

Linking Science, Planning, and Policy-Making for Sustainable Development In the Great Lakes Basin

Richard K. Norton[•]
Elisabeth R. Gerber^{••}
Robert W. Marans^{•••}
Guy A. Meadows^{••••}
John M. O'Shea^{•••••}

Prepared for the
University of Michigan Great Lakes Initiative
And the
Second Annual Wege Symposium
November 2002

University of Michigan
Ann Arbor, Michigan

October 21, 2002

Abstract

Many observers note an apparent disconnect between our scientific knowledge of coastal resources and processes in the Great Lakes Basin, on the one hand, and regional land use outcomes, on the other. The objective of this paper is to propose and illustrate a conceptual framework for better understanding the relationship between local land use policy-making and selected natural resource aspects of sustainable development. To achieve this objective, we first summarize current scholarship connecting local government, sustainability, and scientific knowledge. Second, we propose a conceptual framework for studying the role of scientific knowledge in coastal planning and policy-making. Third, we apply this framework to two examples of coastal problem solving. Finally, we describe our vision for an interdisciplinary research agenda.

[•] Assistant Professor, Urban and Regional Planning Program

^{••} Professor, Ford School of Public Policy and Director, Center for Local, State, and Urban Policy

^{•••} Professor, Architecture and Urban Planning and Senior Research Scientist, ISR

^{••••} Professor, Naval Architecture and Marine Engineering

^{•••••} Professor, Anthropology and Curator, Museum of Anthropology

The authors would like to thank Elsa Pereira, MUP candidate in the Urban and Regional Planning Program, for her contributions as a research assistant.

I. Introduction

A decade ago, a blue-ribbon commission of scientists, private citizens, and state officials, convened by Governor John Engler, issued a report entitled *Michigan's Environment and Relative Risk*. The report concluded “to the surprise of many...that an ‘absence of land use planning that considers resources and the integrity of ecosystems’ was among the most critical environmental problems facing Michigan” (Smyth 1995:1 (emphasis in original)). More recently, the Michigan State Senate’s 2002 Great Lakes Conservation Task Force Report concluded that the “quality of the Great Lakes is strongly impacted by activities that occur on the land” and that one aspect of land use that “has not been fully integrated with water impact is land use planning and zoning” (GLCTF 2002:64). This was true, according to the Task Force Report, especially with regard to the already extensive and ongoing loss of wetlands. These conclusions are of special relevance as we look toward the long-term ecological and social sustainability of the Great Lakes Basin. Indeed, given the basin’s historic and anticipated levels of population growth and land development patterns, and the corresponding past and likely future assaults to its aquatic and terrestrial ecosystems, Rabe (1999:247) asserts that the “Great Lakes Basin may constitute the ultimate test of a North American region’s capacity to adhere to the tenets of sustainable development.”

These assertions raise a number of compelling questions. Looking back, why have localities in Michigan and throughout the Great Lakes Basin not been able to address coastal resource protection issues effectively through their local planning and policy-making? Looking forward, what are the prospects for those efforts in the future? Such assertions and questions, not unique to the Great Lakes Basin, have recently prompted a substantial amount of attention to the concepts of sustainable development. As this debate proceeds, one almost universal *prescription* deriving from this work is the urgent call to better inform local citizens and officials about the environmental crises we face and the consequences of the private and public land use decisions we make. In other words, there appears to be a fundamental and widely perceived disconnect between what we know about the natural systems we depend upon for our survival—systems like the hydrologic processes and aquatic and terrestrial ecosystems of the Great Lakes

themselves—and how that knowledge is actually incorporated into our local land use planning and policy-making.¹

The purpose of this paper is to call for a collaborative, interdisciplinary research agenda to systematically study the relationship between our knowledge of the natural resource systems that comprise the Great Lakes Basin (including physical, ecological, and historical/cultural resources), on the one hand, and the federal, regional, state, provincial, and local land use planning and policy-making processes that comprise the current institutional resource management system throughout the Basin, on the other. In section II, we first put the recent emphasis on sustainable development into context by focusing on the important role to be played by local governments in achieving sustainability. We describe the institutional, regulatory, and natural resource context of US land use policy, noting the importance of local government actors. In section III, we articulate a conceptual framework for assessing the role of scientific knowledge about natural resource systems in local land use planning and policy-making. This framework builds upon recent work in the planning, public administration, and political science disciplines on growth management and so-called “commons” problems, and forms the basis for our proposed research agenda. In section IV, we offer two brief examples that illustrate the potential application of our conceptual framework to current Great Lakes coastal resource management problems. In section V, we conclude by describing next steps for advancing such a research agenda. We attempt to address resource management issues as they exist throughout the entire Basin as much as possible, but given the extent of our research efforts to date, we focus primarily on the State of Michigan.

II. Sustainability and the Importance of Local Land Use Planning and Policy-Making

Since the concept of “environmental protection” materialized in the collective consciousness of citizens and policy-makers over three decades ago, American environmental policy has evolved through at least three epochs (Mazmanian and Kraft

¹ “Land-use planning and policy-making” is used here and throughout this paper in a broad sense, encompassing the variety of transportation, wastewater treatment, and other public infrastructure investments and policies—in addition to more traditional land use planning and regulation—that affect land development and use patterns over time.

1999; 1999b:3-41). Moving through a period of top-down environmental regulation and then flexibility-driven regulatory reform, the most recent emphasis has been on creating “sustainable communities.” This ongoing movement largely crystallized around the Brundtland Commission’s call for sustainable development, which it defined as development that “meet[s] the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987:43). The current epoch can be best characterized to date by an explosion of both scholarly and applied work that has struggled collectively to define more precisely what “sustainable development” means.²

While that struggle still continues, a broad consensus has developed around the need to redesign public policy-making processes and public and private land development activities so as to ensure long-term ecological health and social stability. Prescriptions to achieve such a sustainable “harmony” between human and natural systems generally focus on the need to better integrate ecosystem management principles and social equity concerns into economic development decisions; to shift emphasis away from residuals regulation and habitat restoration and towards pollution prevention and habitat protection; to increase intergovernmental coordination both horizontally and vertically; to employ collaborative, stakeholder-based planning and policy-making processes; and, overall, to better inform local citizens and public officials of pending threats to regional and global sustainability (see, e.g., Burby 1998; Mazmanian and Kraft 1999; Wheeler 2001; Berke 2002; Berke and Manta Conroy 2000).

Much of the work on sustainable development has been promoted by officials at the international and national levels as something to be taken up and applied at the state and local levels.³ To a notable extent, this new emphasis on sustainability has also found its way into the mission statements of the major intergovernmental programs that speak

² Examples of scholarly studies include Campbell (1996); Mazmanian and Kraft (1999); and Harris (2000). Examples of applied studies include Roseland (1998) and Hart (1999). Students of sustainable development generally define sustainability in terms of balancing economic, social, and environmental concerns (see, e.g., Campbell 1996). Nonetheless, as reflected by the discussion here, most start from an environmental protection perspective given the nature and scope of the various resource threats we face, particularly in coastal settings (see, e.g., Burby 1998; Beatley, Brower, and Schwab 2002).

³ These include, for example, the United Nation’s Agenda 21 initiative (<http://www.un.org/esa/sustdev/agenda21chapter17.htm> (August 2002)); the U.S. Environmental Protection Agency’s Community-Based Environmental Protection initiative (<http://www.epa.gov/ecocommunity/> (August 2002)); and the National Oceanic and Atmospheric Administration’s coastal zone management programs (<http://www.noaa.gov/coasts.html> (August 2002)).

to Great Lakes management, such as the International Joint Commission,⁴ the Great Lakes Commission,⁵ the Michigan Sea Grant Program,⁶ and the State of Michigan's Coastal Management Program⁷ (supported by the national Coastal Zone Management Program). Indeed, one of the five priorities identified by the Michigan Sea Grant Program for its 2000-2005 Strategic Plan is specifically the goal of advancing sustainable coastal development, while the remaining four priorities relate to sustainability to a greater or lesser extent (see Michigan Sea Grant 1999). The Great Lakes Commission's "Restore the Greatness" and "Bridges" initiatives sound a similar theme with their stated priorities of promoting better control of nonpoint source pollution, strengthened protection and restoration of coastal wetlands and habitat, sustainable water use, strengthened public policy decision-making capacity, and increased brownfield redevelopment (see GLC March 2002; June 2001).

