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Networks

Marie Curie Actions

Periodic Report

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Project coordinator name:

Dr. Michelle Portman

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PUBLISHABLE SUMMARY

Comments:

The Mediterranean Sea supports many endangered and endemic species and it is an important hotspot for targeted conservation planning. It is an enclosed sea with a slow flush and exchange rate, both which exacerbate its problems of large-scale pollution. Further, environmental awareness among the sea's surrounding populations is considered low, leading to unregulated development and overexploitation along its coasts. As such, the management of human activity within the sea is crucial; it highlights the need for an enhanced set of marine protected areas (MPAs, also called "special protected areas" or "marine reserves") with high levels of protection, arranged as a network. Broadly defined, MPAs now number in the thousands worldwide. The World Conservation Union (IUCN) defines MPAs as sites in the ocean where legal or regulatory mechanisms limit or restrict human activities to protect natural, historic or cultural resources. To achieve protection aims of varying levels and to accommodate certain human uses within MPAs, managers commonly use spatially-specific regulatory techniques such as complete and/or seasonal closures, equipment constraints, permits, and economic incentives/disincentives. Once an MPA has been sited and approved, comprehensive management plans define specific spatial objectives and accompanying restrictions within the MPA. Management plans frequently employ spatially explicit use directives, also referred to as zoning. The use of zones facilitates understanding and compliance by those who have a stake in management of the area and are on-going users of area resources.

The DEMARN program has two main parts: 1) mapping and analyzing the context within which MPAs are established and designed; and 2) identifying the factors that influence conservation planning outcomes within MPAs that deviate from best practices of conservation planning, especially those arrived at through the use of decision support tools. Both these research tasks will contribute to improving marine conservation in this area of the world. The main tool researched as a conservation planning outcome will be zoning, or the use of placed-based protection levels, within MPAs. This research has numerous applications and is particularly important as the seas, especially those of Europe and North America, are subject to greater development and exploitation and efforts at marine spatial planning move forward following new directives (e.g., Europe's Marine Strategy Framework Directive 2008) and new national legislation (e.g., UK's Marine and Coastal Access Act 2009). The focus of the first two years of the DEMARN program has been on characterizing the spatial extent of the geographic distribution and physical characteristics of MPAs, characterizing MPA management regimes and on disseminating information about the program (see <http://demarn.net.technion.ac.il/>). To date, I have focused on empirical surveying of information about MPAs of the entire Mediterranean Sea by country (see Portman et al 2012). Previous studies have surveyed parameters similar to those I analyzed, but none have systematically used parameters based on the details of MPA management plans to characterize restrictions and prohibitions of human activities within these areas considering country characteristics, particularly using several indicators of general conservation management capacity. An article presenting findings from this first period of the research program is currently under review (Portman and Nathan, under review). This article characterizes MPAs by how countries interact with the marine environment. I hypothesize that those countries with greater protection levels within their MPAs, as determined by the regulation of types of human activities and the subsequent assignment of "scores", will be those with a greater focus on the marine environment for conservation and those with greater dependence on the maritime economy. If similar to terrestrial PAs, they will likely be in areas relatively excluded from human activity.

To examine these hypotheses, I analyzed the relationship between a "protection level" (PL) score and a set of variables pertaining to each country's conservation efforts, economic conditions, and human impact along the coast using ordinary least squares regression analysis. Four sets of models demonstrated country characteristics that correlate with higher PLs within MPAs. Certain contextual factors - particularly economic dependence on the marine environment, efforts at terrestrial conservation and greater human impact - were found to be significantly associated with higher PLs among the northern littoral countries of the Mediterranean. Such findings can inform policy makers about where efforts and investments should be directed for marine conservation (see Portman and Nathan, under review).

Plans for the second part of the funding period include a more specific focus on a proposed MPA in Israel and its management regime, including proposed zoning, as this relates to the MPA's physical context, its ecological attributes, and potential contribution to conservation in the Eastern

Mediterranean Sea considering national and international policies and conventions. The case study will be conducted on the Rosh HaNikra Protected Area which is currently an existing small coastal reserve of several square kilometers (sq km). It is slated for substantial expansion of up to approximately 10 sq km. A detailed plan has been submitted to the Northern District Planning Authority and in November 2013, the plan was deposited for public review. The public review follows a period of approximately two years that the Israel Nature Parks Authority promoted the plan, working with planning professionals and public sector decision-makers to obtain final approval for the plan. The DEMARN research will use two conservation planning software applications to arrive at proposed zoning plans. These applications, MARXAN and ZONATION, use techniques of spatial conservation prioritization (SCP). SCP is a form of assessment (i.e., analysis of available information) aimed at informing decision-making for a particular class of environmental planning problem. In general terms, SCP is based on principles of complementarity or scoring, uses data that is as comprehensive and heterogeneous as possible and ultimately reflects the requirements for continued existence of ecosystem function.

