



On a Strategic Framework for Performance Enhancement in Managing New Jersey's Urban Coast

A White Paper for Monmouth University, Urban Coast Institute

Dr. Ronald C. Baird
Research Professor
Center for Marine Science
University of North Carolina Wilmington
bairdr@uncw.edu

INTRODUCTION

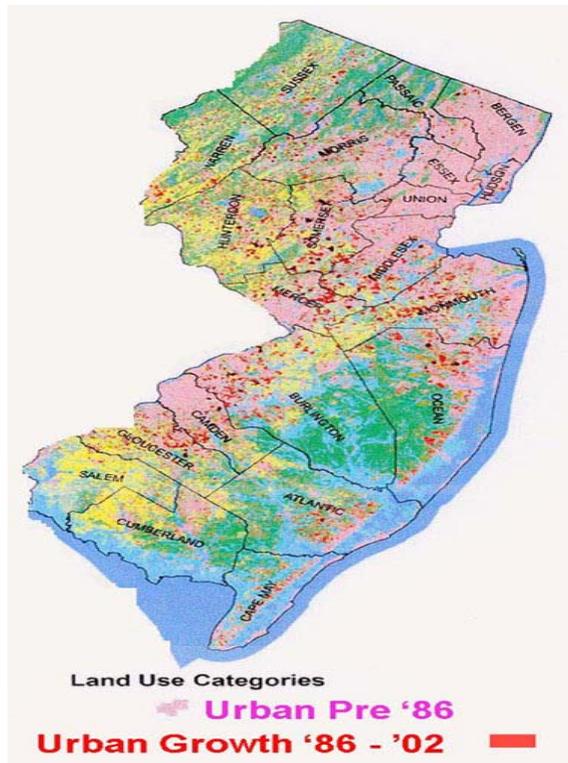
New Jersey (NJ) is a highly urbanized coastal state faced with the difficult challenge of protecting the ocean/coastal resources so critical to societal well being, economic vitality, and quality of life. Coastal resources however are increasingly threatened by expanding development, climate change and the difficulty of current institutions of governance to adequately respond to human drivers of environmental stress. *The purpose of this white paper is to provide guidance and a framework for thinking strategically about improving performance in managing the urban coast.* That is – how to address the governance mismatches, inefficiencies, lack of information and resource limitations that now impede rapid and effective responses to emerging coastal problems. By urban I mean areas having the characteristics of cities including suburban and exurban classifications, not specific political boundaries. Coastal cities refer to urban areas that border coasts and estuaries or are located in watersheds defined as estuarine regions. By whatever criteria commonly used much of NJ's land area is considered coastal in character

The reality for the coastal management community is that current systems of governance and agency infrastructure change slowly in relation to changing economic and ecological conditions. The challenges of continued growth and development require management approaches that evolve at a much faster rate than has been the case for contemporary systems of governance.

NEW JERSEY'S URBAN COAST

Setting: The State of New Jersey lies at the center of the largest megapolitan area in the country, an urbanized corridor stretching from Maine to the Chesapeake. This densely populated area is expected to grow by 20-40% by 2030¹. Over 75% of the land area of NJ is defined as coastal and contains 90% of the population². Other salient facts include:

Fig. 1



- NJ is the most densely populated state in the nation³.
- Urban areas are the predominant land category in NJ [Fig. 1]⁴.
- Urban land conversion rates exceed population growth rates⁴.
- From 1997-2004 NJ's population growth was 2-4% while GDP increased by 13%⁵.
- Land use patterns indicate intensifying use of land for economic purposes in the north and intensifying uses for residential purposes in the south⁴.

Coastal economic indicators for NJ include:

- Two major estuarine ports with \$120 billion in cargo value per year⁶.
- Commercial fisheries valued at over \$118 million annually⁵.
- Recreational fisheries valued at 3-5+ times the commercial fisheries value.
- NJ ranks 4th in the United States in coastal recreation with 3% of the national population and 6.2 million people involved, generating annual revenues of \$30 billion (2005)⁵.
- The New York Bight and Delaware Bay metro regions to which much of NJ's economy is tied accounts for 10% of the U.S. population and 13.7% of national GDP⁶.

In conclusion NJ is embedded in a highly populous, urbanized region, is largely dependent environmentally and economically on coastal watersheds, estuaries and shorelines for its continued well being and its future is tied in large measure to effective management of coastal resources.