This developing momentum to impel concepts and principles of sustainability from abstract ideas to practical planning and policy decision-making at the local level is significant in two respects: first, these concepts need to make their way into local planning and policy-making processes in order to significantly change patterns of development; and, second, little such change appears to be happening. To begin to understand both why the local level is critical, and why local governments might be unable to meet the challenge of sustainability, we next discuss the institutional, regulatory, and natural resource settings in which land use policy is made in the United States, focusing in particular on the State of Michigan.

A. Institutional Context

Decision-making power over land use issues in the United States is distributed across levels of government in a system of "regulatory federalism." Formally, this structure involves the federal, state, and local governments. The existence and powers of

⁴ See Annex 13 of the Great Lakes Water Quality Agreement of 1978 regarding the control of nonpoint sources of pollution at <http://www.ijc.org/ijcweb-e.html> (August 2002).

⁵ See <http://www.glc.org/> (August 2002).

⁶ See <http://www.miseagrant.org/> (August 2002). Links to the state Sea Grant programs for all of the eight Great Lakes states can be found on the National Sea Grant Program web site at <http://www.nsgo.seagrant.org/NationalSeaGrant.html#GL> (August 2002).

⁷ See http://www.michigan.gov/deq/0,1607,7-135-3313_3677_3696-11188--,00.html (August 2002).

the federal and state governments are explicitly described in the US Constitution. Local governments, by contrast, lack their own constitutional status; they depend entirely upon the states for their existence and powers. In Michigan, the State Constitution allows for the formation of general-purpose local governments (counties, cities, villages, and townships), and special-purpose governments (school districts, intermediate school districts, community college districts, special districts, and planning and development regions) (CRC 1999). Each of the four types of general purpose local governments has the option of adopting a structure and set of powers described in the State Constitution, or of drafting and adopting its own charter. Procedures for incorporation, charter adoption and revision, and specific powers of each type of government are all described in the State Constitution and enabling legislation.⁸ Michigan's local government structure is often described as highly fragmented, with 83 counties, 273 cities, 262 villages, and 1,241 townships, as well as 748 education districts and 277 other special districts (CRC 1999). Nearly 350 of those county, township, and municipal units are located within the near-shore coastal zone, having jurisdiction over land directly adjacent to a Great Lakes shoreline (Klepinger July 2002).

B. Regulatory Context

Operationally, American regulatory federalism creates a complex web of rights, powers, laws, and regulations across the international, federal, regional, state, and local levels of government. The authority of governments to regulate the public and private uses of land derives largely from their rights to engage in zoning, planning, and environmental protection.

In response to rapid and largely unregulated growth at the end of the 19th Century, many American communities passed zoning ordinances that regulated industrial, commercial, and residential uses of land in particular regions of the community. Property owners challenged these zoning practices as unconstitutional violations of due process and takings of private property.⁹ The US Supreme Court ruled in *Village of Euclid v.*

⁸ See, e.g., Constitution of the State of Michigan (1963); Counties Act (MCL § 45.1 et seq.); Charter Township Act (MCL 42.1 et seq.); Home Rule Cities Act (MCL § 117.1 et seq.); and Home Rule Village Act (MCL § 78.1 et seq.). See generally (MML and MAMA 2002).

⁹ US Constitution, Fifth and Fourteenth Amendments.

Ambler Realty Co.¹⁰ that zoning ordinances were, in fact, consistent with the proper exercise of government police powers to promote public health, safety, morals, and general welfare. In Michigan, the state supreme court has held that zoning power belongs to the state government¹¹ and is delegated to localities through enabling legislation.¹² These enabling acts authorize municipalities to regulate the use of land and buildings to meet the needs of the people for food, natural resources, places of residence, recreation, industry, and trade. They authorize regulation to prevent overcrowding of land and congestion and authorize the provision of adequate roads, water supplies, and sewer systems. They also prohibit some categories of regulations (including regulation of oil and gas, foster care, water rights) (MML and MAMA 2002).

All of the eight states in the Great Lakes Basin authorize local governments to engage in both planning and zoning. None, however, have adopted state-wide or regional growth management programs and none mandate local planning (Johnson et al. 2002). Surveys conducted by the MI Society of Planning Officials in 1994 and the MI Sea Grant Program in 2002 indicate that many of the coastal localities in Michigan are in fact engaged in local planning and land use control and that those activities have been increasing in frequency. About 75% of the counties and townships, 87% of the villages, and 96% of the cities in Michigan's coastal zone have adopted master plans as of early 2002, up substantially from the late 1970s when less than half of these localities reported having master plans (Klepinger July 2002). Similarly, about 29% of counties, 80% of townships, and 95% of villages and cities in the coastal zone reported having adopted zoning ordinances as of early 2002, also up substantially from numbers reported in the late 1970s (approximately 2% of counties, 65% of townships, 19% of cities and 13% of villages as of 1978) (id).

Nonetheless, while we know that the number of localities engaged in planning and land use control is substantial in Michigan, we do not know how rigorous those planning and land use regulation efforts are. Initial survey efforts indicate that less than half of the localities surveyed in the coastal zone use GIS (44%) or digital zoning maps

¹⁰ 272 U.S. 365 (1926).

¹¹ See *Clements v. McCabe*, 210 Mich. 207 (1920).

¹² See, e.g., *City and Village Zoning Act* (MCL § 125.581 et seq.); *County Zoning Act* (MCL § 125.201 et seq.); *Township Zoning Act* (MCL § 125.271 et seq.). Major amendments to increase community flexibility were made in 1978. See generally MML and MAMA (2002).

(41%) (Klepinger July 2002). Moreover, generalized studies and anecdotal evidence suggest that local plans in the region do not tackle growth management issues generally or coastal resource management issues specifically in much depth if at all (Klepinger July 2002; Smyth 1995). Therefore, there is a substantial need to systematically characterize and assess the extent and quality of land use planning efforts actually taking place.

In the area of environmental protection, the regulatory environment is more complex. Compared to zoning and planning, which are largely local (and increasingly regional) affairs, the federal government exerts greater power over environmental policy, both through its power to enter into international treaties and agreements, and through its role in regulating interstate commerce.¹³ International, federal, regional, state, and local laws all exist which limit and constrain particular activities with significant or potential environmental impacts. Adding further complexity, on any given law responsibility is often shared among levels of government, with the federal government (typically through the US Environmental Protection Agency) setting standards, engaging in oversight, and providing (sometimes partial) funding; state governments taking on program implementation responsibilities; and local governments responding to state and federal mandates.¹⁴

In addition, states and local governments pass their own environmental protection laws. In Michigan, the state's many environmental statutes were substantially consolidated in the MI Natural Resources and Environmental Protection Act of 1994¹⁵ (MML and MAMA 2002). This Act contains provisions covering such areas as contaminated properties, wetlands, water pollution abatement, underground storage tanks, worker and community right-to-know, waste management, and air pollution. Conveying a sense of the great complexity of this regulatory environment overall, Table 1 describes a selection of the most significant current federal, state, and local laws, policies, and regulations pertaining to Great Lakes coastal land use, development, and protection.

¹³ US Constitution, Article I, Section 8.

¹⁴ For example, one program especially relevant to water quality protection in the Great Lakes Basin that will affect many localities throughout Michigan is the Phase II Stormwater management program under the federal Clean Water Act. Through this program, the US EPA and state environmental protection agencies are imposing increasingly demanding requirements on local governments to control nonpoint source pollution from stormwater runoff. See <http://www.epa.gov/npdes/pubs/fact1-0.pdf> (September 2002) for a description of the program.

¹⁵ MCL § 324.101 et seq.