During the course of progress on DEMARN, I have contributed significantly to my field of marine and coastal protection within the Technion and both nationally and internationally. Shortly after beginning my term at the Technion (1.3.2012) I secured funding from the Israel Ministry of the Environment. The funding supports the development of a method for ecosystem services assessment designed to incorporate the consideration of ecosystem service values by decision-makers. The method is unique in that it will be designed to value ecosystems services across both terrestrial and marine areas along a transect in the Carmel mountain coastal region. In June 2013, I secured approximately \$1.2 million as a donation to the Technion from the Yad Ha Nativ (Rothschild) Foundation to lead the development of a marine spatial plan for Israel's Exclusive Economic Zone of the Mediterranean Sea. The plan, slated for completion within three years, will implement ecosystem-based management practices and spatial conservation planning outcomes for marine protected as it considers current and future uses of the near-shore and offshore environment. I have secured start-up funds from the Technion (approximately \$250,000), for the establishment of a visualization laboratory. It is my intention to research the use of visualization methods (mapping, representation, simulation, etc.) in virtual reality theatre environments for marine conservation purposes. An added area of activity has been the application for funding for collaborations in several cutting-edge research fields: mapping of coastal infrastructure to identify environmental enhancement opportunities (PADI Foundation, submitted Jan. 2014); and multipurpose coastal and shoreline infrastructure enhancement to support marine ecosystem restoration (Israel Ministry of Science and Technology, submitted Nov. 2013); and proposed German-Israel symposium on ecosystem-based governance for marine spatial planning (Fritz Thyssen Stiftung, submitted Dec. 2013).

I have established an 8 member research team composed of master's level planning students, one doctoral student and a post-doctoral student who will begin work on 1.3.2014. In Summer 2013, I signed a contract with Springer-Verlag Publishers to author a book entitled: Environmental Planning for Oceans and Coasts (forthcoming in 2015). The classes I have developed and taught include a required course: Introduction to Environmental Planning; GIS for Planners; Planning and Management of Coastal and Ocean Environments; and Advanced GIS for Conservation and Environmental Decision-making.

PROJECT OBJECTIVES FOR THE PERIOD

Comments:

Phase One: Researching Policy Frameworks

- This phase included:
- Data collection: inventorying of Mediterranean MPAs, both terrestrial and marine; forging a working relationship with regional organizations
- Devising a roadmap addressing core elements of ecosystem-based management
- Devising a topology of marine protected areas that relates to fundamental goals of ICZM, namely integration of design and management of MPAs within marine spatial planning and coastal planning efforts.
- Choosing an MPA proposed in the Israel Mediterranean Sea that has a management plan being reviewed by planning authorities and expected to achieve statutory approval within the project's execution period.

Phase Two: Review of decision support tools (DSTs) that could be relevant for the design and management of MPAs based on the information collected and analyzed in Phase One.

- Review of MPA design and management tools (i.e., spatial conservation planning tools)
- Obtain operational knowledge of a number of DSTs
- Analysis of the spatial conservation planning tools available and suitable
- Choosing appropriate spatial conservation planning tools (DSTs) for a comparison of implementation of the use of these applications on the case study site.

WORK PROGRESS AND ACHIEVEMENTS DURING THE PERIOD

Comments:

The DEMARN project started in early 2011. From early March 2012 to early 2013, progress on the research program was slowed due to my transfer from Hebrew University of Jerusalem to the Technion # Israel Institute of Technology. Therefore this detailed list of work progress and achievements covers activities undertaken from 2011 to the present and listed as non-consecutive years.

Phase One: Researching Policy Frameworks

This phase included:

