Planning for Resilient Waterfront Communities

The protection and management of coastal and waterfront natural resources are key elements of building community resiliency. The Department of Environmental Quality (DEQ) Michigan Coastal Zone Management Program and MAP share a commitment to educate Michigan coastal and waterfront communities about the impacts of extreme weather events and trends and provide the training and financial resources to integrate solutions into local master plans.

MAP and DEQ have partnered in recent years to develop and share best practices for planning for coastal and waterfront communities. DEQ once again has provided financial assistance to MAP to help municipalities integrate best practices for coastal management into local planning efforts. Over the past year, MAP developed and conducted waterfront planning workshops across the state, and in 2016 will re-grant funds to eligible communities that focus master planning efforts on community resilience. Creating a Waterfront Plan as part of the master plan can increase your community's capacity to anticipate, prepare for, and avoid or mitigate the impacts of severe weather events and trends that result in hazards to property and public health and safety.

This issue of the Michigan Planner is provides practical information about how to create a waterfront plan; increases understanding about recent climate finding; showcases innovative projects in other Michigan communities, and introduces a new tool to evaluate the fiscal impact of allowing development in high-risk areas. For even more comprehensive information about waterfront planning, visit www.michigancoastalcommunities.com.

How to Create and Implement a Waterfront Plan

Michigan is a state rich in lakes and rivers and home to the longest freshwater coastline in the world. The list of communities that do not have some sort of waterfront is much shorter than the list of communities that do.

> Resilient: Able to become strong, healthy, or successful again after something bad happens.
>
> Source: Merriam-Webster

But in many community master plans and zoning ordinances, waterfronts are neglected or ignored, with designations and regulations that treat them the same as inland property. Without planning tailored for waterfronts, communities are missing out on the economic, social, environmental, and quality of life benefits that water provides.

The solution is to create a Waterfront Plan – a planning document specifically created to articulate a vision for the waterfront and surrounding areas, including a comprehensive list of actions designed to enhance and preserve the waterfront for future generations. The Waterfront Plan can and should be adopted as part of the community's master plan – for instance as a sub-area or district plan – to give it the full authority that is fundamental to that designation.

Crafting a Waterfront Plan is a four-step process. First, a community must understand the existing natural, economic, legal and social dynamics of its waterfront. Then, it must engage its citizens and stakeholders to develop a widely agreed-upon vision for the future. Once that vision is established, community leaders must put it into words so it can be referenced and implemented in future years. And finally, the community must develop a comprehensive and detailed

action plan, including tasks, responsibilities, financing mechanisms, and priorities to guide the day-to-day implementation of the vision.

Step 1: Know Your Waterfront

A waterfront plan should include a detailed analysis of the existing natural, economic, legal, and social conditions along the waterfront.

Natural Dynamics

The natural dynamics of a waterfront include the ecosystem, water level fluctuation, erosion and accretion, shoreline, floodplain, wetlands, and other natural elements. These need to be understood, because they impact any activity that takes place along the shore, and careless shoreline development can alter the dynamics with negative consequences.

Prudently managing the uses of shorelines that are subject to erosion, flooding, and other extreme weather impacts promotes the health, safety, and welfare of the community's residents and is a compelling reason to carefully study and plan for the natural dynamics of a shoreline. There are more everyday reasons as well – the way people experience a waterfront is shaped by the natural dynamics more than any other feature.

The Great Lakes, inland lakes, and rivers all have different natural dynamics. In the case of the Great Lakes,, the water levels of each fluctuate based on seasonal patterns of precipitation and evaporation, among other factors. The water elevations can also fluctuate over years or decades in response to long-term climate patterns. High winds on the Great Lakes can cause large waves and flooding, and beach widths can often become altered after one storm. In good weather, some Great Lakes shorelines remain susceptible to erosion while others, such as those sheltered by coastal wetlands, may accrete beach material and expand. Additionally, certain types of shoreline infrastructure, such as seawalls and hard shoreline armoring, may increase erosion on adjacent stretches of the shore. Shoreline erosion poses a threat to property and public safety.