Urban Dynamics: The cumulative impacts of coastal urbanization on ecosystems are highly complex and occur at many spatial scales^{1,7,8}. Knowledge about the relationships of urban growth to consumption of and impacts on ecosystem services need to be rapidly assimilated and translated into management actions⁹. Many diverse properties of cities (e.g. wealth, pollution, and infrastructure) have been shown to scale with population and/or urban form, that is the overall spatial pattern of development. These properties in turn affect resource use and ecosystem services. While the mechanisms behind these relationships are incompletely understood many can be tied to spatial metrics and associated census data. For instance auto use and energy consumption are non linear functions of population density. Areas of impervious surfaces are functions of population growth and density as is developed land. Socio- economic variables such as employment, GDP, resource use and waste production can be related to urban form and infrastructure characteristics. Such known relationships can be characterized at scales from regional to local and can be very useful as key indicators of socio-economic and environmental impacts in planning and management decision making.

The following is a partial list of known relationships and observations useful in understanding urban management problems. Greater knowledge and understanding of socioeconomic and environmental parameters critical to quality of life as a function of commonly measured variables such as population size, density and urban form at spatial scales appropriate to decision making is key to developing new and more comprehensive approaches to integrated coastal zone management.

- The ecological footprint of coastal cities far exceeds their actual dimensions (e.g. air quality, food, transportation, water, pollution)¹⁰.
- Urban form affects resource use in that past patterns tend to persist because of infrastructure (e.g. roads) that create a physical imprint that persists for years^{2,11}.
- Variables that affect coastal ecosystems that exceed urban population growth rates: vehicle miles, land development, impervious surfaces, urban runoff, consumption (food, water, energy); production (trash, fertilizers, wastewater, pollutants).
- Important variables that lag per capita growth are infrastructure efficiency (roads, wastewater treatment, energy distribution) and management response to ecosystem problems.
- Contemporary urban complexes such as NJ now exist as part of larger scale multistate, regional urban corridors that exhibit high degrees of connectivity, and commonality in dynamics, form, economics and ecological impacts.

Management Context: The State's coastal management framework is highly complex, multilayered involving a broad array of agencies, jurisdictions, laws, and policies. The structure is an outgrowth of our political system and organizational concepts of sector specific governance (e.g. water resources, health, fisheries, land use). This is referred to as compartmentalized coastal resource management. By way of example for NJ:

- Over 20 federal agencies and 140+ laws affect coastal management^{11,12}.
- The Department of Environmental Protection lists 66 separate programs and units³.
- The Coastal Management Program lists 14 divisions, bureaus, departments, commissions involved in the Non-point Pollution Control Program and 24 relevant environmental statutes related to management measures in addition to county and municipal jurisdictions¹³.

- Home rule and strong local government have major roles in land use decision making (e.g. 245 coastal municipalities).
- Spatial mismatches between management jurisdictions and ecological/watershed units including the land/water interface and contiguous ocean waters so critical to coastal zone management are common.

Environmental Context: The State faces a host of environmental challenges associated with urbanization and high population density. The following is a partial list to characterize the major ecological issues. *Note that as with most comprehensive reports the data reflect time lags from current conditions.*

- With few exceptions, watersheds and wetlands are locally contained and/or associated with highly urbanized estuarine environments at either (north or south) end of the State⁶.
- Impacts from regional megalopolis population centers impact NJ's coast, air and watersheds as well as socioeconomic variables.
- The amount of land in this fifth smallest U.S. state developed in 16 years (1986-2006) is equivalent to doubling the existing land of the state's four most urbanized counties every 1.5 decades. Rates of land development in NJ exceed population growth rates by 2:1 and by larger ratios in certain coastal counties⁴.
- Land use patterns as of 2002 continue to exhibit significant urban sprawl.
- Both the New York Bight and Delaware River major estuaries are rated in poor condition based on a number of metrics¹⁴.
- Much of the State's coastal/estuarine environments are under seafood consumption advisories¹⁴.
- While non-point pollution sources account for much of the impairment of estuaries atmospheric deposition and municipal/industrial wastewater remain major sources¹⁴.
- Impervious surface was being created at a rate of 5000+ acres annually ('95-02) and estimated surface area ('02) was equivalent to the size of Ocean County⁴. As little as 10% impervious cover has been linked to watershed impacts and chief among them is degradation of water quality³⁰. The large and growing area of impervious cover in NJ may require extensive restoration of natural areas and watersheds in the near future.

