gathered in a room: A few generalists stand at the front with many specialists invited as participants in this "EBM workshop". A generalist begins with an overview of the ecosystem. It soon becomes apparent that every specialist in the room is unhappy with the generalizations, and perhaps errors, the generalists have made. Each of the specialists leaves the room shaking her or his head in frustration that this meeting has been a waste of time, though each has a different reason why. How can the generalists convince the specialists otherwise?

2. Can traditional incremental improvement apply a new paradigm such as EBM? This issue is related to the one above but looks at it through an institutional lens. To date, institutions generally have developed credibility and trustworthy results through incremental improvement. This particularly is true of governmental bodies, which tend to attract correspondingly detail-oriented, careful, methodical individuals often with a sense of civic responsibility to maintain existing order. But the question has not yet been answered: Can EBM be implemented incrementally? If so, what are the steps?

3. Can the implementation gap be closed or do we require a re-thinking of what is necessary? The gap between what is required and what usually is available to implement EBM appears to be widening. Recommendations regarding indices, methodologies and planning processes typically are becoming more data-intensive, analytically sophisticated, and broad. While our attention remains focused on addressing problems that already have a long history (such as fisheries allocations or coastal eutrophication), new environmental issues (such as genetic truncation in fisheries, ocean acidification or climate change) are rapidly emerging and threaten to outstrip our institutional ability to respond. Is all this complication necessary to EBM? Or can we still make good decisions using simpler heuristics? Is our pursuit of the ideal EBM process blinding us to simpler, but still good, solutions? I would suggest that openly discussing these EBM riddles is preferable to wishing them away.

My hunch is that the answer to riddle #1 hinges around research funding (i.e., that specialist funding is preferentially given to research that can aid in addressing EBM questions). My answer to riddle #2 is a qualified yes, given that a multi-departmental approach can be achieved as an intermediate step (i.e., fisheries and environment directorates must begin working together - and, if this is not possible, then more dramatic institutional restructuring may be called for). For riddle #3, I believe much simpler approaches are possible and just as likely, if not more so, to be successful.

## Perspectives: Where Do We Go from Here? <sup>[3]</sup>

As part of MEAM's launch, we sought leaders in the EBM community for their viewpoint on EBM's status and where it is headed. Their views are below.

### A. Need to adopt novel approaches

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Widespread declines in the state of marine ecosystems and the services they provide have led to global calls for ecosystem-based management (EBM). Scientists describe the degradation and loss of services in technical language. The Millennium Ecosystem Assessment (2005) highlights that globally 60% of ecosystem services have been degraded - e.g., the provisioning service of seafood, the regulating service of protection of coasts from storm damage, and the cultural service of recreation. The informed lay public identifies many of the same problems but with different language, saying that the things they value most about oceans are gone or at risk: healthy seafood, clean beaches, resilient fisheries, abundant wildlife, vibrant coastal communities, and recreational opportunities. Regardless of the language, it is increasingly apparent that more effective approaches are needed to help ensure delivery of key services. EBM is a promising approach because it recognizes that healthy, productive, resilient ecosystems are the key to providing the services people want and need. EBM differs from conventional approaches that focus on a single sector or species. EBM integrates management across key sectors of human activity and accounts for their cumulative impacts. By focusing on protection of multiple (vs. single) services, EBM provides opportunities to restore and maintain whole ecosystems and therefore the long-term delivery of multiple benefits.

Importantly, EBM will allow managers to do their jobs more efficiently and effectively by streamlining the increasingly complicated policies and regulations that govern the plethora of activities affecting the oceans. Explicit decisions about inevitable tradeoffs between management scenarios are more feasible under EBM (e.g., evaluating use of a wetland for resort development vs. a working waterfront vs. providing juvenile fish habitat).

