

MARINE ECOSYSTEMS *and* Management

International news and analysis on marine ecosystem-based management

MEAM

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John B. Davis
MEAM Editor

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The Links between Urban and Marine Ecosystems: Balancing the Sustainability of Coastal Cities and Their Adjacent Seas

For the first time in human history, more than half of the world's population now lives in cities, and each year tens of millions more people become city dwellers through births and migration. We have become an urban species.

What does this have to do with marine ecosystems? Most of the world's urban population is coastal. According to the Millennium Ecosystem Assessment (www.millenniumassessment.org), for example, two-thirds of the world's largest cities are on coasts. Coastal cities occur because that is where ecosystem services are often abundant. The adjacent seas supply food, allow for transportation and trade, carry away wastes, and so on.

Although the focus of marine ecosystem-based management is often on marine agencies and uses (e.g., how should we manage fisheries? where should

we site offshore energy facilities?), the solutions to at least some of our oceans' ills start in our cities. Urban runoff and wastewater pollute coastal seas. Poorly planned urban development results in lost wetlands and other coastal ecosystems. Inefficient transportation and energy policies contribute to global warming and its associated ocean impacts, like acidification and coral bleaching.

Half a decade ago, former mayor Jeremy Harris of Honolulu posed a challenge to his fellow coastal mayors. Threatened oceans, he said, are an urban problem — the result of unsustainable urban development. The fate of the world's oceans therefore rests in the hands of city governments. Cities should be viewed and managed as urban ecosystems, he said, and should be modeled after natural ones. Integrating urban policies for

continued on next page



MEAM

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land use, transportation, energy, and more — all of which are interrelated, after all — will lead to greater sustainability both for cities and their adjacent seas. (Harris's challenge, called *Saving Our Oceans*, is available at www.gdrc.org/oceans/Cities%20and%20Oceans%20PDF.doc.)

Sustainable oceans are good for coastal cities. In turn, sustainable cities can be good for oceans. Getting to that balancing point is the challenge. How do we ensure the ecosystem services provided by seas continue to be available to the urban systems that need them? Here, MEAM talks with experts who manage or study urban ecosystems about the challenges ahead.

A. Restoring an inland sea next to a high-growth urban environment: Puget Sound

Puget Sound, an inlet of the Pacific Ocean in the northwestern US state of Washington, is not a healthy ecosystem. Swimming beaches and shellfish beds are contaminated and closed. Nearly 60% of Puget Sound's wetland habitat has been lost to development. Populations of salmon that once numbered in the millions now face extinction. The Sound's resident orca whales carry some of the world's highest levels of man-made chemicals in their bodies.

At the same time, the human population in coastal Seattle and other municipalities in the region is burgeoning. In just the past 20 years, the population in the Puget Sound watershed has grown by nearly 40%, from 2.7 million people to 4.4 million, and that is expected to jump to 5.1 million by 2020. Direct links can be drawn between the region's increase in population (in urban but also suburban and rural areas) and the decline of its marine ecosystem, particularly due to runoff, insufficient wastewater management, and unsustainable coastal development.

In an aggressive and ambitious effort to stop and reverse that decline, the state government created the Puget Sound Partnership: an inter-agency and multistakeholder initiative to address several stressors on Puget Sound (www.psp.wa.gov). The PSP released its latest two-year Action Agenda in August 2012, providing an updated blueprint for restoring the Sound's health by 2020 (www.psp.wa.gov/action_agenda_2011_update_home.php).

Anthony Wright is the PSP executive director.

MEAM: In overseeing the PSP — one of the largest ecosystem restoration projects in the country — what are the main management challenges you face?

Anthony Wright: When it comes to managing the Puget Sound Partnership, there is the management and oversight of the agency itself and its defined tasks, such as coordinating advisory boards, developing plans, and creating reports that reflect a large and diverse stakeholder group. But it is not just about managing an agency or managing a project. It's about understanding and facilitating the actions of many people to move in a common direction.

It's about creating a mass movement by removing obstacles and getting down to the business of Puget Sound recovery.

That recovery can incorporate behavior change, policy change, efforts by individuals and organizations, actual cleanup, or other activities. We are working with a lot of different partners: not just state and federal agencies, but also tribes, NGOs, businesses, and individuals. We find people and organizations and help them fill roles in that common direction.

