WATER RESOURCES IMPACT

HUMAN DIMENSIONS PERSPECTIVES ON THE IMPACTS OF COASTAL ZONE MARINE RENEWABLE ENERGY

Caroline Pomeroy, Flaxen Conway, and Madeleine Hall-Arber

INTRODUCTION

Climate change and soaring energy costs have fueled attention to renewable energy. In coastal areas, the potential to harness the clean power of offshore wind, wave, and tide is irresistible. Our extensive coasts and oceans offer what appears at first glance to be virgin territory for development of energy producing facilities. A closer look, however, reveals that these areas are teeming with productive activity, activity that cannot be ignored in planning and implementing marine renewable energy (MRE) development and production.

Historically, marine management decisions have focused on the ecological dimensions, that is, marine life and associated habitat. Humans traditionally have been viewed primarily as stressors on, rather than as functional components of, the ecosystem. While human activities in marine areas have been managed, they have been considered individually (within sectors) rather than holistically, with little attention paid to conflicts and cumulative impacts (Ehler, 2008).

However, a focus on human dimensions – the economic, social, cultural, and political ways people affect or are affected by the ocean and coastal environment (NCCOS, 2007) – is gaining traction. Ecosystem-based management (EBM), a key principle of United States (U.S.) ocean and coastal management, "is an integrated approach that considers the entire ecosystem, including humans" (Leslie and McLeod, 2007). Marine EBM considers "interactions among ecosystem components and the cumulative impact of multiple activities" (Leslie and McLeod, 2007). Both ideally and legally (the latter according to the National Environmental Policy Act), projects in the marine and coastal zones must minimize negative impacts on the ecosystem. To attain the goal of well being of our coastal and ocean ecosystems, coastal management policy must consider these coupled natural-human systems in decision making.

THE COASTAL OCEAN AS A SOURCE OF ENERGY

Growing interest in generating a significant percentage of our energy from renewable sources has led many states, regions, and countries to consider their marine waters as developable space. Policies are beginning to reinforce this interest. Oregon, for example, has a "Renewable Portfolio Standard" that includes the goal of a power supply comprised of 25% renewable energy (for all large utilities, and 10% and 5% for smaller utilities, depending on their size) by 2025. The MRE industry is nascent, with technology undergoing frequent change. Underwater turbines, stationary and floating wind devices, and over 100 wave energy conversion devices have been conceptualized or initially developed; however, few have been built as full-scale prototypes or tested. Production potential is currently limited by the challenges of generating energy in a harsh ocean environment, a lack of knowledge about environmental impacts, regulatory and permitting hurdles, and the slow pace of efforts to determine which areas might be most suitable for ocean energy projects.

One step toward identifying areas suitable for ocean energy projects was taken in 2009 when the United States (U.S.) Bureau of Ocean Energy Management (BOEM, then the Minerals Management Service) funded a bicoastal study to (1) investigate potential space-use conflicts between offshore renewable energy and existing uses on the Outer Continental Shelf; and (2) in cases of unavoidable conflict, to identify mitigation measures for the loss of use of that space by existing users. Here, we briefly present lessons learned from this research regarding understanding, avoiding, and mitigating negative – and often unintended – impacts of MRE development and generation (Industrial Economics, Inc., 2012).

It is incumbent upon coastal policy makers, managers, existing users, and the public to keep in mind potential differential impacts and vulnerabilities, and to commit to working together in an effective, responsible, and swift manner to maintain or enhance the well-being of coastal space and place.