In the United States, EBM is gaining traction in science, management, and policy circles on the heels of the Pew and U.S. Ocean Commissions' reports in 2003/2004. EBM is progressing along several parallel tracks, including within-sector approaches, regional ocean governance, pilot projects at multiple scales, and other actions that pave the way for larger, overarching changes. Improving management within a sector - e.g., the incorporation of EBM provisions into last year's reauthorization of the Magnuson-Stevens Fisheries Conservation and Management Act - will strengthen the long-term viability of the sector.

However, sectoral EBM cannot integrate across sectors or provide the authority to consider the fate of whole ecosystems. A key remaining policy challenge is to determine how to work across sectors toward a shared goal of ocean health.

Promising endeavors to coordinate ocean governance at the state (e.g., California, Massachusetts, New Jersey, and New York) and regional levels (e.g., West Coast Governor's Agreement on Ocean Health and Gulf of Mexico Alliance) are moving forward throughout the country and across borders (e.g., Northeast Regional Ocean Council of U.S. State Governors and Eastern Canadian Premiers). Internationally, Australia, Canada, and the European Union have already implemented overarching national oceans policies. While the United States has made headway in legislating initial aspects of EBM, a timeline for moving forward with a comprehensive governance framework in the U.S. remains uncertain.

Where do we go from here? Recent decades have witnessed dramatic changes in the world's oceans but also increasing awareness of the need for change and the emergence of new solutions. Addressing the numerous, complex threats to the oceans and associated human communities will require a more interdisciplinary scientific enterprise in support of EBM. This enterprise must prioritize integration of the human dimensions (e.g., anthropology, sociology and economics) and better integrate these with ecology, fisheries science, aquaculture science and oceanography.

There is a parallel need for improved connections between science and management so that management is informed by the latest science, and scientists are addressing questions for which managers need answers.

Given the changes on the horizon, both scientific and management enterprises will need to adopt novel approaches. The emerging science of resilience and complex systems has much to offer, as it (1) seeks to better understand how systems change in response to disturbances, (2) provides guidance to manage in the face of uncertainty and change, and (3) cautions us to anticipate surprises, because change may sometimes be slow and predictable, but at other times rapid and unexpected.

Much work remains to be done to enable responsible decisions that maintain, not foreclose, future options. Ultimately comprehensive EBM in the United States will require a new, overarching oceans mandate. This step is crucial because no existing management entity has the authority to consider overall ocean health or to conserve the full suite of services that coasts and oceans provide. Responsible management and stewardship will require comprehensive EBM.

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## B. Investigating the roots of confusion

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The Ecosystem Approach to Management (EAM) of human activities in the sea is becoming everyone's panacea. Like the Hogwarts Room of Requirement,\* it always contains what you think you need to solve today's most vexing problem. And like the Room of Requirement, in containing the solution to everyone's problems, each person finds it in a different way, finds different things in it, and uses what it contains differently.

This analogy holds up when considering EAM for marine ecosystems. The concept is widely endorsed as the next great hope for addressing the unsustainable uses of marine resources. However, people have come to EAM from different directions and want to use it to address different problems. So EAM, already complex, is becoming confused. Investigating the roots of the confusion may contribute to faster progress in getting EAM into practice.

Advocates of EAM promote four classes of change, compared to cartoons of "classic" management:

1. Consider effects of all major environmental forcings on the dynamics of the resource(s) being used;
2. Consider impacts of the activity being managed on all major ecosystem properties, not just the resource(s) directly used;
3. Consider the consequences of all human activities in the sea, not just one's own sector;
4. Make the governance process more participatory and effective.

Few experts consider all four classes equally important. Many ignore some of them, yet the experts all provide guidance on EAM.

Ecologists may consider 1 and 2 central to EAM. Oceanographers may consider ocean physics and chemistry to ecosystem dynamics (1) as the important ecosystem issue. Benthic ecologists may consider the impacts of resource uses on ecosystem structure and function (2) as the important class. Ecologists taking energetics approaches perhaps emphasize bottom-up processes and variation in productivity (1); those studying predators - prey relationships - may emphasize how fishing changes pathways (2). All ecologists seem to grapple with 3 less frequently, and 4 rarely.