Table 1. Selected Program Initiatives and Institutional Actors in the Great Lakes Basin		
<i>Level</i>	<i>Program</i>	<i>Lead / Responsible Agencies & Focus</i>
International Agreements and Treaties	Boundary Waters Treaty of 1909	Established the International Joint Commission (IJC) <ul style="list-style-type: none"> • Authorizes water level controls • Monitors, assesses, and comments on US/Canadian efforts under the Water Quality and Air Quality Agreements (see below)
	Great Lakes Water Quality Agreement, Amended 1987	US Environmental Protection Agency (US EPA), Environment Canada (EC), and the Canadian Provinces of Ontario and Quebec <ul style="list-style-type: none"> • Establishes Remedial Action Plans (RAPs) for designated Areas of Concern (AOCs) (43 AOCs identified to date) • Establishes Lakewide Management Plans (LaMPs) (LaMPs for Lakes Erie, Michigan, and Ontario established to date)
	Great Lakes Air Quality Agreement	US EPA and EC <ul style="list-style-type: none"> • Provides a formal mechanism for addressing shared trans-boundary air pollution
	Binational Toxics Strategy	US EPA and EC <ul style="list-style-type: none"> • Provides a formal mechanism for addressing persistent, bio-accumulative toxic substances in the Great Lakes Basin
	Convention on Great Lakes Fisheries	Established the Great Lakes Fishery Commission (GLFC) <ul style="list-style-type: none"> • Authorizes the GLFC to conduct research on Great Lakes fisheries management issues, particularly on the sea lamprey
	Strategic Great Lakes Fisheries Management Plan	GLFC and individual fisheries management jurisdictions <ul style="list-style-type: none"> • Establishes by cooperative agreement procedures for establishing fishery management goals and plans
	1836 Treaty	Chippewa-Ottawa Treaty Management Authority <ul style="list-style-type: none"> • Establishes native American fishing rights and tribal management of certain Great Lakes fisheries
Regional Agreements	Great Lakes Basin Compact	Established the bi-national Great Lakes Commission <ul style="list-style-type: none"> • Promotes US and Canadian cooperation and advocacy on Great Lakes management issues
	Great Lakes Charter and Charter Annex 2001	Council of Great Lakes Governors <ul style="list-style-type: none"> • Controls diversions and consumptive use of water within the Great Lakes Basin
	Great Lakes Toxic Substances Control Agreement	Council of Great Lakes Governors <ul style="list-style-type: none"> • Provides a formal mechanism for coordinated regional action to control toxic pollutants to the Great Lakes

Table 1. Selected Program Initiatives and Institutional Actors (continued)		
<i>Level</i>	<i>Program</i>	<i>Lead / Responsible Agencies & Focus</i>
<i>National Laws and Programs (U.S.)</i>	US Environmental Protection Laws	US EPA. Selected major legislation includes: <ul style="list-style-type: none"> • Clean Water Act • Clean Air Act • Safe Drinking Water Act • Comprehensive Environmental Response, Compensation, and Liability Act • Superfund Amendments and Reauthorization Act • Resource Conservation and Recovery Act • Toxic Substances Control Act • Pollution Prevention Act • Oil Pollution Act • Federal Insecticide, Fungicide, Rodenticide Act
	US Resource Management/ Protection Laws and Programs	National Oceanographic and Atmospheric Administration (NOAA), US Army Corp of Engineers (US ACE), US Fish and Wildlife Service, and/or US EPA. Selected major legislation includes: <ul style="list-style-type: none"> • Water Resources Development Act • Coastal Zone Management Act • Endangered Species Act • Shore Protection Act • Shoreline Erosion Control Development and Demonstration Project • US National Estuary Program • National Coastal Monitoring Act • National Environmental Policy Act • Rivers and Harbors Act of 1899 • Coastal Barrier Resources Act
<i>State Laws and Programs (Michigan)</i>	Pollution Control and Resource Management Laws and Programs	Michigan Department of Environmental Quality (MI DEQ) and Department of Natural Resources (MI DNR). Selected major programs include: <ul style="list-style-type: none"> • Point and nonpoint source water pollution control • Wetlands protection • Air quality protection • Critical dune protection • Ship ballast water monitoring • Erosion and sedimentation control • Construction, dredge, and fill regulation in Great Lakes waters • Shorelands protection and management • Coastal Zone Management Program • Great Lakes Protection Fund (self-administered)
Sources: See GLCTF (2002) and http://www.epa.gov (September 2002); http://www.noaa.gov (September 2002); http://www.usace.army.mil/ (September 2002); http://www.deq.state.mi.us (September 2002).		

It is important to recognize that despite the existence and predominance of numerous international, federal, regional, and state policies in the area of environmental protection, local governments are important players in translating policies into outcomes. Even within coastal areas where federal and state coastal zone management programs and special purpose programs like wetlands regulations and coastal hazard mitigation requirements operate, local governments play a primary role in implementing those programs. And even in coastal states that mandate and prescribe statewide or regional land use planning like North Carolina, Florida, and Oregon, *local* governments make the public infrastructure investment decisions, land use regulatory decisions, and site approvals for almost every aspect of new development and urban redevelopment, including location, density, building height and bulk, and site design.

Furthermore, local citizens and officials face strong political incentives to pursue local, as opposed to regional, state, national, or international objectives. Catalyzed by a tendency towards localism, these local policy-makers may lack a commitment to top-down programs that render those higher-level programs ineffective if not counter-productive (see May et al. 1996:3-7). In sum, however important federal and state efforts are and will continue to be, there are compelling institutional and pragmatic reasons to think that sustainable development, as an approach to resource management in the Great Lakes Basin and elsewhere, will only work when it is fully embraced at the local level and actively promoted by local governments through their local planning and policy-making efforts.

C. Natural Resource Context

In addition to the institutional and regulatory environments that funnel power to the local level, there are other good reasons to facilitate local-level efforts to promote sustainability, particularly from an ecosystem management perspective. One of the great challenges of ecosystem management is the great variation in site-specific habitat, hydrologic, cultural resource, and built-environment conditions. These conditions must be considered in order to make informed and effective land development and management decisions for any given locality and, cumulatively, for the region as a whole. And like that variation in natural conditions, the people who inhabit those settings

similarly vary in terms of their concerns about, aspirations for, and endemic knowledge of their own local settings. That variation in natural, built and social conditions necessarily renders the uniformity inherent in the federal and state regulatory/ permitting processes poorly tailored to local conditions.

This traditional arrangement over land use authority has engendered agreement by most stakeholders that the national priority of balancing “environmental protection and development in the coastal zone ... [is one] best served by maintaining the voluntary, incentive-based intergovernmental program that has been created thus far” (Beatley, Brower, and Schwab 2002:99). In other words, “[f]or the purposes of growth management, local governments are where the action is, and where it will likely remain” (Beach 2002:22).

D. Local Progress Towards Sustainability

But if sustainability must occur at the local level to be effective, there is little evidence that meaningful change is yet under way. Self-initiated efforts by local governments to actively integrate and advance principles of sustainable development are as yet more the exception than the rule. In a recent nation-wide study of municipal planning efforts, for example, Berke and Manta Conroy (2000) determined that only 10 of the 30 localities they studied clearly incorporated principles for sustainable development (whether denoted as such or not) into their community plans. And to the extent that they did, those plans focused mostly on the goal of promoting a livable built environment (the stuff of traditional community planning) and relatively little on other sustainability principles like resource protection, place-based economic development, and social equity. Similarly, in their recent work on state-mandated planning for natural hazards mitigation—a sustainability issue of particular relevance in coastal settings—Burby and May (1997:105-106) concluded that even the highest quality plans in the states studied (i.e., those produced by localities in coastal North Carolina) failed to do “a very good job of addressing natural hazards” (scoring on average 1.35 out of a possible 5 on a standardized scale measuring plan quality with respect to hazards mitigation).

There are exceptions. Within the Great Lakes Basin, efforts by higher-level governmental entities, nongovernmental interest groups, regional councils of

governments and watershed councils, and some local governments themselves, have begun to take identifiable sustainable development initiatives at the local level. Through a collaborative effort between the Land Information Access Association and the Northwest Michigan Council of Governments, for example, Grand Traverse and Leelanau Counties recently participated in a “Regional Cooperation for Land Use Planning Project,” which was designed to help local governments increase their capacity for and use of Geographical Information Systems (GIS) analysis tools for land use planning and management activities.¹⁶ Nonetheless, aside from these types of special funded projects and other limited exceptions,¹⁷ self-initiated efforts to promote sustainability at the local level by local governments generally appear only in the form of goal statements within the context of community development initiatives.¹⁸ Stepping back and contemplating state, provincial, and local efforts to advance sustainability in the Great Lakes Basin, Rabe (1999) characterizes the Canadian and U.S. institutional and nongovernmental stakeholders constituting the basin as a “massive ‘community’” facing a “daunting collective action challenge” (p. 270). He concludes that while governors and premiers of Great Lakes states and provinces in particular have succeeded in making “bold pronouncements on behalf of the regional ecosystem,” they have not succeeded in “translat[ing] those declarations into meaningful collective action” (p. 276).

So, if there is broad agreement among natural scientists, social scientists, and policy-makers that serious efforts to promote sustainable development are in order, and that those efforts—if they are to be effective—must take form especially at the local level, the question becomes why such local efforts have not appeared. The answer, of course, is not straightforward. Even so, drawing from efforts to address this question in a variety of settings (see, e.g., Rabe 1999; May et al. 1996; Burby and May 1997; Berke and Manta Conroy 2000; Beatley, Brower, and Schwab 2002; Beach 2002), the most common conclusions are that: most local officials do not recognize the need to

¹⁶ See <http://www.liaa.org> (August 2002).