The Action Agenda makes a point of saying that the PSP does not aspire to restore Puget Sound to its condition prior to European settlers (i.e., prior to 1850). In that light, and in light of the continued population growth that the region is expected to have, would you consider it a success simply to not allow the ecosystem condition to worsen beyond the current state?

Wright: We would not consider it a success merely to stop the decline of the ecosystem. The Partnership has developed statements of our interests for the future of the Puget Sound ecosystem. These 19 targets for ecosystem recovery describe achievable, results-oriented conditions for the year 2020. Most of our targets specify conditions that are substantially improved from the current situation:

- Species such as Chinook salmon and orcas need to be on a path to recovery.
- Key contributors to the food web, like herring, should be recovered to levels seen in previous decades (but not back to 1850) to provide greater assurance that top predators (such as Chinook, orcas, marine birds) will be viable into the future.
- Habitats need to be stabilized to reflect a balance between ecological interests and services for people — such as to maintain forest cover into the future, increase functioning habitats in floodplains and estuaries, increase the extent of eelgrass, and improve the habitat condition of streams as measured by their insect communities.
- Water quality needs to improve to support aquatic life and human uses — our targets specify

improvements needed for toxics in fish, marine sediment quality, freshwater quality, dissolved oxygen in marine waters, shellfish beds, and swimming beaches. The targets for shellfish beds and swimming beaches are focused on ensuring a future where people's health is better served by a recovered Puget Sound.

An older and perhaps more widely known inland sea restoration project is the Chesapeake Bay Program, on the East Coast of the US (www.chesapeakebay.net). Despite significant efforts and funding, the Chesapeake program is struggling to meet its cleanup goals. In what ways is the PSP different from the Chesapeake Bay Program?

Wright: Compared to Puget Sound, Chesapeake Bay has a more concentrated focus on a single type of ecosystem stress — that posed by nutrients [primarily from upstream farms]. Their cleanup goals are largely focused on reducing nutrient inputs and, yes, they have had trouble meeting their goals. This is worrisome for us here in Puget Sound, because we have identified a complex suite of stressors that we believe are impacting the system, but haven't singled out a focal area as has been done in Chesapeake Bay. So we have to make progress on several fronts.

As far as how we make sure to be "more successful", well, nobody has done this with great success in a large complex ecosystem with many stresses. But we think we have some advantages. One is governance: we are a single state, not several states like Chesapeake Bay, although we do share an international boundary

with Canada and have a number of treaty tribes [autonomous indigenous populations]. Having a single state government that is consistently focused on the environment, and aware that a healthy environment helps support a strong economy, is a big plus. We should note that the tribes and Canada are similarly focused on having a healthy environment. Also, while it is a complex problem set for us, we are attacking it earlier in the decline than the Chesapeake. We think we have gotten to work on our system comparatively sooner, given the size of the systems involved in proportion to the surrounding human population and associated degradation of the system. The farther gone an ecosystem is, the more difficult it is to bring it back to a desirable state.

Probably the biggest keys to our success moving forward are: 1) to honestly describe the level of effort that will be needed to do the work, and to sustainably provide the resources to undertake those efforts, and 2) to monitor and understand how the system is responding to management and policy decisions, and to similarly resource that effort. The first requires that we tackle the problem with the scope of effort needed, and the second will allow us to provide a better scientific basis for the work as we go along. Overall, we have a scientific understanding right now that allows us to develop a plan, but we are fully aware that our understanding is weak in several areas. By actually assessing the system (in addition to the modeling and laboratory experimentation that we currently conduct), we think we will learn enough to address those weaknesses.

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The Puget Sound Partnership's biannual *State of the Sound* report, recently updated, is available at www.psp.wa.gov/sos.php

B. Sea level rise and the future of an iconic city: Venice

Of all the coastal cities in the world, perhaps the one most indelibly linked to its marine environment is Venice. Located in the Venice Lagoon along the northwestern Adriatic Sea, Venice comprises more than 100 islands separated by the city's famous canals. It has been a trade center for nearly 1000 years, and the city and its lagoon are a UNESCO World Heritage site.