Michigan Waterfront Planning and Resilience Website

MAP, with funding from the DEQ Coastal Zone Management Program, recently introduced an online information portal for coastal planning and community resilience. The website, at **www.michigancoastalcommunities.com**, includes background data and links to programs and resources from around Michigan that are unique to waterfront planning:

Master Planning Resources

- Who Owns the Water?
- Natural Shoreline Dynamics
- Climate Variability
- Case Studies

Tools for Communities

- Overlay zones
- Vegetated buffers
- Environmental assessment requirements
- Fees for professional reviews
- Sensitive area protections
- Shoreline protection provisions
- Planned Unit Developments
- Site plan review
- Coordinated permit review and approval procedures
- Land division and subdivision ordinances
- Capital improvement plans
- Fiscal Impact Analysis
- Green Infrastructure

State Mapping and Regulatory Resources

Inland lakes typically have more stable water levels, but are more susceptible to water quality deterioration from shoreline development than the Great Lakes due to their smaller size. Runoff from lawns and parking lots can carry sediment, fertilizer, and other substances into the water and effluent from poorly-sited or unmaintained septic systems can seep into groundwater that feeds the lake. Increased nutrient levels in the water cause an overgrowth of aquatic plants and alter the natural ecosystems in these lakes. In worst-case scenarios, the excessive growth of plants and algae can significantly degrade water quality when the plant material dies and decomposes, harming fish and other aquatic life.

The natural dynamics of rivers provide unique challenges and opportunities. One of the main issues for riverside communities seeking to avoid or minimize impacts from severe weather events is managing land use in areas subject to flooding. During a flood, the river channel and adjacent floodplain provide the major conduit for transporting flood waters downstream and away from the community. Local wetlands have a role in flood mitigation by storing flood water and releasing it gradually. Consequently, buildings and other types of development in the floodplain are not only at risk of flood damage, they also interfere with the transport of flood waters and can worsen flooding in other areas of the community. Construction and fill in wetlands may also increase flood impacts by reducing local flood water storage capacity.

Erosion and sedimentation present additional challenges for riverside communities, for example, where the river is used for recreational or commercial navigation. Sediment entering the river through streambank erosion or in runoff from exposed soils, such as at construction sites or farm fields, can accumulate and change the profile of the riverbed. The shoals and shallow areas that result from the sedimentation can obstruct navigation and require costly dredging projects to correct. Communities that adopt vegetated riparian buffer, or “greenbelt” requirements, or take other steps to keep sediments out of the river may avoid or reduce such impacts to the local economy.

Products from this analysis include inventories and maps of wetlands, inland lakes and streams and their 100-year floodplains and the location of steep slopes, sand dunes, sensitive habitats, important forest land and agricultural land. Assistance in collecting and mapping this data may be available through county or regional planning agencies and state agencies (see State Mapping and Regulatory Resources).

Economic Dynamics

A community’s resiliency to the impacts of extreme weather events depends in large part on how the community manages land use around its water resources. Who is using the waterfront – and how? Which businesses rely on the water for their success? How does the waterfront impact the economy of the inland portions of the community? One

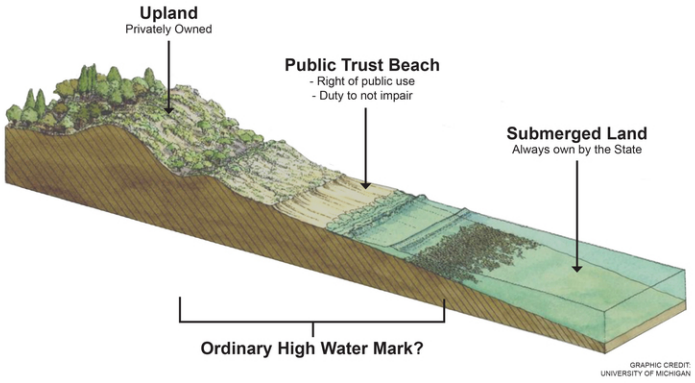
concise and understandable way to organize the answers to these questions is to take a traditional, basic component of a master plan – the Existing Land Use Map – and expand its role to incorporate detail about waterfront uses .

Existing land use maps are a crucial part of any planning process, because they show the current development pattern and are a starting point for the community's vision. But a waterfront existing land use map and text should go far beyond the traditional categories of residential and commercial to include the physical characteristics of development along the waterfront, including setbacks, permeable surface, shoreline treatment, and vegetation, much of which can be captured using aerial photographs.

One way to demonstrate the important information in the Existing Land Use is to display the information graphically, rather than with text and a land use designation map. A graphic format that uses a combination of aerial and street view photographs can effectively communicate the combined characteristics of a the land uses, site designs, shoreline treatments, vegetation, transportation infrastructure, and utilities. Because pictures say 1,000 words, plenty of images should be used to demonstrate each category.