The major points relevant to coastal management in NJ are:

- The State continues to add population and develop land at significant rates.
- The few parameters examined here are indicative of urban dynamics in the State consistent with patterns observed in broader urban studies.
- Economic indicators underscore the economic importance of coastal resources.
- Location in a highly urbanized region points to the importance of regional influences on coastal ecosystems and economy. Recently the states of NY, NJ, DE, MD and VA entered into an interstate agreement to advance a regional agenda to improve collective management of ocean and coastal resources. This is a major innovation and opportunity for NJ to improve management performance at all levels of coastal governance.
- Coastal resource management remains highly compartmentalized.
- In spite of much progress, major indicators of ecosystem stress remain at significant levels indicative of management inadequacies⁽¹³⁾.

ON BUILDING A STRATEGIC FRAMEWORK

Confronting Reality: Larry Bossidy and Ran Charan warn that to be successful one must confront reality, understand the big picture, and think about the practical details of what to do about it¹⁵. Building a strategic framework requires starting with an understanding of current conditions, future trends and system characteristics. The following are examples of realities that performance enhancement strategies need to confront.

- Increases in population, urbanization, and intensity of human activity are inevitable over the next 30 years and must be dealt with in a management context.
- There is significant time lag between onset of ecological degradation and management response; it takes time to pass a law, build infrastructure, improve technology, and change behavior or alter institutions of governance.
- Reconciling socio-economic considerations with environment is a primary management challenge. In a recent urban poll¹⁶ environment ranked eighth among societal concerns.
- Growth means increased vulnerability to sea level rise and associated climate risk factors⁵. Impacts from weather (e.g. flooding, erosion) and climate change (e.g. sea level rise) must be major concerns for NJ. Enhanced understanding of impacts to the built environment and more effective land use strategies to minimize risk/vulnerability and enhance recovery are critical needs.
- We are entering an age of unprecedented advances in communication, data management, monitoring, computational power, and spatial resolution/pattern recognition. These innovations need to be rapidly assimilated into performance enhancement stratagems.
- Place based knowledge at the spatial dimensions relevant to decision making (local, regional, global) is critical in managing human activities and ecosystem stresses at all levels of governance.
- Future growth must be tied to the value of natural resources¹⁷ and the socioeconomic consequence of their loss to properly evaluate environment/development trade offs. Marine ecosystem services for NJ have been valued in excess of \$20 billion annually not including other benefits such as ecotourism¹⁸.

Thinking Strategically: Thinking strategically is an approach to problem solving - not the formal process of strategic planning. It may be viewed as the practice of devising and employing stratagems for achieving performance goals once these are understood and defined. That means utilizing a broad array of approaches, engaging many constituencies, blending scientific understanding with the realities and limits of current institutions in order to enhance management performance. In practice, good strategic thinking is truly an art form utilizing science, knowledge of human behavior, leadership, and experience in devising and implementing successful stratagems¹⁹. The following are recommendations from numerous sources useful in developing successful approaches²⁰⁻²⁹.

- Determine the primary impediments to performance (however defined) and focus on practical, workable solutions that include evidence based assessment and feedback protocols.
- Build on strong leadership, collaboration, partnerships, coordination, learning networks and action.

- Promote anticipatory decision making – that is – use of predictive models and current trends analysis as decision support tools. These are essential to development of vision and planning as well as reduction of response time to emerging threats.
- Insure that environmental and socioeconomic information are incorporated into spatially explicit data bases used in managing urban landscapes at scales appropriate to decision making.
- Insure a strong foundation of science and practice through periodic information exchange between researchers and practitioners including integration and transmission of information of high quality to decision makers.

Actionable Strategies: Strategic thinking must lead to effective action that is based on smart planning, reliable information, defining objectives, taking responsibility, and evaluating performance. The following are considerations critical to developing effective action plans.

- Integrated coastal management is about regulating human activity in time and space. For NJ management decisions once made in highly built out urban contexts cannot be easily or quickly reversed and can persist for a decade or more.
- Most land use decisions are made at a local scale while environmental regulation and impact analyses often occur at larger scales.
- Developing a place based spatial framework for critical variables (via new information display technologies) for local/regional decision-making provides a common denominator for planning, policy coordination, alignment and rapid decision making at all jurisdictions of governance.
- Developing reasonable and easily understood metrics for complex processes (e.g. heuristics) is important to stakeholder understanding and informed decision making. Careful development and use of commonly measured environmental and economic metrics and their relationship to land use, population, and sustainability factors is important.
- In practice monitoring, data analysis and assessment are chronically underfunded and often inadequate. Partnerships, leveraging with federal or private agencies and engaging universities can help address monitoring and assessment shortcomings.
- Human and financial resources are chronically in short supply and generally highly compartmentalized among agencies and by source. Developing more effective mechanisms for prioritization of joint activities and funding across jurisdictions leads to more efficient use of scarce resources and informed decision making.