The link between sustainable cities and sustainable seas does not only involve reducing urban impacts on adjacent waters. Seas may also impact their adjacent cities. Venice, for example, is now in severe danger of inundation, owing to expected sea level rise (up to 2 mm per year in the region) and the increasing frequency of flooding events in the city, both consequences of climate change. The city has an average elevation of less than one meter above mean sea level. (To make matters worse, land in the lagoon is also gradually subsiding at rates varying from <1 mm/year

to 5 mm/year, due to the variability of the subsoil and local aquifer exploitation. The city's historic center, though, is presently stable.)

Federica Rizzetto is a geomorphologist at the Institute of Marine Sciences for Italy's National Research Council. She studies the Venice Lagoon.

MEAM: Venice is primarily addressing the threat of flooding by installing a floodgate system: the multi-billion-euro Modulo Sperimentale Elettromeccanico (MOSE) system, which is set for completion in 2016. The floodgates will isolate the Venice Lagoon from the Adriatic during high tide events. Would you say that floodgates provide an ideal, long-term management solution to the problem of sea level rise for Venice?

Federica Rizzetto: MOSE is a floodgate system projected to protect the Venice Lagoon from becoming inundated with water from the sea during tides higher than 110 cm above mean sea level. In the last century,

a general increase of frequency and magnitude of high tides has occurred, more evident since the mid-1950s. The impact of high tides on the lagoon environment and the city has been magnified by the increasing relative sea level rise.

MOSE was proposed in the 1980s and projected taking into account rates of relative sea level rise lower than those calculated in the last years by the Intergovernmental Panel on Climate Change (IPCC). Consequently, if the new IPCC scenario is correct, this solution would not be sufficient to preserve Venice and its lagoon from high waters and sea level rise in the long term.

What do you think Venice will look like 100 years from now?

Rizzetto: A global relative sea level rise of 18–59 cm is expected from 1990 to the 2090s, in addition to the effects deriving from melting of the ice sheets that cover Greenland and Antarctica (Intergovernmental Panel on Climate Change, 2007), but even higher rates of relative sea level rise have been predicted by other researchers. Consequently, 100 years from now Venice could be partially submerged unless a proper set of solutions is envisaged and applied. Moreover, the periods of lagoon “closure” [by the floodgates] may become more frequent and/or longer owing both to relative sea level rise and to the increased number of high tide events. As a result, the exchange of water, sediments, and marine organisms between the sea and the lagoon will be variably, perhaps irreversibly, modified, causing drastic changes in the lagoon ecosystem and morphology through time.

If you were to design a long-term, sustainable solution to help Venice address the threat of sea level rise, what would that program look like?

Rizzetto: The Venice Lagoon is a very vulnerable and sensitive environment. For this reason all the interventions aimed to preserve and protect it must be planned carefully by using a multidisciplinary approach. Furthermore, the possible effects and interactions of those interventions must be evaluated in the short and long term in order not to cause irreversible major damage. The solutions must also take into account the magnificent artistic and architectural heritage, which makes Venice a unique city in the world, and the presence of other important urban areas and economic activities in the littoral and the lagoon surroundings.

Consequently, it is difficult to identify only a single solution to save Venice and its territory. I think the best way to safeguard the lagoon is the application of multiple and complementary interventions, compatible with the environment and the related human activities and able to preserve, as much as possible, the morphological, sedimentological, and ecological characteristics of the lagoon. In my opinion, restoration projects aimed to slow down the degradation of the lagoon morphology and to contrast erosion represent the most important condition to preserve the territory, as well as the raising of the quaysides and the lower margins of the urban areas.

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C. Managing urban growth next to the Great Barrier Reef

The Cairns region of northeastern Australia has grown rapidly in recent decades. Located adjacent to two World Heritage sites — the Great Barrier Reef to the sea, and the Wet Tropics rainforest on land — Cairns has become a major tourism destination. Spurred by that industry, urban development has converted significant portions of Cairns’ coastal ecosystems. Although a master plan for Cairns does provide some protection for biodiversity within the urban footprint, loss of ecologically significant habitats is expected to continue. Maintenance of reef water quality from runoff has also posed consistent challenges.

Iris Bohnet is a social ecologist with CSIRO, Australia’s national science agency. She has studied the management of urban growth for Cairns, as well as management of reef water quality in the adjacent catchment.