Legal Dynamics

The development pattern and other economic dynamics of a waterfront are beholden to the legal framework that addresses philosophical-sounding questions like "who owns the water?" "where is the water's edge?" and "what can be done with land that used to be under water, but isn't anymore?" The answers are different for different types of water bodies.



The water in the Great Lakes and Lake St. Clair is owned by the general public according to the Public Trust Doctrine. The Public Trust Doctrine is a legal theory that is applied across the Great Lakes, in both Canada and the United States. It was affirmed in the 2008 Great Lakes Compact, an agreement between seven states, two Canadian provinces, and the U.S. and Canadian federal governments to protect the lakes for the enjoyment of the public.

This Public Trust Doctrine allows for the public use of water and submerged land regardless of neighboring private property ownership, because the water and submerged land are held in the public trust. The neighboring property owners do not own the water or the land under the water. However, they do have unrestricted access to the water, a concept known as "littoral rights." This allows for property owners on the Great Lakes and Lake St. Clair to construct structures that anchor to the submerged land (like docks) with a State permit.

The boundary line between the public trust land and water and the "upland" that can be privately owned is the ordinary high water mark (OHWM). The ordinary high water mark has two definitions – one under State law that applies for regulatory purposes (and can be used for zoning) and one under a Michigan State Supreme Court ruling that applies for liability purposes.

The "Elevation" standard for the ordinary high water mark is used for regulatory purposes. It is defined as an elevation above sea level, and is constant for each Great Lake and Lake St. Clair, regardless of the physical realities of the shoreline. Communities with Great Lakes or Lake St. Clair shoreline should determine through surveys where the elevation-based OHWM hits the beach in their community, and, if appropriate, include the line on their existing land use map.

The "Natural" standard for the ordinary high water mark was defined by the State Supreme Court Case *Glass v. Goeckel (2005)*. For the purposes of liability, trespassing, and other civil legal functions, the OHWM is defined by "evidence of the

presence of water." The simplest way to determine where water has been recently is vegetation. Recently submerged areas will have no vegetation, so the vegetation line frequently approximates the ordinary high water mark (see diagram).

Within naturally occurring inland lakes and rivers, including the St. Marys, St. Clair, and Detroit Rivers, the water is also held in the public trust – but the land underneath the water is not. Property owners on those water bodies have an ownership stake in the land under the water and can build docks or other structures anchored to the "bottomland" with a State permit. This concept is known as "riparian rights," and these rights extend to the center of the body of water. Riparian rights entitle owners to build structures, and ensure that if lake levels recede, lakefront owners will still own all of the land to the water's edge.

Man-made lakes present a more complex situation. Within human-created water bodies such as impoundments or former quarries, riparian rights apply differently, and legal research may be necessary to identify which property owners have riparian rights on artificially created or modified water bodies.

For many major rivers and lakes, the Federal Emergency Management Agency (FEMA) has developed maps of areas projected to have a 1% chance of flooding in any given year, commonly referred to as the "100 Year Floodplain." The Michigan Building Code contains regulations that limit construction in a floodplain, and state regulations prohibit residential use in the "floodway," the stream or river channel that passes the base flood. Because of the increased risk of property loss, virtually all lending institutions require building owners in mapped areas to purchase flood insurance as a condition of securing a mortgage. FEMA administers the National Flood Insurance Program, which provides lower flood insurance rates to communities that adopt and enforce zoning and floodplain management regulations in an effort to reduce the risk of loss to private and public structures.

MAP, with funding from the Michigan Department of Environmental Quality's Coastal Zone Management Program, produced a resource manual and take-home training on specific tools, resources, and implementation strategies to protect Michigan's natural and environmental treasures. The publication is a full color resource with appendices on CD. The take-home training is 2.5 hours long, and is available on DVD.

Mark Wyckoff, FAICP, Professor and Director, Planning & Zoning Center at MSU, Senior Associate Director, Land Policy Institute, developed the training and updated the content.

For a free copy, contact the DEQ Office of the Great Lakes at 517-284-5052. The full document is available at www.michigancoastalcommunities.com.

Additional detail regarding environmental protection regulations may be found in Filling the Gaps: Environmental Protection Options for Local Governments, available at no charge through the Michigan Department of Environmental Quality (see sidebar article).