WORKING WATERFRONTS AS EXAMPLE

Setting: In recent years, legislators, media, state and local agencies and commissions, community organizations and the public have highlighted concerns over access to public trust waters and the loss of working waterfronts. New programs and policies are being introduced in several states³¹. The issue provides a good example for applying the strategic approaches articulated above to an important management problem. The issue has already received considerable attention in the State and given its economic importance will be an issue of increasing management concern in the coming decade.

Working waterfronts are parcels of land containing commercial/industrial facilities that require direct access to a location on or adjacent to coastal public trust waters. These have been

defined in various ways but include marine construction, seafood related industries (fishing, processing etc.), minerals extraction (gravel, sand, oil, gas), ship/boat building and repair, recreational activities (recreation services, hotels, restaurants, aquaria, marinas etc.), transportation (ports, harbor facilities and services, warehousing etc)³² and increasingly energy generation. Land uses of waterfront property generally have major impacts on land use and human activity patterns in adjacent areas not considered waterfront.

Management complexities include: a finite amount of developed or developable waterfront land remaining in NJ; urban land use conversions once made are difficult and expensive to reverse; tax revenues are based on fair market value not present use valuation, such valuation does not include economic and social impact such as jobs, essential services related to or connected with related economic activities/industries including transportation, food production, recreation and cultural values. Current trends in land use in many states favor conversion from industrial to high-end residential and recreational services (e.g. hotels, resorts, casinos).

Management and Environmental Contexts: While many of the issues discussed above apply to the working waterfront example there are special jurisdictional concerns as well. These include:

- NJ has a highly fragmented jurisdictional network that collectively determine land use, zoning and permitting including numerous laws, regulations, departments, divisions of state agencies plus 245 coastal municipalities with their own land use plans and management practices³. Federal jurisdictions are involved at many levels.
- Regulations and management actions in adjacent waters can have major impacts on waterfront land use patterns with associated socioeconomic ramifications. This adds a whole new layer of management complexity not easily accommodated in traditional land use decision making and waterfront zoning that must be dealt with.
- Environmental concerns deal primarily with the impact of waterfront areas on contiguous water bodies through design and associated human activity.
- Difficult to value infrastructure such as historical, culturally important or ecologically sensitive sites can be major concerns.
- The recent granting by the U.S. Department of Commerce of leases for offshore energy development in NJ waters represents an emerging environmental and economic concern of special import for management decisions along waterfronts.
- Future increases in human activity and infrastructure along waterfronts that are most vulnerable to climate change impacts represents an enormous concern for the management of waterfronts.

Stratagem Development: Understand the big picture, determine where NJ is today on the issues, what management policies are now in place, articulate the major performance shortcomings and develop an action plan. Here again note that well conceived State, federal, university partnerships have been shown effective in producing scientific assessments and policy relevant reports^{4, 5}. Strategic issues to be addressed include:

- Local governments must make important and difficult choices including land use, zoning and taxation often without spatially precise or current information regarding the economic consequences of their choices. Stratagems leading to improvements in

information flow, spatial precision of data especially economic information, decision support tools and education are required.

- There are important legal and resource issues to be resolved. Land values and economic activity effect public services, state and local tax revenues. Legal issues on use valuation, private property rights, environmental compliance, and costs that may require trust funds or expensive infrastructure must be dealt with in policy development.
- The working waterfronts issue is one of national import and major economic consequence. A number of states are actively addressing the problem. Novel stratagems, governance reforms, and effective management protocols are being developed of potential value to NJ. Analysis and promulgation of approaches that work in other state contexts can reveal innovations that can be rapidly adopted locally.
- The public trust doctrine requires flexible coastal enterprise zoning (including adjacent waters) that enhances economic viability but also insures access to public waters. That requires precise socioeconomic and spatial data.
- Public and private waterfront infrastructure must comply with increasingly stringent regulations and service provision (water, waste, energy, transportation) and may require expensive remediation. Collectively these place significant demands on public and private resources that must be considered in decision making.