MEAM: If you designed an urban growth plan for Cairns that aimed purely to maximize sustainability for the Great Barrier Reef seascape, what would be the main elements of such a plan?

Iris Bohnet: To maximize “environmental” sustainability for the GBR and not social and economic sustainability, I would suggest that a growth plan (for Cairns) would need to include the protection of all remaining coastal habitats such as mangroves, coastal wetlands, and other low-lying habitats. Not only do these areas provide filter functions for potential non-point sources of pollution that may enter the Reef from the land (mainly agricultural land), but they also provide a buffer zone when considering climate change and the risk of sea-level rise and tropical cyclones.

Could Cairns, or any coastal city, be managed in such a way to have a net-positive impact on its adjacent marine ecosystem, theoretically?

Bohnet: In general, it is easier to manage pollution from urban areas (point sources) via treatment plants than it is to manage pollution from agricultural land (non-point sources). In terms of whether a coastal city can have a net-positive impact on the health of the adjacent marine ecosystem, I would say it also depends on the activities that the city's human population carries out on the Reef: how well those activities — like fishing, for example — are regulated.

If you were to design an urban growth plan for Cairns that aimed to *balance* sustainability for the Reef ecosystem with sustainable economic growth

for the city, what would be the main elements of that plan?

Bohnet: I think as above, protection of coastal habitats is important not only for better protection of the GRB but also to be prepared for the risk of sea level rise. Therefore, one key element of a growth plan for coastal cities might be guidance for sea level rise planning. In other cities that do not have up-to-date water treatment plants, it would also be a requirement to establish those. ■

To comment on this article:
<http://openchannels.org/node/...>

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Tundi's Take: Gray Alongside Blue May Get Us the New Green

By Tundi Agardy, MEAM Contributing Editor, tundiagardy@earthlink.net

The gray, concretized urban landscape couldn't be farther from protection of nature and oceans in most people's minds. Yet coastal cities may hold the key to a sustainable future, and will be crucial to ensuring that EBM unfolds effectively and efficiently around the world.

We speak of "greening cities", which conjures up the image of taking something inherently ugly and bad and giving it a makeover so it better suits our new environmentally conscious sensibilities. But that is not why gray is the key to green in a blue world. What I propose is that there are characteristics of cities that should make them focal areas for EBM — perhaps the most important combatants in the fight to preserve marine and coastal ecosystems.

My mind was first opened on this issue when I had the good fortune of working on the Millennium Ecosystem Assessment (www.millenniumassessment.org), alongside some brilliant big-picture thinkers from around the world. As lead on the coastal portion of the assessment, I spent much time with other thematic lead authors, including Gordon McGranahan, who oversaw the urban systems assessment. Putting urban systems on equal footing with natural ecosystems was already a renegade move that got a lot of conservationists and ecologists scratching their heads, but we all quickly learned why this made sense. Cities are indeed ecosystems, and the effects that urban consumption and growth have on ecosystem services go well beyond their boundaries. But these effects are both positive and negative — and there are clear ways that we can use cities as a force for positive change.

Why do cities occur where they do? In large part, it is the ecosystem services that attract people to these places and support population growth there. The

worldwide population is unevenly distributed: about two thirds live in the coastal fringe, which itself represents only 5% of inhabitable land mass. The pull factors that explain this human settlement include safe harbors and navigation routes both inland and offshore, access to water and food resources, and waste disposal, among others. These factors are behind demographic trends that have a large majority and fastest growing segment of the human population living near major estuaries.

Cities are key to getting our ocean management right not only because of the numbers. By their nature, cities prevent widespread habitat alteration by concentrating coastal development in discrete areas, preventing sprawl. Smart growth minimizes exurban and suburban habitat conversion creep — and this is some of what is behind the greening of cities.


Positive impacts of coastal cities

But coastal cities can do more than just reduce negative impacts — they also increase the potential for positive impacts. By concentrating people in small areas, the opportunity to do everything necessary to use coastal resources sustainably and minimize our impacts on ecosystems is more readily achievable. Waste management is easier; education and outreach can more readily reach the masses; people have more opportunity to support local businesses and buy from local markets; and there can be enhanced participation in governance. Cities also create opportunities for progressive leadership — like Honolulu with its watershed approaches that mimic traditional practices, or San Francisco and its growth management to maximize resilience in the face of coastal hazards, or Copenhagen where kayak-commuting is an objective in the city's forward planning! Even smaller Milford,

“Cities create opportunities for progressive leadership — like Honolulu with its watershed approaches that mimic traditional practices, or San Francisco and its growth management to maximize resilience in the face of coastal hazards, or Copenhagen where kayak-commuting is an objective in the city's forward planning!”

