WATERFRONT LAND USE CHANGE AND MARINE RESOURCE REGULATION: THE NEW BEDFORD PILOT STUDY

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Introduction

Since the implementation of the interim New England multispecies fishery management plan in 1982 there has been a dramatic increase in regulatory activity (e.g., area closures and limits on days at sea). Industry participants perceive these regulations as imposing additional costs, and they seek to adjust to each new set of regulations in order to lessen their financial impact. In many cases, adjustments require relocating business operations and switching to other stocks or species. Geographic shifts in harvesting capacity may have implications for the location of associated industries that supply the harvesting sector as well as those in the processing, distribution, and other downstream sectors, leading to broader societal impacts (Goodwin, 1988).

Federal laws such as the National Environmental Policy Act of 1969 and the Sustainable Fisheries Act of 1996 require that policy makers consider the importance of fishery resources to fishing communities with the goals of providing for the sustained participation of those communities and minimizing adverse economic impacts. One of the challenges in gauging the long-term and cumulative impacts of conservation and management regulations on coastal fishing communities is the lack of clear understanding of the interactions between changes in fish stocks and waterfront land uses.

As the initial stage of a larger regional study, this project examines the impact of changing fish stock abundance and regulation on the structure of fishing and related industries in the prominent New England port community of New Bedford. The study uses municipal and state level data to examine changes in waterfront land uses over time using GIS tools and relates these to industry employment, landings and fishery stock data from the last two decades. Results will improve our understanding of the cumulative effect of marine resource conditions and relevant regulations on economic impacts at the community level. This is crucial information for agencies charged with decision-making regarding coastal land-use planning, fisheries conservation and the protection of fisheries infrastructure.

Methods

The proposed work involved two main tasks: development of a historical water front land use database and construction of statistical models. The data base shows changes in land uses over the last twenty years. Once the spatial database depicting land use changes is available presenting quantitative variables for area,

number of parcels, parcel size statistics (e.g., areas used for docking, fishing and processing), the next step in the analysis is integration of land use data with fishing industry, regional economic and fish stock data leading to the development of statistical models.

The data on land uses are from two main sources: the state Waterways Regulation Program Licenses and municipal assessor's cards available for each property. The former is a regulatory program administered by the state that aims to protect water dependent uses of tidelands, including filled tidelands. This program, commonly referred to as Chapter 91, requires issuance of a license for use of properties within its jurisdiction. These licenses include a "use statement" which helps determine current and past land uses. Similarly, the municipal assessor's card data has information on uses for tax purposes that includes property sales information such as sales date, seller, and price. Review of these sources allowed the generation of a set of tiled GIS maps that showed past and current land uses by parcel. The researchers showed the maps to key informants familiar with the study area who were able to improve on and validate the findings.

From the database trends in land use changes can be identified and the relationship between these changes and fisheries industry data, stock conditions and regulation is clarified. Fisheries industry data was collected from the National Marine Fisheries Service. This included annual landings and stock information by species. Fisheries industry data such as yearly employment data by sector and the number of establishments was obtained from County Business Pattern data of the U.S. Census Bureau. Researchers used categories of land uses that coincide with North American Industry Classification System (NAICS) codes to facilitate the application of appropriate economic and business data. A series of statistical analyses and tests generate models that describe the relationships between industry and land use data.

The New Bedford Harbor

New Bedford is one of the most important fishing ports in the U.S. and its history is well known. From the latter part of the 18th century New Bedford developed a famous whaling industry which thrived until the late 19th century. In the mid 1800s, whaling made New Bedford a major U.S. fishing port with over 300 whaling ships employing 10,000 seamen. As whaling declined, fishing ceased to play a significant role in the local economy until the 1930s when the industry grew rapidly following the introduction of a local filleting operation and of refrigerated trucking. Since the 1920s the port has specialized in scallops, haddock, cod and various types of flounders. By 1986 New Bedford became a major fresh-fish processing center with distribution networks to all major East Coast cities (Moss and Terkla, 1985). In 1996, it ranked first among East Coast ports, and second nationally based on the value of product landed (Vanasse Hangen Brustlin, 2002).

The pilot study has built a GIS database covering approximately 170 parcels along the intensely used port area of New Bedford. This area is approximately 3.9 km (2.4 miles) in length from north to south. It is bounded by a major highway in the north and in the south by a hurricane barrier through which vessels pass to enter the New Bedford-Fairhaven Harbor on opposing banks of the Acushnet River. The New Bedford study area goes inland to the first major roadway and includes Fish Island and Popes Islands, both within New Bedford city limits It encompasses a total area of 1.03 million square meters (1.2 million square yards).

Results

To track chronological land use changes in the study area each parcel was assigned land uses for four five-year periods: 1986-1990; 1991-1995; 1996-2000; and 2001-2006. To cover multiple uses, up to three land uses have been assigned to each parcel. Researchers used a total of 21 grouped land use categories. Most of these groups combine several sub-groups. For example, the category "manufacturing" include both textile manufacturing operations and metal works. There are a total of 41 possible sub-groups for which all but two have corresponding NAICS codes.