¹⁷ See <http://www.sustainable-racine.com/> (August 2002) for a description of the “Sustainable Racine” program.

¹⁸ The proposed Bay City “RiversEdge” waterfront redevelopment project, for example, states as one of its objectives its intent to “attract and encourage sustainable development.” See <http://www.baycitygovernment.com/riversedge.htm> (August 2002). If order of presentation is meaningful, however, this objective statement is listed as the last of 14 different objectives identified.

incorporate sustainability into their land use planning and policy-making; do not know how to do so (i.e., lack technical capacity); lack the necessary financial and/or administrative capacity to do so; or lack the commitment to do so. These characterizations of the problem boil down to insufficient capacity, knowledge, and commitment. All of these potential factors have been identified and discussed in a variety of settings, and most if not all probably play some role in the Great Lakes Basin to a greater or lesser extent. They form the basis for our conceptual framework, which we describe below.

Of these potential causes, the problem of limited local capacity is probably the least controversial. Many local governments charged with formulating and implementing land use planning and policy simply lack the basic financial, technical, and administrative resources to conduct site-specific studies, formulate master plans or detailed zoning ordinances, monitor land use and development activities, or collaborate with neighboring communities on regional planning efforts. Especially in places like Michigan where local government power is distributed among a great many rural townships, each of which represent very few individuals, the resource base available to these governments is severely limited. While clearly important, even so, some work on coastal hazards mitigation suggests that local capacity may be a necessary-but-not-sufficient factor; that is, local policy-making for sustainability cannot be achieved without adequate financial and administrative resources, but beyond some threshold the other factors become more important (see Berke and French 1994). The more complicated—and more interesting—factors are those relating to the knowledge and commitment of local officials.

With regard to local knowledge, a number of possible explanations exist. It could be that adequate or appropriate scientific knowledge is simply not available to local officials, or perhaps it is too complicated or simply too soon to expect information on sustainability and ecosystem management to have reached them. Another possibility is that there is too much information out there for local officials to sift through, forcing them to rely on simplistic and inappropriate heuristics. Or perhaps local officials collectively have a good understanding of ecosystem management principles in general (e.g., wetlands are “good” because they act as natural filters), but not of the actual ecosystem conditions within their own jurisdictions. Or perhaps they do not know how to

translate general statements of sustainability or ecosystem principles into practical performance standards or indicators for policy-making purposes.

Similarly, with regard to the issue of commitment, it could be that local officials are not committed to the adoption of sustainability principles because they do not recognize the need to do so (i.e., as a direct result of the lack of an adequate level of knowledge). Or they may recognize the importance of sustainability, but choose to place a higher value on other priorities (e.g., promoting economic growth for local revenue-generating purposes). Or they recognize sustainability as a long-term concern but feel compelled to address more pressing near-term concerns out of political necessity. Or they see the issue of sustainability and environmental protection generally as a problem to be handled by the state. Or they fear that by taking steps to promote sustainability they will become the “suckers” and lose out on important economic development opportunities to neighboring jurisdictions. Or, finally, they appreciate the need to incorporate sustainability principles into their policy-making but simply resist any new initiative that smacks of a mandate from above.

III. Conceptual Framework

Our approach to understanding Great Lakes coastal land use planning and policy-making processes, and to isolating the role of scientific knowledge in those processes, is to integrate the three factors identified above—capacity, knowledge, and commitment—into a broader theoretical framework based on a body of social scientific scholarship.¹⁹

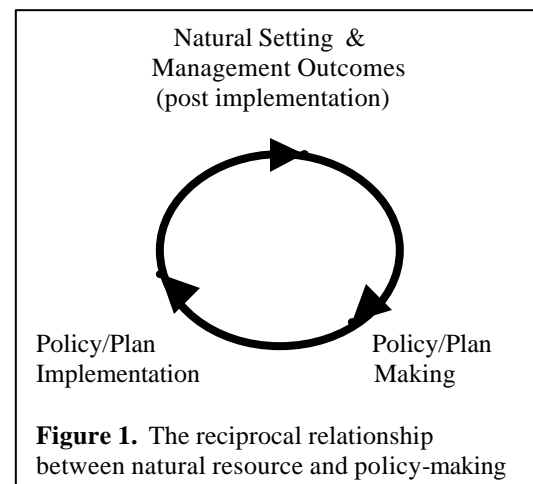
¹⁹ A diverse array of theoretical approaches has been proposed. Sabatier (1999:3-13), for example, describes a selection of such approaches including a “family” of frameworks extending from institutional rational choice theory (see, e.g., Ostrom 1983, 1986; Chubb and Moe 1990; Ostrom 1990; Ostrom, Schroeder, and Wynne 1993; Ostrom, Gardner, and Walker 1994; Scharpf 1997; Schneider and Ingram 1997), the “multiple-streams framework” as developed by Kingdon (1984), the “punctuated-equilibrium framework” as developed by Baumgartner and Jones (1993), the “policy diffusion framework” as developed by Berry and Berry (1990), and others. The most influential of these approaches until recently has arguably been the so-called “stages heuristic” or “textbook approach” (Nakamura 1987), which extended from Lasswell’s articulation of the concept of the “policy sciences” in the early 1950s (see Lasswell and Kaplan 1950; Lasswell 1951). This approach was developed more fully in the early 1970s through public policy texts such as those by Jones (1970) and Anderson (1975), and has been subsequently fine-tuned over time by others (see deLeon 1999; Brewer and deLeon 1983; Lester and Goggin 1998). The stages heuristic approach entails conceptualizing the policy-making process as a series of discrete phases, typically including agenda setting, policy formulation and legitimation, implementation, and evaluation stages, that move in a linear fashion from higher to lower levels of government.

Recently, researchers in political science and public administration have also focused some attention on the evaluation of policy and program *implementation*. Goggin and others (1990) have suggested that

This broader theoretical framework combines important elements of two distinct models of the policy process, the sustainable development framework and the advocacy coalition framework.

A. Sustainable Development Framework

The first approach develops a model of the policy-making and implementation process. Derived from recent work by planning and public administration scholars on local planning and policy-making for sustainable development (see, e.g., Burby and et al. 1993; May et al. 1996; Burby 1998), this approach identifies and evaluates the key inputs and outputs at any given stage of the process. In the context of coastal resources management, for example, the key relationships of concern are the reciprocal relationships between the natural resource systems and the social policy-making systems, as illustrated by Figure 1. Extant conditions in the environment—such as rising lake levels or the loss of near-shore cultural resources and wetlands to land development activities—serve as inputs into the policy-making process to the extent that local policy makers perceive them as problems and respond accordingly. Their responses—such as the enactment of land use regulations to require shoreline setbacks or wetland set-asides—represent the outputs of the policy-making process that serve in turn as inputs into the policy implementation process, in this case enforcement of the ordinances. The changed land use practices resulting from implementation of those policies, finally, represent outputs of the implementation process



intergovernmental program implementation scholarship is now in its “third generation.” They describe the “first generation” studies as having consisted primarily of detailed accounts of how an authoritative decision was carried out (citing Bardach 1977; Derthick 1970; Pressman and Wildavsky 1973). “Second generation” studies took a more “eclectic view of implementation” (Goggin 1986:328), acknowledging its inherent variability, stressing its political as well as its managerial dimensions, and adopting a comparative approach. The “third generation” work now under way attempts to extend second-generation work by making it more rigorous, specifying theoretically grounded conceptual models, and systematically testing hypotheses derived from them (Goggin et al. 1990).

that serve in turn as inputs into the resource system by yielding changed physical conditions, which in turn feed back into the policy-making process and perpetuate the cycle.

As presented here, the sustainable development framework focuses attention primarily on the mechanics of the policy-making process itself and the products generated by that process. Evaluating the relationship between scientific knowledge of the resource base and the use of that knowledge in the policy-making and implementation processes entails: characterizing the resource conditions for a given locality; evaluating the level of knowledge among relevant policy makers; and looking for evidence that knowledge of those conditions have been factored into the locality's plans and development management programs. With respect to the concepts of capacity, knowledge, and commitment, the emphasis is clearly on whether government actors have the scientific knowledge and the capacity to use it. While recognized as important, commitment issues are measured indirectly and given relatively less attention. Thus, any breakdowns in incorporating knowledge into policy are assessed primarily in terms of structural (or at least non-political) factors.²⁰

This approach suggests several principal hypotheses to be tested. The first is that both resource-management oriented planning requirements imposed by states on localities and higher levels of education, outreach, and technology transfer made available to localities will tend to yield higher quality local plans (i.e., in terms of the accuracy and rigor with which those plans incorporate scientific knowledge). The second is that higher quality plans, in turn, will tend to generate higher levels of commitment on the part of local officials for effective resource management (i.e., as a function of improved knowledge regarding the issues), which would in turn generate higher quality local development management programs (i.e., defined by Burby and others as employing a balanced mix of regulatory and information tools and not relying too heavily on the latter alone).