Actionable Strategies: The enormous economic and environmental importance of waterfront areas to NJ places a high value on stratagems that enhance the State's ability to manage the land water interface. That will require a comprehensive review of current practices and needs. The following are suggested avenues for performance enhancement.

- Decision-making must be tied to outcomes in a rapidly changing world. Resources for monitoring and assessment of policy impacts should be a high priority in planning.
- Develop a "language of spatial relevancy" for waterfronts among the management community including municipal governments- that is timely provision of spatially precise data bases of relevant information including socioeconomic and natural resource variables, infrastructure, population, geography, jurisdictional boundaries and zoning. These need include contiguous water bodies and at a scale sufficient for local decision making.
- Explore novel ways to improve data collection, analysis, promulgation and updating of relevant information. State, federal, university and private sector partnerships need be explored and developed in producing scientific analysis, innovations and policy assessments.
- Engage legislators, agencies, municipalities and stakeholders through special councils, regional governance, public meetings, opinion surveys, assessment reports and other educational avenues.
- Novel stratagems, governance reforms and effective management protocols are being developed of potential value to NJ. The urgency of NJ's waterfront management issues mandate making maximum use of knowledge bases developed elsewhere. Strategies for developing better more timely mechanisms for knowledge transfer to institutions of governance within the State will pay dividends in terms of institutional alignment and performance.

CONCLUSIONS

New Jersey has much at stake environmentally and economically in improving the management of its highly urbanized coasts. The magnitude of change from expected growth in the next decade calls for innovations that help insure sustainability. A number of promising avenues for developing new insights and approaches to integrated management of the urban coast have been articulated. The references cited provide a more comprehensive discussion of many of the points made here. The next steps are rigorous assessment of current performance shortcomings and identification of promising areas where implementing new approaches could demonstrably improve performance. Many new concepts such as place based management³³ and urban economics³⁴ promise new approaches and policies. To do this well will require thinking strategically(and realistically) about a fast changing world, future trends and an objective evaluation of the current situation. That in turn leads to stratagem development to address shortcomings and create opportunities that in turn lead to actionable strategies and performance enhancement.

Thinking strategically about managing the urban coasts reveals the primary importance of spatial planning- that is the need to express information of broad scope in a spatially explicit context. Expressing the right information at management critical scales holds great promise for improving management performance in urban settings where decisions have long lasting effects. University resources such as the Urban Coast Institute can play a significant role in that endeavor through scientific assessment, policy reports and outreach initiatives.

REFERENCES

- 1) Grimm, N.B., D. Foster, P. Groffman, J. M. Grove, C.S. Hopkinson, K.J. Nadelhoffer, D.E. Pataki, and D.P.C. Peters. 2008. The changing landscape: ecosystem responses to urbanization and pollution across climatic and societal gradients. *Frontiers in Ecology and the Environment* 6(5):264–272.
- 2) Beach, D. 2002. Coastal sprawl: the effects of urban design on aquatic ecosystems in the United States. Pew Oceans Commission. Arlington, VA.
- 3) New Jersey Department of Environmental Management: Coastal Management Program. May 2009. <http://www.nj.gov/dep/cmp/>
- 4) Hasse, J., and R.G. Lathrop. 2009. Tracking New Jersey's Dynamic Landscape: Urban Growth and Open Space Loss 1986-1995-2002. Center for Remote Sensing and Spatial Analysis. Rutgers University.
- 5) Williamson, S., M. Ruth, K. Ross, and D. Irani. 2008. Economic Impacts of Climate Change on New Jersey. The Center for Integrative Environmental Research, University of Maryland. College Park, MD.
- 6) Pendleton, L. H. 2007. (ed). The Economic and Market Value of Coasts and Estuaries: What's At Stake? *Restore America's Estuaries*. Arlington, VA.