- a) Data collection: inventorying of Mediterranean MPAs, both terrestrial and marine; forging a working relationship with regional organizations such as Network of Marine Protected Areas Managers in the Mediterranean (MedPan) and World Wildlife Fund (Mediterranean division). Working with a graduate student from Hebrew University of Jerusalem (paid for through DEMARN) I conducted an extensive inventory of: a) existing Israel MPAs, proposed Israel MPAs, and MPAs designed and managed by the twenty-two littoral countries abutting the Mediterranean Sea. In order to do so, we forged a working relationship with UNEP/MAP, MedPAN and MedMPAnet (RAC/SPA). This allowed us to network and collect detailed information on attributes of approximately 120 MPAs.
- b) A method of quadrant analysis was developed to evaluate the level of integration achieved by various spatial planning initiatives. I ended up conducting the analysis using relatively advanced cases of marine spatial planning (MSP) with marine conservation (the designation of MPAs) used as one of the criteria for judging the “scope” of integration. This formed the basis for the comparative policy analysis that highlighted three cases: MSP in the USA, England and Portugal. The criteria developed through the examination of these cases focused mainly on aspects of integration which is important for implementing marine planning and coastal management.
- c) For ecosystem based management relevant to Mediterranean cases of marine planning and designation of MPAs, an approach based on nature’s services was chosen. This led to work on inventorying topologies of ecosystem services (ES) for the marine and coastal environment, based largely on literature on the subject.
- d) A topology of MPAs in the Mediterranean was constructed using examples from previous inventories and surveys of MPAs in other areas of the world (for example, in Latin America and the Philippines). These typologies use categories: no-take, limited-take and mixed use. Also IUCN categories of protected areas, both terrestrial and marine had been used in previous studies. The former method was chosen for use in my study of the Mediterranean MPAs as these are established, designed and managed by the 22 littoral countries of the Mediterranean Sea (see Portman et al. 2012).
- e) Based on the above detailed tasks completed, I was able to choose an MPA proposed in Israel’s Mediterranean Sea, along its northern border. This is a suitable MPA that has been reviewed by planning authorities, has been reviewed by planning authorities and is expected to achieve statutory approval. The plan includes designation of specific areas with use restrictions and prohibitions of various activities within.
- f) A more specific topology of management regimes was identified for further inventory, analysis and characterization of the MPAs in the Mediterranean Sea. For this analysis, information was updated according to current and updated information available, mostly through online databases, such as MedPAN and World Directory of Protected Areas, and also through contact with relevant policy analysts of the World Wildlife Fund. I developed a finer categorization of management regimes using use and non-use values for determined protection level (PL) scores (i.e., direct use,

indirect uses, existence values, etc.) and this was related to other socio-economic characteristics of the countries managing the MPAs, terrestrial conservation efforts and human impact levels along the coast and in the near-shore marine environment. The results of this part of the research are presented in a second DEMARN article currently under review (Portman and Nathan, under review).

Phase Two: Review of Decision Support Tools

This phase, still partially in process, includes:

- a) A review of MPA design and management tools (“User Cases”). This stage dovetailed with work with students in a class, “Use of GIS for Conservation Planning and Environmental Decision-making” and work on an Israel Marine Plan, which will also likely make use of advanced decision support tools. With the help of a number of students, user cases were developed in order to identify criteria with which to evaluate existing software applications.
- b) Analysis of the various decision support tools was conducted. These included consideration of the following DST applications:
 - ARIES; MarineMap (now called SeaSketch); MINOE; MPA EZ; InVEST; Marxan with Zones; and MIDAS. Other approaches considered which could be implemented by minimal software development or using the model building capabilities of ArcGIS 10.2 were automation of: Multi-criteria analysis, DPSIR (Drivers, Pressures, Stresses, Impacts, Response), and ecosystem service valuation methods.
- c) Outreach to the public, policy makers and area users about the project, mostly through conferences as described in other sections of this report. Training activities involved working with a group of five students on the use of two applications, MARXAN and ZONATION, and applying ‘practice runs’ on the proposed Rosh HaNikra MPA.
- d) Identification of specific data layers of information pertaining to the Rosh HaNikra MPA (northern most area of Israel’s territorial sea). This includes the following data layers: marine biology, energy, geology, geomorphology, oceanography (currents); archeology, shipping, defense, fishing (legal and illegal) and aquaculture, infrastructure (i.e., piers, communication cables), jurisdictional boundaries, tourism and recreation.
- e) We are currently in the process of building a survey of the public in regards to their preferred needs and uses of the Rosh HaNikra MPA. The public will be categorized in two groups: visiting (i.e., transient) and permanent. The permanent users will be either business owners/operators or nearby residents.

In regards to the use of resources, the project has overlapped with others (e.g., the ecosystem service assessment of Atlit Beach and marine area and my leading the development of a Marine Plan for Israel) and therefore most of the funds for purchase of equipment, student wages, purchase of data from the Israel Maps Authority, has come from other sources.

Deviations from time frame:

All the tasks of Phase I were conducted on time. These included initial acquisition of equipment/software and the hiring and training of an assistant. Phase II has been conducted mostly on time with about a lag of three months time due to difficulties in hiring qualified staff. The delay has been mostly due to the need to hire a different assistant (through the Technion). However, this has been balanced by advances in the initial development of a survey instrument and the collection of a number of the GIS data layers as well as initial identification of groups of stakeholders who will serve as interviewees (part of the third and final phase of DEMARN).