Connecticut, in the US has had a string of mayors who have been a shining light in climate change adaptation debate and action.

Coastal cities have a unique ability to focus awareness and management on the full suite of areas and activities needed to make EBM a reality. Take UNEP's Hilltops-to-Oceans (H2O) initiative, coordinated by the Global Programme of Action's Takehiro Nakamura. Coastal cities, especially those located in estuarine areas, can not only lead coastal management but influence watershed management as well. They even have the (economic and political) power to influ-

ence what happens offshore in marine management, too. The social scale of cities is conducive to achieving true integration — these are coherent social units that are not so big as to become too complex to govern and not too physically large to effectively manage. And as concentrations of wealth and power, coastal cities can also influence what happens in a wider region, and have a voice even on the world stage. 

To comment on this article:

<http://openchannels.org/node/...>

Updates on US coastal and marine spatial planning

The US initiative to enact a region-by-region process of coastal and marine spatial planning (CMSP) took a step forward in November 2012 with the meeting of the Northeast regional planning board. It was the first such meeting of a CMSP regional planning board. The blogs below document that meeting, and the additional updates profile new materials or programs developed to support the national and regional efforts.

Blogs at OpenChannels

- **The US's First Regional Ocean Planning Body Meets**

By Sean Cosgrove

<http://openchannels.org/node/2330>

- **"It's Good to Be Here and Get It Started": Ocean-Use Planning Moves Forward in New England**

By Sandra Whitehouse

<http://openchannels.org/node/2432>

- **Powerful Partners Team up for Nation's First Regional Ocean Plan**

By Robin Just

<http://openchannels.org/node/2255>

Fact sheets available on ocean planning in US

The New England Ocean Action Network — a coalition of NGOs, educational and research institutions, fishing associations, renewable energy providers, and other ocean users — has published a series of brief fact sheets on ocean planning efforts at the US national level and in the country's Northeast (New England) region. The fact sheets, as well as other resources on US ocean planning, are at <http://newenglandoceanaction.org>.

US coastal decision-makers invited to register interest in attending training workshops on coastal and marine spatial planning

The Coastal and Marine Spatial Planning Advancement Training (CMSP-AT) project team is inviting US coastal decision-makers to register their interest in attending training workshops on coastal

and marine spatial planning. The first US regions to host CMSP-AT will be the US Caribbean, Mid-Atlantic, and Gulf of Mexico. Coastal decision-makers outside these initial training regions are encouraged to register for future training opportunities.

The advancement training will begin during the first half of 2013. Participation will be by invitation only and accepted on a space-available basis. To be included, coastal decision-makers are encouraged to register their interest as soon as possible by visiting www.CMSPAdvancement.com. CMSP-AT is produced by the Battelle Memorial Institute in association with the Coastal States Organization, and is funded by the Gordon and Betty Moore Foundation.

Short films highlight MSP opportunities for fisheries and offshore renewable energy

Two new short films — on fisheries and renewable energy, respectively — are the latest in a four-part series that explores ocean planning through interviews with practitioners from around the world, with a particular focus on the US. The fisheries film, "Ocean Planning: Enhancing and Protecting Our Fisheries", examines how integrated planning across multiple user groups can help resolve economic and environmental issues facing the fisheries sector (<http://zygotedigitalfilms.wistia.com/medias/5gjc6wny4p>). The renewable energy film, "Advancing the Ocean Economy: Renewable Energy", shows how offshore energy development relates to ocean planning and how the industry can support economic development (<http://zygotedigitalfilms.wistia.com/medias/6cx4kpnvic>).

The video series is produced by the Rhode Island Sea Grant Program and partners. The Rhode Island team hosted an international symposium on marine spatial planning in May 2012, at which many of the video interviews were conducted. The series' first film, "America's Ocean Economy: Challenges and Opportunities", is available at <http://seagrants.gso.uri.edu/oceansamp/multimedia.html>. 