²⁰ That is, this analytical approach tends to lead one to focus on the problems of sustainability from an ecosystem management perspective and on corresponding sustainability principles and institutional modifications that might be made in response to those problems. Researchers employing this framework have acknowledged both the importance of the role played by local commitment to the implementation of sustainability initiatives and the lack of adequate attention it has yet received (see, e.g., Burby 1998:290).

B. Advocacy Coalition Framework

Policy-making and implementation studies based on the “stages heuristic” approach underlying the sustainable development framework have proven very useful for systematically framing the processes involved and the relationships between inputs and outcomes. This traditional approach to program implementation assessment, however, has recently come under rigorous attack for failing to fully specify causal relationships (specifically in terms of motivators of human behavior), oversimplifying the sequence of stages involved, adopting a “legalistic” top-down bias that sees policy development as always coming from above, and imposing a too-linear framework on processes that are in fact much more iterative, cyclical, and chaotic (see Sabatier 1999:3-17). Laying out this critique and responding to it, Sabatier and Jenkins-Smith (Sabatier and Jenkins-Smith 1999, 1993; Sabatier 1999) have argued for an alternative conceptual approach, labeled by them as the advocacy coalition framework. Recognizing the usefulness of the sustainable development framework but the disadvantages of employing it alone, we intend to evaluate local planning and policy-making in the Great Lakes Basin using both that framework and the advocacy coalition framework in a comparative and critical way.

The advocacy coalition framework views policy-making and implementation as a seamless rather than a staged process, by focusing on identifiable but unorganized belief associations of policy elites that participate in all or most stages of the policy process. Three aspects of the advocacy coalition framework are most relevant for purposes here. First, rather than conceiving of policy-making as an institutionally-oriented and staged process (i.e., moving from federal-level initiatives to state-level initiatives to mandates on local government), the advocacy coalition framework posits “policy subsystems” within which actors at all levels are involved in all aspects of the policy-making process—problem definition, policy formation, and implementation. A policy subsystem within the Great Lakes Basin, for example, might be the planning and policy-making system within the coastal region of a given state, viewed in its integrated entirety rather than segmented by level of government.

Second, rather than focusing primarily on the roles played by governmental officials functioning in their capacity as institutional actors (e.g., state regulators acting as overseers of local efforts, local planners acting as local planners), the advocacy coalition

framework incorporates the involvement of “policy elites” more broadly (including, for example, informed and active interest group lobbyists and activist citizens) and hypothesizes that they tend to align themselves first-and-foremost according to competing belief systems (and not necessarily by their institutional roles).²¹ For example, one group of policy elites—or advocacy coalition—might consist of federal, state, and local officials and active citizens who view people as motivated primarily by self-interest and material well-being while a competing coalition might consist of officials and citizens who believe that humans are motivated more in terms of social relationships and concerns regarding the environment *per se*.

Connecting these concepts of discernable policy subsystems and policy elites, a third attribute of the advocacy coalition framework is the way in which key variables are organized conceptually. Again, rather than conceiving of a more linear process that proceeds from resource setting through levels and stages of policy development and implementation, factors are characterized as “relatively stable” parameters (e.g., basic distributions of natural resources, constitutional structure, fundamental sociocultural values), “external events” (e.g., changes in resource conditions, changes in public opinion), factors that support and constrain subsystem actors (e.g., legal authority), and interactions between policy actors within the subsystem (see Sabatier and Jenkins-Smith 1993:224). Given this arrangement, policy-making and implementation evolves over extended periods of time in response to the worldviews of the dominant advocacy coalition and advances (or at least does not violate) the belief systems of that coalition.

Evaluating the relationship between our scientific knowledge of the resource base and the use of that knowledge in the policy-making and implementation processes using this framework again largely entails characterizing the resource conditions and then evaluating how much and in what ways knowledge of those conditions appear to have been factored into local plans and corresponding development management programs. Unlike the sustainable development framework, however, this approach entails characterizing policy elites’ collective knowledge of resource conditions as they *perceive and interpret them directly*, rather than measuring them implicitly through local plan

²¹ These competing belief systems consist in turn of the basic set of values to which a given group of policy elites subscribe, their causal assumptions about how the world works and why, and the ways in which they perceive and define the policy problems at hand (see Sabatier and Jenkins-Smith 1993:221).

content and quality. It also entails thinking about policy-making within the entire subsystem over time more so than the cross-sectional array of practices and outcomes across localities within that subsystem at a given point in time. Both of these attributes have implications with regard to research design and methodological approach, as discussed below.

Finally, given the emphasis of the advocacy coalition framework on the actors rather than policy process, the key hypotheses to be tested speak primarily to the underlying motivations of those actors, the ways in which those motivations affect their interpretations of the scientific knowledge they receive, and the ways in which those interpretations affect the policy decisions they make. In other words, it directly addresses the question of “commitment,” which is central to our integrated conceptual framework. In order to articulate specific hypotheses to be tested, we anticipate first adapting competing models of human behavior and motivation that have been developed specifically in the context of environmental resource management problems, including the institutional rational choice model as developed by Ostrom and others (see, e.g., Ostrom 1990; Ostrom, Gardner, and Walker 1994; Ostrom 1999) and the reasonable person model as developed by Kaplan, Kaplan, De Young and others (see, e.g., Kaplan and Kaplan 1989; Kaplan 2000; De Young 2000). This further specification will be one of our next research steps.

VI. Applications

Our conceptual framework, which combines elements of the environmental resource approach and the advocacy coalition approach, provides a way to assess the relative importance of scientific knowledge, local capacity, and local political commitment in explaining Great Lakes coastal land use policies and outcomes. Our longer-term research agenda involves generating specific hypotheses and testing these hypotheses with empirical data. We describe two coastal resource management issues below where there appears to be a significant disconnect between scientific knowledge and policy outcomes, and illustrate how our conceptual framework will guide future empirical work to explain this disconnect.

A. Lake Level Variation and Shoreline Management

An issue of great importance with regard to local planning and policy making in the Great Lakes Basin relates to property development at the shore-water interface. As land development continues apace along both Great Lakes shorelines and coastal shores throughout the nation, substantial investments in private property and public infrastructure are increasingly put in harm's way (see Godschalk, Brower, and Beatley 1989; Heinz Center 1990; Burby 1998). Local planning and land use control can play a vital role in mitigating the potential loss of property to shoreline movement. But to do so, local citizens and officials must first understand the nature of coastal processes and the dynamic changes in shoreline profiles likely to result over time from those processes. The key research questions to be addressed on this issue are how much local officials collectively know about these processes and how that knowledge affects both their commitment and actions toward sustainable coastal shoreline management. To lay the foundation for addressing those questions, this section briefly summarizes what we know about lake-level variation in the Great Lakes Basin and discusses the use of that knowledge for our proposed research agenda.

The Great Lakes Basin is subject to harsh and rapid weather and climate changes. Each year the lakes of the Great Lakes system undergo an intense thermal change, occurring in as short a time as three months, and equally rapid changes in its water balance brought about by evaporation – precipitation changes in the atmosphere overhead. These changes occur at many time scales, from seasonal to decadal, and result in significant impacts on the shoreline and on coastal communities. Fortunately, accurate and complete records of Great Lakes water levels have been recorded since before the Civil War. Water levels have been recorded since 1860 for Lakes Superior, Michigan – Huron, Erie and Ontario, and since 1898 for Lake St. Clair. A portion of the continuous record of lake levels for Lakes Michigan and Huron is presented in Figure 2, revealing many episodes of both high and low lake level periods.