Social Dynamics

After developing an understanding of the natural, economic, and legal dynamics of the waterfront, planners must analyze how all of those facets impact the community's residents and visitors– do they have access to the water? If so, where? What community members are most likely to be impacted by flooding or erosion?

A vulnerability assessment can determine which areas and residents of the community are most likely to be impacted by extreme weather events. The assessment compares two metrics – exposure and sensitivity. Exposure relates to the presence of people, houses, infrastructure, businesses, and community assets in areas that are likely to experience severe weather impacts. For instance, developments in floodplains are more exposed to the danger and damage of flooding than those built on higher ground. Sensitivity is a measure of the at-risk population in the affected area.

Great Lakes Case Studies

City of Grand Haven - Grand Haven used an innovative planning tool, fiscal impact analysis, in their 2015 Resilient Grand Haven Master Plan. The analysis weighed the costs and benefits of building in places with a greater risk of flooding and erosion. It included three scenarios for erosion and flooding, three scenarios for building and development, and a comparison among all scenarios to estimate the fiscal responsibility of different types of development. Based on the analysis, the plan included recommendations for safeguarding public health, enhancing emergency management capabilities of the community, and protecting the public infrastructure from future threats like increased precipitation and flooding. See www.resilientmichigan.org/grand_haven.asp.

Resilient Monroe (City of Monroe, Monroe Charter Township, Frenchtown Charter Township) - The Resilient Monroe planning process was a collaboration between the City of Monroe, Monroe Charter Township, and Frenchtown Charter Township. The three communities, which share water resources such as Lake Erie and the River Raisin, joined together to create a multi-jurisdictional plan. The plan included vulnerability assessments to identify how changing water (I don't know what the appropriate term is since I haven't read the document, but I suspect there is a better term than "ecosystems") and other future environmental trends would impact different segments of the population, and how the communities could respond. The action plan placed emphasis on water preservation, low-impact developments, and connecting natural resource protection to placemaking and economic development in all three communities. See www.resilientmonroe.org.

City of Marquette - The City of Marquette created a plan for relocating segments of Lakeshore Boulevard near the mouth of the Dead River to restore the natural dynamics of the shoreline. The City plans to execute a "managed retreat" away from the shoreline and to build a natural buffer to help prevent erosion. Plans for the reconstructed roadway include building a dune and swale complex, which contains sand dunes and wetlands planted with native grass and plants along the length of a road that helps prevent erosion. The reconstructed road area will also include a bike path. See www.mqtcty.org.

Seniors, children, people who live alone, people with restricted incomes or lack of housing, and people who work outside are among the many groups that are often more likely to be impacted by a severe weather event. For example, people who live in areas where "heat islands" develop and lack air conditioning are particularly susceptible to the harmful effects of high temperatures. By determining which high exposure areas are also home to sensitive populations, communities can see where they are most vulnerable to severe weather and can take steps to mitigate potential problems.

As discussed above, waters of the Great Lakes, rivers, and inland lakes are public trust resources, and providing the public with access to the water at sites along the community's waterfront supports tourism and recreation, benefitting the local economy and quality of life. The waterfront plan should inventory public access sites along the community's waterfront, in order to determine if more are needed. The community must also determine whether the access point offers merely a waterfront experience (i.e. a pathway or overlook) or if it allows full access to the water for fishing, swimming, boating, etc. Where the shoreline is prone to erosion or flooding that is likely to jeopardize development, passive recreation and parks may prove to be the most strategic use of the land for the community.

Step 2: Develop a Vision

Once the community has developed a deep understanding of the dynamics of its waterfront, the next step is to develop a vision for the waterfront's future. Any master planning process should reflect a consensus of the community for its desired future, and waterfront plans are no exception. To develop this vision, community leaders must engage as many residents, with as many perspectives, as possible through a variety of visioning techniques.

Community Forums

A public forum, where interested community members are invited to a structured brainstorming meeting, is one way to seek out points of view. Successful forums are scheduled well in advance to ensure people can put the event on their schedule. Food should be provided, as well as child care, if possible, especially if the event is in the evening. There are many choices for activities, including collaborative mapping or SWOT analysis (Strengths-Weaknesses-Opportunities-Threats). Visual preference surveys, where participants react to images of various land use alternatives, can also be valuable activities.