- 7) McDonald, R.I. 2008. Global urbanization: can ecologists identify a sustainable way forward? *Frontiers in Ecology and the Environment* 6(2):99-104.
- 8) Bettencourt, L.M.A., J. Lobo, D. Helbing, C. Kuhnert, and G.B. West. 2007. Growth, innovation, scaling, and the pace of life in cities. *Proceedings of the National Academy of Sciences of the United States of America* 104(17):7301-7306.
- 9) Baird, R.C. 2009. Coastal urbanization: the challenge of management lag. *Management of Environmental Quality Journal* 20(4):371-378.
- 10) McGranahan, G., and D. Satterthwaite. 2003. Urban centers: an assessment of sustainability. *Annul. Rev. Environ. Resources* 28:243-274.
- 11) USCOP (U. S. Commission on Ocean Policy). 2004. An Ocean Blueprint for the 21st Century. Final Report, Washington, D.C. ISBN 0-9759462-0-X.
- 12) PEW Ocean Commission Report. 2003. America's Living Oceans: Charting a Course for Sea Change. *A report to the Nation*. Pew Oceans Commission, Arlington, VA.
- 13) Kennedy, S.M. 2009. Coastal Resource Protection: A Review of Select New Jersey Regulatory & Planning Tools. White Paper for the Monmouth University Urban Coast Institute. Monmouth, NJ.
- 14) National Coastal Condition Report III. 2008. Environmental Protection Agency. Washington, DC.
- 15) Bossidy, L., and R. Charan. 2004. *Confronting Reality: Doing What Matters to Get Things Right*. Crown Business, New York, NY.
- 16) Harper, J. 2004. Environment lags in poll of concerns. *Washington Times*, April 2004.
- 17) Widespread Accord Ties Future Growth to Natural Resources. IL-IN Sea Grant Helm, Fall 2002.
- 18) Valuing New Jersey's Natural Capital: An Assessment of the Value of the State's Natural Resources. NJ Department of Environmental Protection, April 2007
- 19) Baird, R. C. 2005. On sustainability, estuaries, and ecosystem restoration: the art of the practical. *Restoration Ecology* 13(1):154-158.
- 20) Armitage, D.R, R. Plummer, F. Berkes, R.I. Arthur, A.T. Charles, I.J. Davidson-Hunt, A. P. Diduck, N. C. Doubleday, D.S. Johnson, M. Marschke, P. McConney, E. W. Pinkerton, and E.K. Wollenberg. 2009. Adaptive co-management for social–ecological complexity. *Frontiers in Ecology and the Environment* 7(2):95-102.

- 21) Palmer, M.A. 2009. Performing watershed restoration: science in need of application and applications in need of science. *Estuaries and Coasts* 32(1):1-17.
- 22) Lovell, S.T., and D.M. Johnston. 2009. Creating multifunctional landscapes: how can the field of ecology inform the design of the landscape?. *Frontiers in Ecology and the Environment* 7(4):212-220.
- 23) Joint Ocean Commissions Initiative, One Coast, One Future: Securing the Health of West Coast Ecosystems and Economies. Meridian Institute. Washington, D.C. January 2009.
- 24) Ecosystem Based Management Tools Network. 2009. About Ecosystem Based Management. http://www.ebmtools.org/about_ebm.html
- 25) Laitos, J.G., and R.B. Reiss. 2004. Recreation wars for our natural resources. *Environmental Law* 34: 1091- 1122.
- 26) Weinstein, M.P. 2008. Ecological restoration and estuaries management: placing people in the coastal landscape. *Journal of Applied Ecology* 45(1):296-304.
- 27) Heinz (H. John Heinz III Center). 2004. Innovation by design, improving learning networks in coastal management. The H. John Heinz III Center for Science, Economics and the Environment, Washington, D.C.
- 28) Gulf of Mexico Alliance. 2009. Governors' Action Plan For Healthy and Resilient Coasts, March 2006 – March 2009.
- 29) Fordham, M. 2007. Social vulnerability and capacity. *Natural Hazards Observer* 33(2) 1-3.
- 30) Schueler, T 2003. Impacts of Impervious Cover on Aquatic Systems. Center for Watershed Protection. Ellicott City, MD
- 31) Waterfront Access Study Committee. Final Report to the N.C. Joint Legislative Commission on Seafood & Aquaculture. The N.C. Marine Fisheries Commission. The N.C. Coastal Resources Commission. North Carolina Sea Grant, UNC-SG-07-03. April 13, 2007.
- 32) Kildow, J.T., C.S. Colgan, and J. Scorse. 2009. State of U.S. Ocean and Coastal Economies. National Ocean Economics Program. <http://noep.mbari.org/>
- 33) Young, O.R., G. Osherenko, J. Ekstrom, L.B. Crowder, J. Odgen, J.A. Wilson, J.C. Day, F. Douvère, C.N. Ehler, K.L. McLeod, B.S. Halpern, and R. Peach. 2007. Solving the crisis in ocean governance: place-based management of marine ecosystems. *Environment* 49(4): 20-32.
- 34) Florida, R. 2009, How the crash will reshape America. *The Atlantic*, March pp 44-56.