Experts in coastal management come to EAM through Integrated Management and focus on 3. They emphasize cumulative effects of chronic disturbances and synergies of impacts from several concurrent activities. Concerned that cumulative effects remain sustainable, they also may place more emphasis on 2 than 1. The interest in governance changes has been strongest among social scientists seeking solutions to community problems. Their efforts to build sustainable coastal communities have made them deal with experts interested in all three other perspectives. They are more likely to recognize the interconnectedness of all four classes of change and see the package most completely.

There actually is no choice to make between 1 and 2 in practice or in concept. Failure to do either well will eventually lead to unsustainable choices. Which one should get more attention will be case-specific. Oceanographic forcings can so dominate dynamics of some marine systems that they must be considered in management, whereas in other systems single forcings rarely dominate dynamics, and careful management can adapt to slow environmentally driven trends in resources. Poor management or poor compliance with management can result in serious ecological consequences however strong the environmental forcing, whereas reasonable precaution, adaptive management and high compliance can succeed even in variable systems.

There is a real conceptual distinction between the Ecosystem Approach and Integrated Management. In practice, though, EA and IM quickly converge. When fisheries management tries to take account of environmental forcings, other human activities are found to affect the pathways. Managers cannot ensure the footprint of one industry is sustainable without considering the ecosystem effects of other activities. A manager pursuing IM quickly learns that how the integration is best done depends on many physical, chemical and biological features of the ecosystem.

Hence, starting down either the path of EAM or IM, one is soon taking both journeys at once. Progress can be made on either alone, though - an important point because governance systems are likely to have very different appetites for changes of types 1, 2 and 3. True IM often encounters so many jurisdictional issues that movement becomes glacial. Until governance issues are resolved, efforts to apply ecosystem knowledge much better in 1 and 2 should still be encouraged.

In the end, the fourth aspect of EAM - governance systems that work - may matter most. Governance is the most independent of the four components of EAM because one can improve governance at scales from local to international, and in settings addressing considerations of types 1, 2 or 3 alone or in all combinations. It is simultaneously the most co-dependent of the four components. None of the other factors can be addressed without effective management tools. One lesson emerging from the many failures in fisheries management is that collaboration among the ecological, social and economic scientists is essential if management tools are to be developed and used effectively. EAM will probably remain ill-specified - found by different paths and used for different things. But as in Hogwarts, it will be where the most promising wizards from social, biological and physical sciences meet to pool their talents into something that is an effective approach to management of human activities in the sea, and oppose the Dark Arts of unsustainability.

\* Note: This is a reference to the *Harry Potter* series of fiction books.

## **Case Study: Southwest Indian Ocean Project Aims for Regional Management** <sup>[4]</sup>

### **Multinational EBM initiative takes shape with objective to remain "Africa-owned"**

A coastal and marine ecosystem-based management (EBM) initiative in the southwest Indian Ocean remains distinctly "Africa-owned" as the project confronts inadequate scientific knowledge and what some experts describe as lack of effective regional management.

Funding for the South West Indian Ocean Fisheries Project (SWIOFP <http://swiofp.iwlearn.org> <sup>[5]</sup>) is expected to be disbursed in September 2007 following complex negotiations that began in 2004. Members of the five-year initiative include Comoros, Kenya, Madagascar, Mauritius, Mozambique, South Africa, Seychelles, Tanzania, and France (Réunion). Somalia has participated as an observer.

The cost of the project is US\$22.64 million - including \$12 million funded by the Global Environment Facility (GEF) and approved by the World Bank; \$3.97 million from France, Norway and other donors; and \$6.67 million from participant nations. GEF describes SWIOFP's goals as developing institutions necessary for sustainable fisheries; conserving nearshore fisheries for artisanal purposes; achieving sustained biodiversity; and mobilizing coastal communities.