Massive transports of water vapor in the atmosphere above the Great Lakes basin are directly responsible for Lake levels. Approximately 10 times more water is transported through the Great Lakes region in the atmosphere above the lakes than flows out of the Great Lakes system to the Atlantic Ocean. Hence, subtle changes in the amount

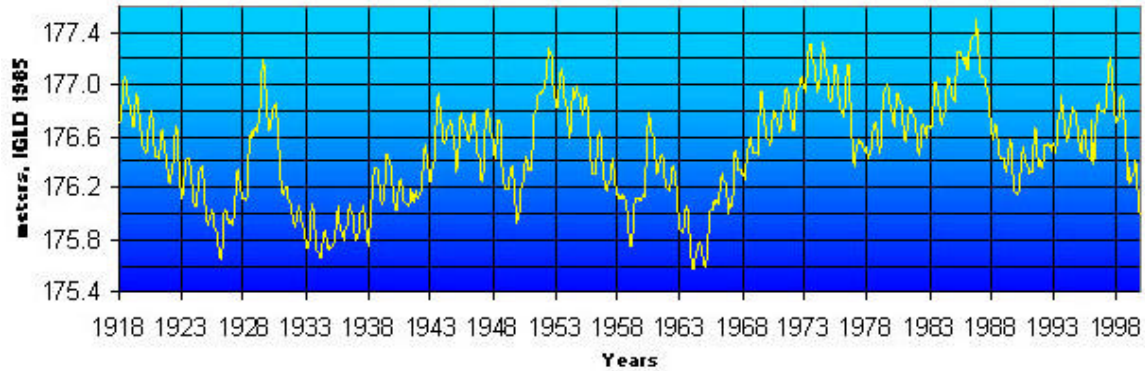


Figure 2. Lake Levels for Lakes Michigan and Huron Between 1918 and 1998.

of evaporation or precipitation from or to the watershed can result in drastic changes in lake levels. Conversely, man-induced changes such as diversions from the basin (Chicago River) or controllable outlets (Lake Superior locks at Sault St. Marie) produce only minor variations of lake levels.

As an example of atmospheric control of Great Lakes water levels, the latter half of the twentieth century can be characterized as a period of rising water levels on the Great Lakes, with record high levels in 1974 and 1986. Hence, unusually high water levels for a period of approximately 30 years were followed by a rapid and precious drop in those levels in 1998 and 1999. This same 30 year time period also corresponded to the most rapid period of shoreline development that the Great Lakes have ever seen.

It has also been observed that periods of high shoreline damage and property loss are reported concurrently with periods of high water levels (Angel 1995). Water levels of the Great Lakes are determined primarily by precipitation, evaporation, river flows, and groundwater flows, while wave energy is primarily a function of wind speed, wind duration, and fetch (the open water distance over which the wind can work on the water surface). Long-term climatologic studies (1956 – 1987) provided by the US Army Corps of Engineers (Hubertz, Driver, and Reinhard 1991) and historical lake-level studies by Meadows and others (1997) suggest that the intensity and frequency of storm activity control both water level and wave energy processes. Hence, over a period of several years, storms, which bring increased precipitation that eventually result in increased water levels, also bring increased winds and storm waves. It is interesting to note that

this work has also shown that periods of reported high shoreline damage and property loss correlate more directly to high wave energy than to peak water levels.

During periods of falling or low lake levels, a perceived safety factor is afforded to shoreline managers and property owners. During these periods the visible (above water) portion of the beach becomes wide as water recedes. The view from shore is that a wide, stable and protective beach now exists to shelter the shoreline and coastal dwellings from storm wave attack. In reality, however, the offshore portion of the beach continues to erode during low water level periods, with the offshore profile becoming steeper from the shoreline to deep water. As a result, when the natural cycle of high water returns, the steeper offshore profile allows larger waves to reach closer to shore, leading to rapid and severe shoreline adjustment during those recurring high water periods.

As part of an ongoing effort, the Detroit District Office of the U.S. Army Corps of Engineers has assessed the potential future damage to Great Lakes shorelines resulting from expected changes in Lake Michigan water levels for the next 50 years. The Lake Michigan Potential Damage Study (US ACE 1999) predicts that within this time period, Lake Michigan water levels could fall to as low as 175.09 meters below sea level (during a prolonged period of dry years) or rise as high as 177.87 meters above sea level (during a period of wet years). Fluctuating lake levels between the low value of this range (0.97 meters below the current chart datum) and the high water value (1.80 meters above chart datum) would produce shoreline change never before contemplated along the Great Lakes coasts.

In general, these physical processes are reasonably well understood as they apply to the Great Lakes basin as a whole. They are not, however, well understood or complete on the local, site-specific level. Moreover, these global processes are often masked (or enhanced) by local perturbations, which may take the form of changes in coastal geology, the nearby placement of a federal navigation structure, local dredging or deposition of bottom sediments, a string of private “shore protection” structures, and so on. The most important fact to recognize is that the Great Lakes shorelines will continue to *erode*. The Great Lakes are new features, geologically. They have been carved by the most recent glacial retreat with deep basins and steep sides. The natural process associated with

wind, waves and currents will continue to work to reduce these steep slopes by broadening the sides (coastal erosion) and filling in the deep basins. Even in the absence of human-induced influences, the basin-wide “background” shoreline erosion rate is thought to be between 1 and 2 feet per year, everywhere. This remorseless change in physical conditions—not amenable to engineered modification—is expected to result in the erosion of at least 50 to 100 feet of coastal shoreline property into the lakes during the next several decades (i.e., the expected lifetime of most dwellings), a rate of loss that can vary locally by a factor of 10 depending upon local conditions and lake water levels.

This brief description of the coastal processes affecting shoreline fluctuations lays the groundwork for assessing the link between our scientific knowledge of those processes and local planning and policy-making within the Basin. Tasks to be undertaken include first characterizing shoreline conditions for some number of study localities and then ascertaining how well local officials within those localities understand these processes generally and how well they understand their own local shoreline conditions specifically. We then need to assess the ways in which that knowledge has—or has not—been incorporated into local planning and policy-making decisions (using primarily the sustainable development framework), while ascertaining how that knowledge appears to be affecting the commitment of those officials to promoting sustainable shoreline management through their public policy-making efforts (using primarily the advocacy coalition framework).

B. Near-Shore Cultural Resources

A second issue of great relevance to local planning and policy-making in the Great Lakes Basin concerns the preservation of near-shore cultural resources. Cultural resources in the Great Lakes region constitute a diverse range of materials relating to the history and prehistory of the region and its inhabitants. They include such disparate things as lighthouses, prehistoric campsites, genealogical records, shipwrecks, and local ethnic festivals. While fluctuating lake levels implicate issues of public safety and property loss, as described above, they also implicate issues relating near-shore cultural resources as archaeological sites are exposed, shipwrecks become accessible, historic structures become threatened, and so on (discussed in more detail below). Rather than

asking how well local officials understand the physical processes involved, the key questions here become, first, whether they are aware of the presence of such resources within their community; second, whether they recognize the significance of those resources, the threats they face, and the institutional mechanisms that have been created to protect them; and finally, to what extent that knowledge has been incorporated into local planning and policy-making efforts.

Archaeological sites, whether terrestrial or lake bottom, are both pervasive and finite.²² Over the past ten thousand years of human occupation in the Great Lakes region, the shores of the Great Lakes, and the rivers and wetlands associated with them, were regularly occupied. Because the actual location of the lake shore has changed during this time, with cyclical high and low lake stands, these lakeshore sites may now be found beneath the present lakes (representing occupations associated with low lake levels, such as the Lake Stanley phase dating to 10,000 years before present) or at a distance inland from the present day shore (representing occupations from equivalent high lake stands, e.g., Lake Nipissing some 5,000 years ago) (Larson 1999). Even during the historic period, smaller scale changes in lake level and shore morphology have the effect of burying or exposing more recent cultural features including campsites, docks and shipwrecks (O'Shea 2002).

For any given area of the Great Lakes, our knowledge of archaeological sites stems primarily from the historical accident of site discovery. This relates to where previous scientific research or survey work has been conducted, but also to the nature of modern land use and population distribution. Many additional sites undoubtedly exist within the area but have not yet been located and identified. In general, information on the location of archaeological sites derives from three sources: academic research, state or federally mandated survey and mitigation, and chance finds reported by local citizens, avocational archaeologists, and sport divers. While information from the first two of these sources is rapidly accessible for planning and research purposes, the reporting of find spots by the general public is neither required nor automatic. Indeed, among some

²² From the perspective of public policy and sustainable development, each category of cultural resources has unique requirements and potential. Nevertheless, for the purposes of this discussion we focus on archaeological sites as representative of cultural resources. This includes prehistoric and historic era archaeological sites located on land as well as historic shipwrecks, which represent the special challenges posed by underwater cultural resources.

amateur archaeologists and divers, knowledge of sites is maintained with great secrecy. While this practice hinders research, its main harm is that the undisclosed resource does not enter into either the planning or resource protection process.