Maximizing the Value of Offshore Space by Co-Locating Aquaculture and Wind Farms: An Interview with Bela Buck

Bela Buck is head of the working group on marine aquaculture, maritime technologies, and ICZM at the Alfred Wegener Institute for Polar and Marine Research in Germany. For more than a decade, he has made the case that offshore aquaculture and wind farms are compatible uses of the marine environment. In other words, aquaculture cages (or mussel longlines or seaweed culture designs) can be attached to the base of wind turbines without hampering the effectiveness of either construction. So in cases where offshore space is at a premium, Buck says, co-locating aquaculture and wind farms would maximize the value of a particular area. (His presentation on this subject at the 2012 International Marine Spatial Planning Symposium is at www.slideshare.net/riseagrant/buck-bella-12975102.)

MEAM: You have proposed co-locating offshore aquaculture and wind farms in German waters since at least 2001. However, no wind projects have been completed yet featuring such co-location. What have been the obstacles?

Bela Buck: The initiative to install wind farms in the German North Sea as well as in the Baltic Sea started around 1999. However, compared to other wind farms in the North Sea or the North Atlantic, German wind turbine sites are not nearshore: the German windmills are planned in regions about 60 km off the coast at a depth of about 50-60 m. (In contrast, the Horns Rev wind farm in Denmark is just 2 km offshore and 10 m deep.) As these conditions require relatively new foundation technology, system designs have first had to be planned before they can be set in place. These foundations have to resist storm conditions and the so-called “century wave” height (potential wave height within 100 years), which can be 20-30 m depending on the site.


Another problem was that there were initiatives fighting against the wind farms, mainly originating from the tourism and fishery sectors. So Germany’s first offshore wind farm (Alpha Ventus) was installed just four years ago. Now the engineering challenges involved with building offshore aquaculture facilities need to be solved. It is not yet clear, for example, if an aquaculture device would be connected to a windmill foundation directly or in the space between various foundations.

In your opinion, should all offshore wind farms also serve as offshore aquaculture facilities?

Buck: Yes, of course, provided economic and engineering problems are solved. We need additional

area for food and do not have that additional area on land anymore. It is a question of which aquacultured food will be cultivated where, in which technique, and extensively or intensively.

Aside from the co-location of aquaculture and wind farms, are there other multi-use pairings of offshore activities that could be compatible and viable?

Buck: Yes, there are some. The multi-use concept is not new. Various combinations have existed for decades: in coincidental ways (e.g., fishing and shipping), in tolerated ways (e.g., nature conservation and a mussel fishery), and in well-organized ways (e.g., tourism and research; artificial reefs and angling). Some other potential co-uses have been established at the decommissioned oil platforms in the Gulf of Mexico, which are today used for private fishing or aquaculture purposes such as finfish farming. 

To comment on this article:

<http://openchannels.org/node/...>

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Upcoming events

• Webinar: How Are We Doing?

Taking the Pulse of California’s Oceans

Featuring Liz Whiteman of the MPA Monitoring Enterprise, California Ocean Science Trust. Co-hosted by OpenChannels, the US National MPA Center, and the EBM Tools Network.

Date: 10 January 2013 • **Time:** 6 pm GMT / 1 pm EST / 10 am PST

Monitoring California’s statewide network of MPAs will produce an unprecedented body of data that will be useful not only to assess the performance of MPAs, but also to measure the health of the ocean ecosystems and inform management decisions. Find out about the new framework developed to guide a partnerships-based monitoring program. To register, visit <https://www1.gotomeeting.com/register/152670337>

• Live chat about the updated Multipurpose Marine Cadastre

Featuring Christine Taylor of the US Bureau of Ocean Energy Management, and David Stein of the NOAA Coastal Services Center. Co-hosted by OpenChannels and the EBM Tools Network.

Date: 17 January 2013 • **Time:** 7 pm GMT / 2 pm EST / 11 am PST

MarineCadastre.gov is an integrated marine information system that provides ocean data, offshore planning tools, and technical support to the offshore renewable energy community, and now is also being used for other ocean-related efforts. MarineCadastre.gov has three primary focus areas: web map viewers and ocean planning tools; spatial data registry; and technical support and regional capacity building. More than 140 data layers are available for immediate inclusion in GIS, mash-ups, and download. To join the live chat, go to OpenChannels.org.