THE COASTAL OCEAN IS A PEOPLED PLACE AND SPACE

To understand, avoid, and/or mitigate impacts of MRE development, it is essential to consider the context, that is, the place and space. Some have called the ocean a "peopled seascape" (Shackeroff *et al.*, 2009), characterized by diverse and extensive uses and users, with a range of values, preferences, and needs. Among the myriad existing uses of the marine and coastal zones that we documented are:

- commercial harvest and processing of fish/seafood
- consumptive and nonconsumptive recreation (e.g., fishing, boating, diving)
- transportation and shipping
- military operations
- sand and gravel excavation
- oil and gas generation
- scientific research

Using existing data along with new data collected through interviews and group meetings, we documented space use by those engaged in these activities. Impor-

tantly, we also documented the spatial and temporal variability in and nuances of these uses, the importance of place as well as space, and the sociocultural and socioeconomic impacts that could occur if these activities had to change due to MRE development and production. For example, we found that the focus of commercial shipping and transportation was on space (the ability to move from point a to point b as directly and safely as possible). In contrast, recreational fishing, boating, and scientific exploration activities were focused on place since their activities were often associated with particular geographies, temporal limits and/or long-term studies. Commercial seafood producers (fishermen, aquaculturists, processors) were focused on both space and place. They value having enough space to access moving resources, but also often rely on particular places, identified through the development and sharing of local knowledge, to succeed. An important key to cooperative sharing of space and/or place in the past has been the ability to move and use the place/space at a variety of times, sometimes with agreed-upon spatial limitations (e.g., towboat lanes) so that other users can access the space at the same time.

LESSONS LEARNED ABOUT UNDERSTANDING, AVOIDING, AND MITIGATING UNINTENDED IMPACTS

Indeed, the coastal ocean is a place of cooperation and conflict. Current ocean users talked about compatibility and on-going efforts to coexist. This cooperation exists within industries or groups, such as fishermen cooperating with fishermen to avoid gear conflict, or scientists cooperating with scientists to coordinate at-sea data collection. There also are examples of cooperation and conflict avoidance between industries or groups. Scientists and fishermen cooperate, both to avoid potentially detrimental conflicts between research equipment and fishing gear in areas they use in common, and in "cooperative fisheries research." Another example, the West Coast Crabber – Towboat Lane Agreement, established in the late 1970s to reduce dangerous and costly conflict and coordinate use of space valued by each group, persists to this day. The Oregon Fishermen's Cable Committee is a cooperative effort involving the cable and commercial fishing industries working to prevent and mitigate the costs of unintended interactions between fishing gear and seafloor cables. Participants in our study pointed to this last example, especially, as a model structure and process that enable these parties to co-exist and thrive.

Yet conflicts among existing uses still occur, especially when one or more users want exclusive access to an area. Federal, state, and regional agencies or organizations must then work to manage the space equitably. New uses such as aquaculture and marine renewable energy, with their demand for extensive, exclusive space, may engender additional serious conflicts.

Despite the diversity of uses and potential for conflict on both the Atlantic and Pacific Coasts, our study developed a number of common recommendations as marine renewable energy development efforts proceed:

- **Planning and siting of marine renewable energy facilities must be done with stakeholders involved throughout the process.** Marine renewable energy development is a multistage process that includes conceptualization, planning, and implementation. Transparency, communication, and incorporation of local knowledge of current ocean space users is critically important to the effective design and deployment of such efforts and to the avoidance or minimization of conflict.

- **Maps and images with easily understood descriptions are necessary but not sufficient for the planning process.** Maps provide particular snapshots in time and space and therefore have inherent limitations in conveying the highly dynamic nature of space and place use. Local knowledge of historical use is invaluable for understanding the dynamics and other nuances of use and for tracking changes in use, local conditions and context. Insights can be gained by looking back; problems can be avoided by looking forward.

- **Information on how some industries use the ocean is lacking, and this data gap should be addressed.** In addition to general use patterns and values, safety considerations are particularly important in the context of multiple ocean uses including marine renewable energy production. Indeed, as our data demonstrate, the coastal zone is a busy place. Crowding and other space constraints, on the waterfront as well as at sea, have implications for existing and prospective uses, especially as they interact with one another.