In Michigan, the Office of the State Archaeologist maintains a central registry of reported archaeological sites within the state. Up-to-date copies of this registry are maintained in the Museum of Anthropology of the University of Michigan and at Michigan State University. The information from the central site registry can be accessed for research and compliance efforts, and can similarly be requested by local governmental agencies, although the information is not released to the general public. Also in Michigan, a separate registry is maintained for bottomland sites.

Near-shore cultural resources, like any natural feature, are constantly threatened by a host of natural processes and land use activities. Natural processes such as surface erosion or lakeshore alteration have been occurring since time immemorial and are, in most cases, inevitable. Land use activities such as farming, sand and mineral quarrying, and coastal property development can also have devastating effects on cultural resources. Yet, the damage is largely inadvertent, and can often be mitigated through effective planning. Unlike most other natural features, however, archaeological sites are also a target for looting and theft, on both land and the lake bottom. As such, efforts to develop and publicize archaeological sites for public education and sustainable community development can also have the perverse effect of directly endangering the resource.

The value we place collectively on our cultural heritage and the vulnerability of our cultural resources to inadvertent or intentional disturbance has prompted a variety of laws and programs at the federal and state level to foster their identification and protection, such as the National Historic Preservation Act of 1966²³ and the National Register of Historic Places.²⁴ In effect, the focus of these laws is to determine whether cultural resource sites that might be adversely affected by land development activities are *significant*. Significance, in this sense, relates both to the quality of prehistoric materials present at the site and their state of preservation, as well as the importance of the particular site with regard to scientific research and public education.

²³ Public Law 89-665; 16 USC 470 et seq.

²⁴ Title 36 CFR 60.

These various federal and state protection efforts comprise a complex institutional setting. Michigan's combined set of cultural resource protection programs, for example, includes the federal programs noted above as administered at the state level by the State Historic Preservation Officer (located in the Michigan Department of History, Arts, and Libraries), federal and state underwater preserves, state law protecting prehistoric and historic artifacts and antiquities (including shipwrecks),²⁵ exemptions under the state's Freedom of Information Act regarding disclosure of vulnerable archaeological sites (to discourage looting), and a patchwork and civil and criminal enforcement efforts at both the state and federal level for property theft and site disruption (with enforcement at the state level provided primarily by conservation officers of the Department of Natural Resources (DNR) and supported by local law enforcement officers and the State Police).

This brief description of the cultural resources present in near-shore locations within the Great Lakes Basin, the threats they face, and the institutional efforts that have been put into place to protect them lays the groundwork for assessing the link between our knowledge of those resources and local planning and policy-making within the Basin. As with issue of lake level and shoreline fluctuations as described above, tasks to be undertaken include first characterizing near-shore cultural resource conditions for some number of study localities and then ascertaining whether local officials within those localities know of those resources and recognize their significance. We then need to assess the ways in which that knowledge has—or has not—been incorporated into local planning and policy-making decisions (using primarily the sustainable development framework), while ascertaining how that knowledge appears to be affecting the commitment of those officials to promoting sustainable cultural resource management through their public policy-making efforts (using primarily the advocacy coalition framework).

V. Next Steps

In this paper we first discussed the current widespread emphasis on sustainable development globally and within the Great Lakes Basin, focusing in particular on the important role to be played by local governments in achieving sustainability and the

²⁵ See Part 761 of the MI Natural Resources and Environmental Protection Act (MCL § 324.76101 et seq.).

limited extent to which they have taken on that challenge to date. We then articulated a conceptual framework for assessing the role of scientific knowledge about natural resource systems on local land use planning and policy-making. We also offered two brief examples to illustrate the potential application that framework to current Great Lakes coastal resource management problems. In this section we briefly discuss potential next steps in the near term for advancing such a research agenda.

For the purposes of this paper, we focused on two resource management issues especially relevant to local planning and policy-making in the Great Lakes Basin—shoreline property management and near-shore cultural resources management. An additional topic of equal importance that should be addressed as well relates to the management of near-shore wildlife habitat and wetlands. Accordingly, one next step we need take is to incorporate this aspect of local planning and policy-making as an additional application to test our proposed approach for explaining the role played by scientific knowledge in those processes. Similarly, although we presented an overview of our proposed conceptual framework and stated some initial hypotheses to be tested, that discussion was necessarily limited. A second additional step we need take is to more fully explicate that conceptual framework and more fully articulate hypotheses to be tested.²⁶

Having taken those steps, the research agenda we envision reflects the multiple perspectives provided by our alternative conceptual approaches. The sustainable development framework approach lends itself to a cross-sectional analysis of a larger number of localities and the use of statistical analytical methods. This work would draw primarily on assessments of local plans and other documentary evidence of local policy-making, census data and other archival information, and possibly surveys of local officials. The advocacy coalition framework approach, in contrast, lends itself to more in-depth, qualitative assessments of a smaller number of selected study localities (i.e., extrapolating from those sites and state-level program efforts to characterize the policy

²⁶ These two next steps speak directly to additional conceptual work required for the study of local planning and policy-making processes in the Great Lakes Basin. Although not discussed here, we also anticipate addressing other aspects of sustainable development relevant in coastal settings, most notably the topic of ecotourism. Finally, while having focused primarily on local governmental decision-making for the reasons discussed in section II above, we anticipate ultimately expanding our attention back out to encompass more directly the roles played both by citizens and by the state and federal governments.

subsystem within a single Great Lakes state). This work would also draw from an assessment of local plans and other documentary evidence, but would incorporate extensive surveys and interviews of local officials designed to more fully characterize the worldviews and concerns motivating their behavior. Although challenging logistically, it should be possible to conduct both of these efforts in a concurrent fashion.

In order to undertake either of these efforts, it will be necessary first to characterize the resource setting of the study localities in some depth, as described above with regard to shoreline fluctuations and near-shore cultural resources. It will also be necessary to devise protocols for assessing the evident use of the knowledge in local plans and policies and to devise survey instruments to assess the extent and character of local officials' collective knowledge on those topics. Finally, we will need to work collaboratively to collect and analyze the data from these various sources and interpret our findings.

References Cited

- Anderson, James. 1975. *Public Policy-Making*. New York, NY: Praeger.
- Angel, J.R. 1995. Large-Scale Storm Damage on the U.S. Shores of the Great Lakes. *Journal of Great Lakes Research* 21 (3):287-293.
- Bardach, Eugene. 1977. *The Implementation Game: What Happens After a Bill Becomes a Law?* Cambridge, MA: MIT Press.
- Baumgartner, Frank, and Bryan Jones. 1993. *Agendas and Instability in American Politics*. Chicago, IL: University of Chicago Press.
- Beach, Dana. 2002. *Coastal Sprawl: The Effects of Urban Design on Aquatic Ecosystems in the United States*. Arlington, VA: Pew Oceans Commission.
- Beatley, Timothy, David J. Brower, and Anna K. Schwab. 2002. *An Introduction to Coastal Zone Management*. 2nd ed. Washington, DC: Island Press.
- Berke, Philip R. 2002. Does Sustainable Development Offer a New Direction for Planning? Challenges for the Twenty-First Century. *Journal of Planning Literature* 17 (1):21-36.
- Berke, Philip R., and Steven P. French. 1994. The Influence of State Planning Mandates on Local Plan Quality. *Journal of Planning Education and Research* 13:237-250.
- Berke, Philip R., and Maria Manta Conroy. 2000. Are We Planning for Sustainable Development? An Evaluation of 30 Comprehensive Plans. *Journal of the American Planning Association* 66 (1):21-32.
- Berry, Frances Stokes, and William Berry. 1990. State Lottery Adoptions as Policy Innovations: An Event History Analysis. *American Political Science Review* 84 (June):397-415.
- Brewer, Gary, and Peter deLeon. 1983. *The Foundations of Policy Analysis*. Monterey, CA: Brooks/Cole.