The main land uses in the New Bedford Harbor are: seafood processing, manufacturing, marine and terrestrial transport and packaging, marine supply and repair, and docking. "Marine supply and repair" encompasses two separate groups that frequently overlapped,, so we combined them. "Docking" refers to land and filled parcels with bulkheads and adjacent slips used mostly for the berthing of commercial fishing vessels, but also for recreational watercraft. The area measured does not include areas of currently submerged land

Figure 1 shows the area measured in square meters dedicated to each of these prominent land uses by each five-year period. Any area designated as a city parcel was counted so this includes only land areas (not areas of the watersheet being used) and the more prominent pile piers on the working waterfront. One parcel of significant size was added when it was filled in 2002. Some of the other uses found on the waterfront that are not shown in Figure 1 are auto repair, offices, retail (e.g., hardware stores), restaurants, cold (refrigerated) storage, storage of goods and recreation.

An interesting finding from the time series analysis is the lack of land use change. The main change occurred in area designated as seafood processing. This reflects the building of some plants on vacant land mostly from the year 2000 onward when there was a 23% increase in "processing" area from the period before, representing 60% of all change for this use between 1990 to 2006. One reason for such little change may be due to most of the study area being a Designated Port Area (DPA) according to Massachusetts state regulations. DPA

regulations limit uses to “water-dependent industrial” which discourages the conversion of port-related uses to non port-related. Another reason for such slight change may be the short study period. Also, some known changes have occurred after 2006 and are not represented in the data.

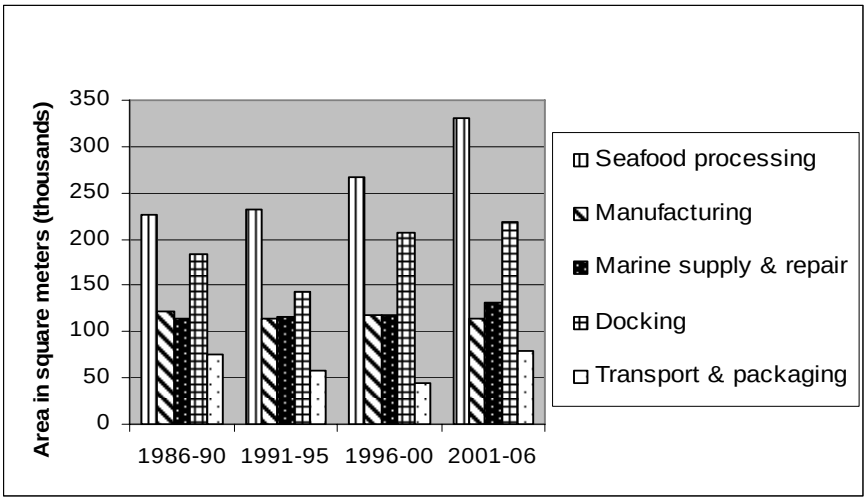

Figure 1: Prominent Land Uses – New Bedford Study Area

As a first step we ran linear regressions models separately incorporating each land use as a dependent variable with employment data or with product landed as the independent variables in each case. For the employment data, results of two models suggest significant relationships in the case of processing and in the case of marine supply and repair land uses. The effects of each of the estimated coefficients on the dependent variables is as follows: a) each added employee in processing is associated with an increase of 153.13 square meters of land area dedicated to processing; b) each added employee for boat dealerships and boat building enterprises is associated with an increase of 130.7 square meters of land area dedicated to marine supply and repair. For the period studied, both of these relationships were statistically significant at the 5% level.

Preliminary results suggest that the relationship between the area dedicated to the different land uses and total fish product landed (valued in dollars adjusted for inflation) is not statistically significant, indicating that fluctuations in value of product landed may not affect other aspects of the industry as they are reflected in land uses. The relationship between area used for processing and the landed value of scallops appears to be marginally significant; each added dollar value of scallops is associated with a .0005 increase in square meters of area dedicated to processing. This is important because scallops made up between 42-78% of the total value landed during the period studied. Similarly, the area used for docking and total value landed is marginally significant with each added dollar value of total landings associated with a .0003 increase in square meters “docking” area.

Regional Study Plans

The next step is to generate more robust statistical models using more complete data on the fisheries industry and fisheries resource conditions such as quantity of product landed and stock level data by species. Researchers also plan to expand the study area to cover the active waterfront area of both New Bedford and adjacent town of Fairhaven. Preliminary findings indicate that the proposed study is feasible and can be replicated at other commercial fishing ports.

New Bedford may be an anomaly among New England and even Massachusetts port cities. First of all, Massachusetts's has very specific regulatory standards for what uses are allowed in Designated Port Areas. As mentioned before most of New Bedford Harbor is a Designated Port Area (DPA) which makes it difficult, and may in fact preclude, conversion of land uses to non port-related uses. Furthermore, although New Bedford's Harbor Plan allows some conversion to uses that are not themselves water-dependent through its Supporting DPA Use Eligibility Credit Program[1], costs for these changes may be prohibitive. Because New Bedford may be an unusual case and also to provide more data points for comparison, the study should be expanded to include other cases. Other cities and towns with active fishing ports are being considered for a similar analysis to develop a comparative regional model.

References

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[1]The Eligibility Credit, unique to the City of New Bedford, is a transferable certification that economic support has been provided to water-dependent industry, pursuant to the New Bedford/Fairhaven Harbor Master Plan.