- **Sociocultural differences within and among regional user groups should be considered and included in the development and implementation of plans.** In addition to the practical considerations discussed here, several other values are central to the well-being of existing ocean and coastal space uses and users. Study participants highlighted a range of such values as aesthetics and "traditional use," and food and employment security. They also expressed concern about the distributional and cumulative impacts of MRE development, particularly on small-scale users who may not be well represented in decision-making processes.

- **Mitigation is not universally applauded.** Most study participants strongly preferred negotiation for allocating the use of commonly desired or needed space rather than mitigation for its loss. Within and among ports and user groups, however, ideas about whether and how to mitigate for loss of access and other impacts of marine renewable energy development and production varied. This evidence suggests that effort must be made to avoid the need for mitigation and, where that cannot or will not be done, to identify site-specific mitigation strategies.

It is incumbent upon coastal policy makers, managers, existing users, and the public to keep in mind potential differential impacts and vulnerabilities, and to commit to working together in an effective, responsible,

and swift manner to maintain or enhance the well-being of coastal space and place. Considering the human dimension is paramount to understanding, avoiding, and mitigating negative – and often unintended - impacts of coastal zone marine renewable energy generation.

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AUTHOR LINK

Caroline Pomeroy
California Sea Grant
University California , San Diego
Institute of Marine Sciences
University of California , Santa Cruz
Center for Ocean Health
100 Shaffer Rd
Santa Cruz, CA 95060
(831) 459-4173 / Fax: (831) 459-3383

E-MAIL

cpomeroy@ucsd.edu
fconway@coas.oregonstate.edu
arber@mit.edu

Caroline Pomeroy is a California Sea Grant Extension Specialist and a Researcher with the Institute of Marine Sciences at the University of California, Santa Cruz. As a social scientist, her work focuses on the social, economic and cultural aspects of coastal and marine activities as they affect and are affected by management. She conducts research, education and outreach to document and improve understanding of the human systems associated with California's fisheries and fishing communities, and to facilitate the application of this understanding at all levels of governance. She received a B.A. from Yale University, an M.A. in Marine Affairs and Policy from the University of Miami, and a PhD in Wildlife and Fisheries Sciences (emphasis on the human dimensions of fisheries) from Texas A&M University.

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Water Resources IMPACT is in its 15th year of publication and we have explored a lot of ideas. We hope we have raised some questions for you to contemplate. "Feedback" is your opportunity to reflect and respond. We want to give you an opportunity to let your colleagues know your opinions ... we want to moderate a debate ... we want to know how we are doing. For this issue send your letters by e-mail to **fitche@marietta.edu.** Please share your opinions and ideas. Please limit your comments to approximately 350 to 400 words. If published, your comments may be edited for length or space requirements.

▲ IN MEMORIAM ... KENNETH L. BOWDEN (AWRA PRESIDENT, 1974)

AWRA Past President Kenneth L. Bowden, 78, died Friday, July 12, 2013 in DeKalb, Illinois. A native of Chicago, Ken attended Wheaton Academy, received his B. S. degree from Northern Illinois University, and his M.S. from the University of Michigan. He was a professor in the Northern Illinois University Geography Department for 30 years. He also served on the Presidential Advisory Committee for Water Resources in Washington, D.C. In retirement, he taught at Waubonsee College and at Elderhostels. Ken is survived by his wife of 49 years, Audrey Sue Pearson Bowden, his son Eric D. Bowden of Chicago, one sister and one nephew.

Ken was one of several dedicated individuals that saw the need for a multidisciplinary water resources organization and was a giant in the early history of AWRA. Ken was a charter member of AWRA when it was founded in 1964. In 1965, he was elected to the AWRA Board of Directors and served with distinction during the years that AWRA was experiencing fast growth. Also in 1965, he was chair of the Program Committee for the Second Annual Conference held at the University of Chicago. He served as Vice President in 1972, President-elect in 1973, and President of AWRA in 1974. His forethought and influence helped shape AWRA into the organization it is today. He was responsible for the creation of AWRA Student Chapters – today's student chapters owe their existence to him.

Ken will be greatly missed by the AWRA community.