- Burby, Raymond J. 1998. Policies for Sustainable Land Use. In *Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities*, edited by R. J. Burby. Washington, DC: Joseph Henry Press.
- , ed. 1998. *Cooperating With Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities*. Washington, DC: Joseph Henry Press.
- Burby, Raymond J., and et al. 1993. Is State-Mandated Planning Effective? *Land Use Law and Zoning Digest* 45 (10):3-9.
- Burby, Raymond J., and Peter J. May. 1997. *Making Governments Plan: State Experiments in Managing Land Use*. Baltimore, MD: Johns Hopkins University Press.
- Campbell, Scott. 1996. Green Cities, Growing Cities, Just Cities? Urban Planning and the Contradictions of Sustainable Development. *Journal of the American Planning Association* 62 (3):296-312.
- Chubb, John, and Terry Moe. 1990. *Politics, Markets, and America's Schools*. Washington, DC: Brookings Institution.
- CRC. 1999. A Bird's Eye View of Michigan Local Government at the End of the Twentieth Century. Livonia, MI: Citizens Research Council of Michigan.
- De Young, Raymond. 2000. Expanding and Evaluating Motives for Environmentally Responsible Behavior. *Journal of Social Issues* 56 (3):509-526.
- deLeon, Peter. 1999. The Stages Approach to the Policy Process: What Has It Done? Where Is It Going? In *Theories of the Policy Process*, edited by P. A. Sabatier. Boulder, CO: Westview Press.
- Derthick, Martha. 1970. Defeat at Fort Lincoln. *The Public Interest* 20:3-39.
- GLC. June 2001. Linking Brownfields Redevelopment and Greenfields Protection for Sustainable Development. Ann Arbor, MI: Great Lakes Commission.
- . March 2002. The Great Lakes Program to Ensure Environmental and Economic Prosperity: Great Lakes Commission Priorities to "Restore the Greatness". Ann Arbor, MI: Great Lakes Commission.
- GLCTF. 2002. The Citizens' Agenda: An Action Plan to Protect the Great Lakes. Lansing, MI: Great Lakes Conservation Task Force, Michigan State Senate.
- Godschalk, David R., David J. Brower, and Timothy Beatley. 1989. *Catastrophic Coastal Storms: Hazard Mitigation and Development Management*. Durham, NC: Duke University Press.
- Goggin, Malcolm L. 1986. The "Too Few Cases/Too Many Variables" Problem in Implementation Research. *Western Political Quarterly* 38:328-347.
- Goggin, Malcolm L., Ann Bowman, James P. Lester, and Laurence J. O'Toole, Jr. 1990. *Implementation Theory and Practice: Toward a Third Generation*. Glenview, IL: Scott, Foresman/Little, Brown Higher Education.
- Harris, Jonathan M., ed. 2000. *Rethinking Sustainability: Power, Knowledge, Institutions*. Ann Arbor, MI: University of Michigan Press.
- Hart, Maureen. 1999. *Guide to Sustainable Community Indicators*. North Andover, MA: Hart Environmental Data.
- Heinz Center. 1990. Evaluation of Erosion Hazards. Washington, DC: Report Prepared for the Federal Emergency Management Agency.

- Hubertz, J.M., D.B. Driver, and R.D. Reinhard. 1991. Hindcast Wave Information for the Great Lakes: Lake Michigan (Wave Information Study Report 24). Detroit, MI: US Army Corps of Engineers.
- Johnson, Denny, Patricia E. Salkin, Jason Jordan, and Karen Finucan. 2002. Planning for Smart Growth: 2002 State of the States. Washington, DC: American Planning Association.
- Jones, Charles. 1970. *An Introduction to the Study of Public Policy*. Belmont, CA: Wadsworth.
- Kaplan, Stephen. 2000. Human Nature and Environmentally Responsible Behavior. *Journal of Social Issues* 56 (3):491-508.
- Kaplan, Stephen, and Rachel Kaplan. 1989. The Visual Environment: Public Participation in Design and Planning. *Journal of Social Issues* 45 (1):59-86.
- Kingdon, John. 1984. *Agendas, Alternatives, and Public Policies*. Boston, MA: Little, Brown.
- Klepinger, Michael R. July 2002. Status of Planning and Zoning in Michigan's Great Lakes Shoreline Communities (Draft Report). Lansing, MI: MI Sea Grant Program.
- Larson, C.E. 1999. A Century of Great Lakes Levels Research: Finished or Just Beginning? In *Bulletin (Cranbrook Institute of Science)*, edited by J. R. Halsey. Bloomfield Hills, MI: Cranbrook Institute of Science).
- Lasswell, Harold D. 1951. The Policy Orientation. In *The Policy Sciences*, edited by D. Lerner and H. D. Lasswell. Palo Alto, CA: Stanford University Press.
- Lasswell, Harold D., and Abraham Kaplan. 1950. *Power and Society*. New Haven, CT: Yale University Press.
- Lester, James, and Malcolm Goggin. 1998. Back to the Future: The Rediscovery of Implementation Studies. *Policy Currents* 8 (3):1-10.
- May, Peter J., Raymond J. Burby, Neil J. Ericksen, John W. Handmer, Jennifer E. Dixon, Sara Michaels, and D. Ingle Smith. 1996. *Environmental Management and Governance: Intergovernmental Approaches to Hazards and Sustainability*. New York, NY: Routledge.
- Mazmanian, Daniel A., and Michael E. Kraft. 1999. The Three Epochs of the Environmental Movement. In *Toward Sustainable Communities: Transition and Transformations in Environmental Policy*, edited by D. A. Mazmanian and M. E. Kraft. Cambridge, MA: MIT Press.
- , eds. 1999. *Toward Sustainable Communities: Transition and Transformations in Environmental Policy*. Cambridge, MA: MIT Press.
- Meadows, Guy A., Lorelle A. Meadows, William L. Wood, J.M. Hubertz, and Perlin M. 1997. The Relationship Between Great Lakes Water Levels, Wave Energies, and Shoreline Damage. *Bulletin of the American Meteorological Society* 78 (4):675-683.
- Michigan Sea Grant. 1999. Strategic Plan 2000-2005. Ann Arbor, MI: Michigan Sea Grant College Program.
- MML, and MAMA. 2002. *Local Government Law and Practice in Michigan (2 Volumes)*. Ann Arbor, MI: Michigan Municipal League and the Michigan Association of Municipal Attorneys.

- Nakamura, Robert. 1987. The Textbook Process and Implementation Research. *Policy Studies Review* 1:142-154.
- O'Shea, John M. 2002. Mapping Lake Huron's Au Sable Shoreline and Near Shore Shipwrecks. Lansing, MI: Michigan Department of Environmental Quality.
- Ostrom, Elinor. 1983. A Public Service Industry Approach to the Study of Local Government Structure and Reform. *Policy and Politics* 11:313-341.
- . 1986. An Agenda for the Study of Institutions. *Public Choice* 48:3-25.
- . 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, UK: Cambridge University Press.
- . 1999. Institutional Rational Choice: An Assessment of the Institutional Analysis and Development Framework. In *Theories of the Policy Process*, edited by P. A. Sabatier. Boulder, CO: Westview Press.
- Ostrom, Elinor, Roy Gardner, and James Walker. 1994. *Rules, Games, and Common-Pool Resources*. Ann Arbor, MI: University of Michigan Press.
- Ostrom, Elinor, Larry Schroeder, and Susan Wynne. 1993. *Institutional Incentives and Sustainable Development*. Boulder, CO: Westview Press.
- Pressman, Jeffrey L., and Aaron Wildavsky. 1973. *Implementation*. Berkeley, CA: University of California Press.
- Rabe, Barry G. 1999. Sustainability in a Regional Context: The Case of the Great Lakes Basin. In *Toward Sustainable Communities: Transition and Transformation in Environmental Policy*, edited by D. A. Mazmanian and M. E. Kraft. Cambridge, MA: MIT Press.
- Roseland, Mark. 1998. *Toward Sustainable Communities: Resources for Citizens and Their Governments*. Updated and Revised ed. Gabriola Island, BC: New Society Publishers.
- Sabatier, Paul A., ed. 1999. *Theories of the Policy Process*. Boulder, CO: Westview Press.
- Sabatier, Paul A., and Hank C. Jenkins-Smith. 1999. The Advocacy Coalition Framework: An Assessment. In *Theories of the Policy Process*, edited by P. A. Sabatier. Boulder, CO: Westview Press.
- , eds. 1993. *Policy Change and Learning: An Advocacy Coalition Approach*. Boulder, CO: Westview Press.
- Scharpf, Fritz. 1997. *Games Policy Actors Play*. Boulder, CO: Westview Press.
- Schneider, Anne Larason, and Helen Ingram. 1997. *Policy Design for Democracy*. Lawrence, KS: University Press of Kansas.
- Smyth, Paul. 1995. *Patterns on the Land: Our Choice - Our Future*. Rochester, MI: Michigan Society of Planning Officials.
- US ACE. 1999. The Lake Michigan Potential Damage Study: Progress Report on Activities 1996 - 1998. Detroit, MI: US Army Corps of Engineers, Detroit District.
- Wheeler, Stephen M. 2001. Planning for Metropolitan Sustainability. *Journal of Planning Education and Research* 20 (2):133-145.
- World Commission on Environment and Development. 1987. *Our Common Future*. Oxford, UK: Oxford University Press.