### **Variety of challenges**

According to Rudy van der Elst, director of the South Africa-based Oceanographic Research Institute, much remains unknown about the area's coastal and marine resources. "The West Indian Ocean (WIO) represents a significant and often critical source of security for many developing countries in the region in terms of food security, employment, foreign exchange, etc.," says van der Elst, whose institute is a SWIOFP consultant. "It is of concern that the countries and small island developing states have no idea of the nature and extent of resources in their Exclusive Economic Zones beyond their inshore shallow-water resources."

The region faces increasing pressures. Coral reefs are impacted by resource extraction, recreation, litter and high-temperature bleaching. Tropical cyclones damage coastal infrastructure. Traditional fishers overexploit inshore and reef species with nonselective methods. In deep waters, distant-nation fleets harvest declining numbers of tuna.

"There is no regional plan to manage the extractive use of what essentially is a shared resource," van der Elst says. "Sharing of data in the region has been exceptionally poor. That will change, and the pooling of expertise and information will ensure a more regional approach to management of shared and straddling resources. SWIOFP perhaps is a last chance to collectively secure sustainable use of WIO living resources."

Johnson U. Kitheka, a Kenyan environmental scientist, says past management efforts have been lacking. "There has been a lack of focus on core issues related to fisheries management such that most of the focus has been research-oriented. This has led to a situation where there has been very little effort to link fisheries research with fisheries management. Also, lack of an effective regional framework for coordination of matters related to fisheries - including weak policy, regulatory and institutional setups - has to a certain extent constrained efforts toward sustainable fisheries management in the WIO region."

Kitheka is project officer for the UN Environment Programme/GEF West Indian Ocean Addressing Land-Based Activities and Sources of Pollution (WIO-LaB) Initiative, whose broad goal is to contribute to the environmentally sustainable management and development of the WIO region ([www.wiolab.org](http://www.wiolab.org)). He says SWIOFP will mark a departure from the past if it can help participating countries "build the required capacity for sustainable fisheries management, and mobilize resources required to address the chronic problem of lack of adequate budgetary provisions to support sustainable fisheries development and management in the region."

Alejandro Anganuzzi, executive secretary of the Seychelles-based Indian Ocean Tuna Commission (IOTC), encourages SWIOFP to collaborate with existing management regimes. "The main challenge is to develop an effective mechanism to deal with the priorities for the nations participating in the initiative. Most of these countries require effective mechanisms to collect data, to establish credible port controls to prevent unloading of illegal catches in their 'ports of convenience'. They also require institutional development including efficient interagency communication at the national level and training on technical and legal matters concerning fisheries management."

"I do not think SWIOFP can address the issue of fisheries management directly, as it does not have the mandate for management," Anganuzzi says. "However, it can provide valuable support to the process of expanding on scientific knowledge for tuna stocks and application of EBM in the context of IOTC fisheries. It also can provide support to develop human resources in the region, training people in a range of scientific and compliance issues. I hope the IOTC scientific community will be offered the possibility to assist in their process."

## Local collaboration

Meanwhile, there is wide consensus that SWIOFP should represent a localized effort. "It was decided that SWIOFP would be 'Africa-owned' in the sense that it would engage local expertise and capacity rather than importing external consultants," van der Elst says. "SWIOFP has been developed by African partners for African benefit. It is strongly focused on self-help - and much of the funding is attributable to African support."

Forging such teamwork has presented challenges. "We knew that SWIOFP's success would require a lengthy development process to ensure buy-in of the many countries," van der Elst says. "It has taken almost four years of planning including detailed approaches, cruise plans, etc. It required memos of understanding for operating in the different countries and sharing of data, etc. The development phase has been a major part of the SWIOFP project and ensures a greater chance of success."

Such collaboration has remained a key priority, says Ben Satia, retired chief of international institutions and liaison for the UN Food and Agriculture Organization. "It is not that people do not want to collaborate. It is that the national interests are so high - the stakes are so high. This calls for building trust. And trust comes because you have been meeting with that person and you have been talking and you can understand what the person means."

"If the countries of SWIOFP are not prepared to bury their small differences, it will be difficult for them to make any headway," says Satia, a key player during early negotiations and now affiliate professor with the University of Washington's School of Marine Affairs. "They must have a specific objective they want to obtain, forgo their differences and work collaboratively toward that objective."