For an option with more flexibility, an open house format allows participants to come for as much or as little time as they want. Activities can be similar to a typical community forum, but should be modified to allow participants to give input without supervision. Examples include putting Post-It notes on a SWOT analysis chart or map, marking up a blank map of the waterfront, putting toy money in

a jar to represent potential capital improvements, and participating in a visual preference survey that plays on a loop.

Focus Groups

Although all community members should have the opportunity to participate in a visioning effort, it is important to seek out focused perspectives or interests. By engaging stakeholders that represent specific community interests, not only can the community benefit from their ideas, but the discussions they have can be fruitful in other ways.

Grouping stakeholders into particular focus groups is a difficult but important task. Focus groups should be organized by category, not by point of view. Planners should never be afraid to put opposing points of view in the same room – it is the only way to build a shared vision.

Online Outreach

Using technology can help a community reach a broad group of people. Online questionnaires are simple and easy to create, but other online resources can provide opportunities to do collaborative mapping, create conversations between community members themselves (MySidewalk), and even reach out directly to citizens via text message (Textizen). Social media such as Twitter or Facebook can also be effective, but the account for the plan must be managed well and updated frequently in order to attract followers.

Partner Organizations

Partner organizations can provide technical expertise, information, or even funding for a waterfront visioning effort. Some of the organizations have infrastructure or other assets within the community that they themselves need to plan for, and their plans and those of the community should be consistent.

Potential local partners can include county road commissions, drain commissions, and health departments. Partners at the regional level can include councils of governments or metropolitan planning organizations, and non-profit groups such as watershed councils and land conservancies.

Several state agencies in Michigan may have information or other resources that support waterfront planning. These agencies cover a broad range of issues including environmental quality (MDEQ), natural resources (MDNR), health (MDHHS), transportation (MDOT), agriculture (MDARD), housing (MSHDA), historic preservation (SHPO), and economic development (TED), all of which have an impact on Michigan communities. Federal partners might include the National Oceanic and Atmospheric Administration, FEMA, FERC, the National Flood Insurance Program, and the Army Corps of Engineers.

Inland Lakes Case Studies

City of Whitehall - In order to protect the water quality of White Lake, the City of Whitehall recently installed the first Green Street in Michigan. Lake Street, which runs along White Lake, was reconstructed to reduce runoff contamination by allowing water to filter through permeable pavement, native vegetation, and the ground. Permeable pavement allows the water to seep through instead of traveling along the surface to storm drains, preventing the water from collecting contaminants like fertilizer and oil. The City also constructed a bioswale, a roadside ditch planted with native vegetation, to filter storm water before it goes into the ground. See www.cityofwhitehall.org.

City of East Grand Rapids - The City of East Grand Rapids focused on sound placemaking principles as they renovated their library and municipal building on the shoreline of Reeds Lake. Over the past decade, the City has increased the recreational opportunities on the lake while also helping to preserve the natural dynamics. The renovated library has a green roof and other design elements designed to minimize runoff into the lake, and includes large windows allowing people to enjoy lake views from the library. A new boardwalk over the wetlands created recreation opportunities while allowing the wetlands to protect the shoreline and water quality. See www.eastgr.org.

Presque Isle Township - As part of their Master Plan update in 2014, Presque Isle Township evaluated several different watershed dynamics. The Township has shoreline on Lake Huron and several inland lakes, and the dynamics of each body of water impacts the water resources available to residents of the Township. The plan includes an extensive inventory of the natural resources in the Township, and several objectives and strategies for managing these resources going forward. For inland lakes, this includes preserving native fish and wildlife populations, promoting greenbelts along the shoreline, and removing invasive species from the natural ecosystem in the lakes. See www.presqueisletwp.org.

River Case Studies

City of Detroit - Detroit has transformed its riverfront into a public asset by restoring natural features and by connecting the riverfront to surrounding neighborhoods. A public walking path runs along the river from near Belle Isle to Joe Louis Arena, with a planned continuation to the Ambassador Bridge and beyond. Visitors to the riverfront can easily access several parks, the Renaissance Center and downtown, and the Dequindre Cut trail. Wetlands have been restored along portions of the riverfront to provide habitat and improve water quality. The Michigan DNR also recently constructed an Outdoor Adventure Center in a former industrial building, allowing visitors and residents to learn about Michigan ecosystems. See www.detroitriverfront.org.