Notes & News

Project to explore international MSP in North Sea releases findings

A two-year, EU-funded project to explore opportunities for cross-border marine spatial planning in the North Sea has released its conclusions. The MASPNOSE project (Maritime Spatial Planning in the North Sea) focused on two case studies:

- Developing an international fisheries management plan for the Dogger Bank, which is under the jurisdiction of the UK, the Netherlands, Germany, and Denmark; and
- Exploring the potential for collaboration on the Thornton Bank, which is managed by the Netherlands and Belgium.

Carried out by a coalition of research institutions (Centre for Marine Policy, Deltares, vTI, University of Ghent and DTU-Aqua), the project concluded that the planning of North Sea countries is not well-harmonized, and that the EU's key principles on MSP are not yet sufficient to foster unified MSP for the area. For more details and policy recommendations from MASPNOSE, go to www.cmp.wur.nl/maspnose.

Policy brief on global mangrove management


A policy brief on the global need to improve management of mangrove ecosystems, including economic policies to support such management, is available at www.inweh.unu.edu/Coastal/Mangroves/Policybrief/Securing%20the%20future%20of%20mangroves%20%28high%20res%29.pdf. Titled *Securing the Future*

of *Mangroves*, the 56-page policy brief was published by the Institute for Water, Environment, and Health of United Nations University. It is based on the 2010 *World Atlas of Mangroves*.

Analyzing economic impacts of fishery closures

A new report provides guidelines on best practices for analyzing the economic impact of restricted fishing areas — such as MPAs or wind farms — on the UK fishing industry and society. It was produced by the UK Fisheries Economic Network, an informal association of economists and analysts working in connection with UK fishing and seafood industries. The report *Best Practice Guidelines for Undertaking Assessments of Financial and Economic Impacts on Fisheries* is at www.seafish.org/media/634910/ukfen%20ia%20best%20practice%20guidance.pdf.

Updated summary on ocean acidification

An updated summary of the state of knowledge on ocean acidification is now available at www.whoi.edu/OCB-OA/FAQs. Updated by the US Ocean Carbon and Biogeochemistry program with support from the UK Ocean Acidification Research Programme, the summary walks readers through the chemistry of acidification, forecasts, management options, and impacts of acidification on ecosystems and humans, among other topics. 

Editor's note: The goal of The EBM Toolbox is to promote awareness of tools for facilitating EBM. It is brought to you by the EBM Tools Network, an alliance of tool users, developers, and training providers.

The EBM Toolbox by Sarah Carr

Citizen science for EBM, Part 1

The data requirements for EBM are vast and can seem overwhelming. One of the most alluring possibilities to address this challenge is to crowd-source at least some of the data collection through citizen science.

Citizen science is the use of nonprofessionals in any part of a scientific process, but most commonly in data collection, validation, and analysis. To date, most citizen science projects in coastal or marine ecosystems have involved groups of nonprofessionals collecting data to:

- Assess or monitor species and habitat condition;
- Describe human use of resources;
- Detect the presence of invasive species; or
- Build the citizen scientists' own awareness and understanding of resources and the environment.

Citizen science has particular interest and appeal for marine data collection because the marine environment is difficult and expensive to survey.

Resource managers and conservationists can harness the activities and efforts of boaters, kayakers, divers, surfers, fishers, and other ocean users to monitor and protect the environments these groups love and depend on. In addition, citizen science is growing in appeal and possibilities thanks to the popularity of cell phones: these devices dramatically increase the capability of nonprofessionals to collect data (including high-resolution images and sounds), transmit data, and georeference observations.

Of course, there are many challenges involved in obtaining and using data produced by nonprofessionals, particularly the challenge of avoiding data-quality problems such as sampling bias.

This Toolbox is the first in a series that will explore the use of citizen science in coastal and marine environments. In the next Toolbox, we will profile several successful and innovative coastal-marine citizen science projects and provide links to a summary of additional ones.

To comment: <http://openchannels.org/node/.....>

Sarah Carr is coordinator for the EBM Tools Network. Learn more about EBM tools and the EBM Tools Network at www.ebmtools.org.