## Threat of IUU fishing

Collaboration takes on new importance as SWIOFP nations strive to combat illegal, unreported and unregulated (IUU) fishing. The European Commission has declared that IUU fishing threatens the sustainability of fisheries in the Southwest Indian Ocean, where profitable fisheries operate in a vast geographic area and where surrounding nations lack efficient monitoring.

According to Satia, battling IUU fishing requires strong political will. "Most of the illegal fishing is done by flags-of-convenience vessels. If the states permitting these vessels to bear their flags carried out their responsibilities - and these responsibilities are well-laid out - IUU fishing would be reduced."

"Also, the coastal states should aggressively inspect these vessels as they come on shore to ensure they are in compliance," Satia says. "The countries need to have appropriate monitoring, control and surveillance mechanisms in place, and they should claim ownership at national and sub-regional levels of appropriate instruments enacted at international levels on IUU fishing."

Van der Elst points to the need for accurate data on IUU and other flag landings. "SWIOFP should contribute to significant reductions in IUU activities - but it will take all partners to collaborate equally. At present, two-thirds of the WIO industrial catch is foreign-driven. That may be okay in the future as long as the host countries are able to make such concessions on a well-informed basis to their benefit."

Poverty compounds such challenges in the world's only region where developing nations entirely surround an ocean. "Artisanal fisheries represent a complicated issue - but it is vital to the people concerned because it is their livelihood," Satia says. "While it is important to encourage artisanal fishing, it also is essential that this fishing be done in a responsible manner. There is a need to reduce fishing effort - which, in some cases, may mean some fishers will not be fishing tomorrow. They need to diversify their way of life."

"How do you select the people who do not fish and those who remain in the fishing sector?" Satia says. "It becomes a very difficult situation. It involves more than just the fish - it involves empowering the people. As long as we can improve the capacity of these people to understand that they should not overexploit the resources, that would be a major achievement. It comes with education - and how to educate them is part of the process."

## Measuring SWIOFP success

According to Satia, SWIOFP's success will hinge on local stakeholders' participation. "My first concern is whether the people are involved in the decision-making process. The second would be the rate at which the resource is replenished. The third milestone would be positive changes in the communities' livelihoods - and, last, if countries have in place fisheries management plans."

Kitheka says he will gauge SWIOFP's success based on whether participating countries eventually will be able to come up with "better policies, regulatory and institutional frameworks necessary for the sustainable management of offshore fisheries. Other indicators that could be used to gauge the success of the project should include its indirect contribution toward improvement of the livelihoods of local populations - hence, poverty reduction - and better understanding of the dynamics of offshore fisheries in the SWIO region."

Van der Elst hopes to see at least one successful example of fisheries management that benefits all participant nations. "Ultimately, I'd like to see the WIO well-managed with

shared responsibilities and shared benefits for riparian countries."

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## **News and Notes: Guidance on EBM implementation - Decline of coral - Forecasting tool - EBM tools - Ask the expert** <sup>[7]</sup>

### **Article offers guidance on implementing EBM**

EBM requires development of a common vision among stakeholders and practitioners, according to an article in the August 2007 issue of the journal *Frontiers of Ecology and the Environment*. Researchers Heather Leslie and Karen McLeod argue that successful EBM demands dialogue on whether emphasis should be on ecosystem health or human well-being. Flexibility and adaptation are key, they write, and governance needs to be on multiple, nested and operational scales. Their recommendations include the sharing of examples of EBM success and agreement on how to measure EBM success. The authors conclude that the scientific community can respond to EBM challenges by addressing critical research needs, building interdisciplinary scientific capacity and communicating existing scientific knowledge.

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(For a PDF copy of their article "Confronting the challenges of implementing marine ecosystem-based management", contact the authors.)