City of Bay City - Bay City has cleaned up brownfields and restored its waterfront along the Saginaw River. The neighborhood near City Hall, often viewed as the "front door" of the City, was once home to a port that deposited large piles of and rocks here. After a downstream chemical plant closed, the plant's harbor became available and the piles were moved. A new mixed-use waterfront development ("Uptown") is rising on this site with apartments, retail, office space, public access to the river, and a mural paying tribute to the history of the Bay City lumber industry. See www.baycitymi.org.

Boardman River Watershed Prosperity Plan (Grand Traverse and Kalkaska Counties) - Communities in the Boardman River Watershed in Grand Traverse and Kalkaska counties have worked together to plan cooperatively for the future of this vital shared natural resource. The Watershed Prosperity Plan is collaboration among 12 organizations in the Boardman River Watershed to enhance the protection and wise use of the river. One catalyst for creating this plan was the removal of three dams on the river, which helped restore the natural flow of the river. Removing the impoundments presented an opportunity for these organizations to consider impacts on ecological, economical, and recreational activities in the watershed. See www.theboardman.org/prosperity-plan.

Communities should also consult with neighboring jurisdictions, above and beyond the required distribution of the draft plan for comment. Coordination is especially important when multiple communities share a body of water.

Step 3: Articulate the Vision

Having developed the vision through robust public engagement and coordination with partner organizations, the community must articulate the future of its waterfront in a way that will resonate through the years of implementation.

The most direct method of articulating the vision is through the waterfront plan's goals and objectives. Goals and objectives are a description of a community's aspirations and how it hopes to achieve them. "Goals" are broad, big picture statements, while "objectives" are the specific actions taken to reach the goal.

Goals and objectives are crucial because they are the articulation of the broad based community vision developed in the previous step. They should not be generic – they should be targeted to the community, its waterfront, and its people. Objectives in particular should lay out practical approaches to implement the vision.

For example, a goal might be to "create new public spaces on the waterfront for preservation and recreation, especially in areas identified as vulnerable to flooding," and the supporting objective might be "purchase the former industrial parcel at 123 Waterfront Drive and redevelop it into a park with a naturalized shoreline."

However, a simple list of goals and objectives is not enough. The plan needs to demonstrate the future vision, not merely describe it. Therefore, each waterfront plan should include a future land use/character plan, a future transportation plan, a sustainability and environmental protection framework, and recreation and public access plan.

Future Land Use/Character Plan

The future land use map demonstrates the vision's physical form. As with existing land use, a future land use map for a waterfront plan should go beyond simple land use categories – and even densities. Along with the accompanying text, the map should clearly show the character the community desires for a particular area – what will the shoreline look like, feel like, and work like through the life of the plan.

Future land use recommendations are best displayed through graphics, charts, and photographs. Each future land use category should have a two-page spread in a print waterfront plan, or its own page on an online plan. The spread should have one page devoted to "existing" and "planned" character photos, and other page devoted to the specific requirements and vision for each category. The character

of each category should be delineated in terms of:

- Land Uses
- Site Design
- Landscaping
- Architecture/Design
- Relationship to the Water
- Shoreline Treatment
- Transportation Infrastructure
- Public Waterfront Access
- Utilities
- Environmental Protection (Stormwater Management, Erosion Control, etc)
- Hazard Mitigation
- Sustainability Goals (Economic, Environmental, Social)
- Community Assets

Future Transportation Plan

Land use patterns typically follow transportation investments. A waterfront plan should offer not only a vision for land use, but how the transportation system – cars, bikes, pedestrians, boats, etc – will complement the planned land use and character.

One crucial aspect of a waterfront transportation system is public access to the water. Will there be a waterfront pathway? Or an access road for private docks? Is there already a roadway along the water? Or railroad tracks?

In some cases, transportation infrastructure may actually discourage mobility. For instance, a busy road along the waterfront may prevent pedestrians from safely accessing a public beach or be too narrow for bicycle travel.. Shoreline roads may be susceptible to extreme weather hazards such as erosion or flooding, and may hamper rescue or evacuation efforts. In reviewing the community's existing transportation system, communities should consider alternative approaches such as rerouting roads from floodprone areas, identifying safe emergency routes and exploring road diets and park and ride lots for tourist destinations.

Converting traditional street infrastructure to "green streets" can help a community cope with extreme precipitation events. Green streets are designed to capture stormwater on-site to reduce downstream flooding and reduce pollutants in nearby rivers and lakes by allowing stormwater runoff to filter through permeable pavement, vegetation, or the ground instead of traveling on the surface to a storm drain or open water. Where a full rebuild of the street with permeable pavement is not practical, communities can integrate rain gardens or bioswales into rights-of-way or create regional stormwater detention systems in parks or under public parking lots.

Environmental Preservation Framework

Transportation and land use both have important roles to play in environmental preservation, but for the important and complex natural dynamics of waterfronts and water systems, additional measures will need to be taken.

The community's wetlands and 100-year floodplains should be evaluated in terms of their importance to local flood control, water quality improvement, and promotion of public health, safety, and welfare, and the information incorporated in the master plan. While existing State programs regulate development in certain wetlands, not all of them are covered by the regulatory protections. Local ordinances have a role to play as well, for example, through regulating development in wetlands that are excluded from State protection, such as so-called "noncontiguous" wetlands that are five acres or less in area, or the strip of natural upland vegetation that buffers the wetland from many threats to water quality. A "noncontiguous" wetland is not contiguous to the Great Lakes, Lake St. Clair, or an inland lake or stream, but may provide locally important functions such as wildlife habitat, flood storage capacity, and groundwater

recharge. A community might opt to implement local programs for managing floodplain development or restoring wetlands where they have been lost.

For Great Lakes coastal communities, sand dunes and beaches are also crucial environmental, recreational, and aesthetic assets. Michigan's Great Lakes sand dunes are among the most charismatic and picturesque landscapes in the Midwest, and communities that are fortunate to have them benefit economically from the flow of tourists lured by their natural beauty. State law provides some protections for "Critical Dune Areas," which are designated as areas where State-level regulations addressing construction, grading, tree cutting, and other activities are in effect. Yet many coastal communities are home to sand dunes that are locally valued, but not protected by the State's Critical Dune Area regulations. Such communities may decide that their dunes are sufficiently important to the local environment, appearance, economy, and quality of life that they warrant protection through an overlay district, Planned Unit Development provisions, site plan review standards, or other measures for managing development.

Inland lakes and streams are susceptible to water quality impacts from a range of inappropriate or poorly-managed land uses that generate polluting stormwater runoff. The role of naturally vegetated riparian buffers in protecting water quality has been mentioned previously, and many communities have chosen to proactively safeguard their lakes and streams through adopting policies that require property owners to preserve a strip of native trees, shrubs, and herbaceous plants along the water's edge. Inland lake shorelines maintained in a natural, vegetated "greenbelt" condition, as well as wetlands fringing the shore, serve as a physical and biological filter for the runoff flowing into the lake, and can help safeguard water quality.

Pollutants can also enter lakes and streams through groundwater, with septic system effluent presenting an all-too-common example in many rural communities. Local health departments have the primary role in regulating the design, siting, and installation of residential septic systems within their jurisdictions. Importantly, the local departments determine how far a septic system must be set back from the edge of a water body, the minimum vertical distance allowed between the effluent distribution tiles in the drain field and the water table, and whether and how often septic systems must be inspected and maintained. These three parameters strongly influence the potential for residential septic systems to pollute local water bodies. Where septic system effluents are degrading lake and stream water quality, a community may request that the local health department strengthen its standards, or it may adopt and implement community-specific programs and policies to decrease septic system pollution.

Of course, a community's lakes, streams, wetlands, and floodplains are just a subset of its natural resources, and other natural features support the community's overall resiliency to the impacts of extreme weather events. For example, wooded parks and street trees mitigate the development of urban heat islands by providing shade and transpiring cooling water vapor through their leaves. Also, undeveloped natural areas capture and infiltrate precipitation, allowing groundwater resources to "recharge" while decreasing the volume of stormwater runoff the community must manage.

Communities are discovering that their waterways, greenways, rustic parks, street trees, and other environmental assets have substantial economic and social value through the services they provide, and are beginning to view these assets as the community's "Green Infrastructure." Identifying, mapping, and describing the functions and values that the network of natural areas, natural features, and green space provides are steps toward developing a community Green Infrastructure Plan for comprehensive environmental management and stewardship.

Recreation and Public Access Plan

Many communities develop parks and recreation plans to help guide the recreational improvements and ensure eligibility for Michigan Department of Natural Resources grant programs. A community's parks and recreation plan may already include many of the important elements of a waterfront recreation and public access plan, which include the size, location, service area, amenities, and condition of the public waterfront sites, making the development of the waterfront plan simpler. A community should strive to allow residents and visitors access to everything the water has to offer. Safe and environmentally-appropriate locations should be determined for fishing, swimming, boating, non-motorized craft, and other activities.