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### **Study finds broad decline of coral ecosystems**

Loss of coral cover is more widespread and occurring faster than previously believed, according to an analysis of more than 2600 coral reef ecosystems located in the Indian and Pacific oceans. Marine biologist John Bruno and graduate student Elizabeth Selig of the University of North Carolina, Chapel Hill (U.S.), compiled more than 6000 independent surveys spanning four decades, and found that more than 3000 square kilometers of living coral reef have been lost each year since 1997. The annual rate of coral cover loss across the region is 2%, or nearly five times the pace of rainforest loss worldwide. The article "Regional Decline of Coral Cover in the Indo-Pacific: Timing, Extent and Subregional Comparisons," appears in the August 2007 edition of the free journal *PLoS ONE*, at [www.plosone.org/article/doi/10.1371/journal.pone.0000711](http://www.plosone.org/article/doi/10.1371/journal.pone.0000711) <sup>[8]</sup>.

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### **Forecast tool may be useful for EBM**

A new simulation model for ocean forecasts in Australian waters may provide useful data for EBM around the globe. Using supercomputers, the US\$12 million BLUElink project simulates marine physical processes to produce ocean-analysis and prediction charts. "The data provided by BLUElink on ocean conditions is an important input for an ecosystem-based approach to fisheries management," says Chris Wilcox, senior research scientist at Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO). BLUElink forecasts are expected to provide data on coastal and ocean currents and eddies, surface and subsurface ocean properties, ecological sustainability, and regional and global climate conditions, among other factors. CSIRO also is developing an ocean-atmosphere model for coastal and continental-shelf analysis. The BLUElink project website is [www.cmar.csiro.au/bluelink/how/over.htm](http://www.cmar.csiro.au/bluelink/how/over.htm) <sup>[9]</sup>.

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### **Survey assesses need for EBM tools**

Results of a survey on what EBM practitioners need in terms of tools and capacity-building were released in September 2007. Respondents shared what they considered to be the most severe problems for implementing EBM; the most critical needs for planning and implementing EBM; the importance of increasing awareness of EBM tools; and other insights. The Web and phone survey was prepared by Intelligent Marine Planning ([intelligentmarineplanning.org](http://intelligentmarineplanning.org) <sup>[10]</sup>) and the EBM Tools Network ([www.ebmtools.org](http://www.ebmtools.org) <sup>[11]</sup>). The report can be downloaded at [www.ebmtools.org/tool\\_needs.html](http://www.ebmtools.org/tool_needs.html) <sup>[12]</sup>.

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### **Ask the Expert: What does "ecosystem" mean in the context of EBM?**

By Leanne Fernandes, Director, Earth to Ocean, Townsville, Queensland, Australia. E-mail: [leanne.fernandes@earth2ocean.com](mailto:leanne.fernandes@earth2ocean.com) (Fernandes managed a multi-year process, the Representative Areas Program, to rezone the Great Barrier Reef Marine Park [GBRMP].)

If one is aiming for EBM, then one needs an idea of what is intended by an ecosystem. From a management perspective, the definition needs to be politically, legally (jurisdictionally), socially and ecologically sensible. This is likely to mean scientific compromise, presuming that science could give one a perfect geographical definition of an ecosystem in any one location...

(For Fernandes' full response, including why GBRMP relied on "bioregions" rather than habitats as the basis for rezoning [click here](#) <sup>[13]</sup>.)

Do you have a question on ecosystem-based management? E-mail it to us at [ameam@u.washington.edu](mailto:ameam@u.washington.edu). We will pick the best ones and find experts to answer them.

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- [10] <http://intelligentmarineplanning.org/>
- [11] <http://www.ebmtools.org/>
- [12] [http://www.ebmtools.org/tool\\_needs.html](http://www.ebmtools.org/tool_needs.html)
- [13] <https://meam.openchannels.org/content/ask-expert-what-does-ecosystem-mean-context-ebm-0>
- [14] <https://meam.openchannels.org/print/meam/issue/september-november-2007-11>
- [15] <https://meam.openchannels.org/printpdf/meam/issue/september-november-2007-11>