Step 4: Create a Road Map for Success

Even the most well-articulated vision cannot succeed without a clear implementation plan. The waterfront plan should have a clear list of tasks for community staff, residents, officials, and consultants to pursue over the life of the plan.

Zoning

Locally regulating land use in areas subject to flooding, shoreline erosion, and other hazards promotes the health, safety, and welfare of community residents and the public, and is explicitly authorized under the Michigan Zoning Enabling Act. To incorporate these provisions into its zoning ordinance, a community must include them in a "zoning plan" in the new or updated master plan. A zoning plan is a concise list of amendments to the zoning ordinance and map that are needed in order to realize the plan. In some cases, entirely new zoning districts may be needed.

Zoning for waterfront property is different than zoning for inland property. Waterfront property has different needs – specifically, the relationship of development to the water itself must be regulated. Nearly every community will need to create specific waterfront districts, or at least a waterfront overlay, in order to accommodate the unique development characteristics of waterfront areas.

Mandatory construction setbacks measured from the ordinary high watermark are one option for reducing the risk to public infrastructure and private investments. For example, where the rate of Great Lakes shoreline erosion equals or exceeds an average of one foot per year, as determined by the DEQ through studies, new development near the shoreline must meet State setback requirements. Communities may determine that local setback requirements are prudent where the shoreline is receding at a rate that the community considers significant, yet is lower than the State threshold.

Zoning standards can be utilized to protect groundwater, surface water, and wetlands. Communities can protect groundwater by requiring a secondary containment system surrounding storage containers for hazardous materials. The use of dry wells, which direct runoff into water bodies with no filtration, can be prohibited. In addition to the suggested setback regulations above, communities can protect surface water by using vegetative buffers and encouraging their use, or by limiting the allowable impervious coverage of development. Communities can regulate wetlands by adopting standards above the requirements of the DEQ. Communities can also use planned unit developments to protect any type of water or other environmentally sensitive properties, by prohibiting development on sensitive lands and encouraging density elsewhere.

The process of updating and amending a zoning ordinance need not be long or arduous. The waterfront plan should list the sections and text to be updated, referencing the vision to make the intent clear. The new text itself should be drafted in consultation with professionals such as the community's planner, attorney, engineer, building official, or zoning administrator.

Capital Improvements and Infrastructure

In addition to their regulatory power, communities can also invest directly in the development and infrastructure of their waterfronts. Capital improvements require more community resources than zoning changes, but can have a long-term impact. Additionally, by raising property values, many infrastructure investments can pay for themselves.

In fact, one of the simplest ways to preserve waterfront land for environmental protection and public recreation is to purchase it for public use or preservation. This can be a substantial investment, but non-profit land conservancies can help find funding. Additionally, adding new park space raises property values, so the new park may pay for itself over time.

A community can invest in capital improvements to enhance the character of its shoreline, in keeping with its predominant uses. For example, seawalls and other methods of shoreline armoring suit areas of intense commercial and

industrial use, such as port facilities. At marinas, recreational boating sites, heavily-used waterfront parks, and other non-industrial areas, stretches of naturally vegetated shorelines, beaches, or elevated boardwalks and fishing decks may alternate with concrete boat launch facilities, as well as riprap or other hard armoring where the shore is subject to high energy wave action. Where recreational uses are less intensive, the community may invest in restoring wetlands, floodplain forests, and other habitats along the shore."

In addition, the community can alter its transportation infrastructure to improve access to the waterfront, incentivize appropriate or discourage inappropriate development, or protect natural systems. Green streets can help protect waterfronts, and some communities are considering moving major waterfront roadways further inland to protect against flooding and erosion, while providing improved water access.

Other infrastructure investments could include sewer and water. These improvements are expensive, but by removing the need for septic systems, communities can ensure their water bodies are protected from excess nutrient pollution.

Get Help if You Need It

There are many resources and professionals available to help a community craft a waterfront plan. Watershed councils, land conservancies, non-profits, county and regional entities, and planning consulting firms are all good sources for assistance. Putting together an effective planning team is the best way to create a successful plan.

For additional waterfront planning and implementation resources, see www.michigancoastalcommunities.com

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