THE BLUE ECONOMY IN ERIE COUNTY

ABSTRACT

Understanding the Blue Economy, and the opportunities that exist to help Erie County thrive.

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The Blue Economy Concept

The history of Erie County cannot be written without its most important natural resource, Lake Erie. It is this magnificent body of water that positioned our region to prosper for decades given the industries and community that thrived off its shores. After years of economic growth, residents are now faced with an important transition from the factories of yesteryear to a new engagement with our waterways. This reconnection with our largest natural resource should come in the form of economic development from sustainable practices that find new and innovative methods to engage with water assets.

The Blue Economy is a concept with broad meaning across the globe. At its core, the topic aims to find the right balance between growth and sustainability, particularly as it pertains to the responsible use of water resources. Although the origins of this concept stem from island nations, the topic offers an array of initiatives that are applicable for all regions that seek a cleaner and more highly valued engagement with blue assets. Key components of a Blue Economy are vast and may include fisheries, tourism, maritime transport, renewable energy, aquaculture, seabed extractive activities, and marine biotechnology.

This report aims to provide much needed education on the topic of the Blue Economy for Erie County residents and visitors to our region. It will start with the origins of the term Blue Economy and work our way through a discussion surrounding this topic at a global, national, regional (Great Lakes), and local (Erie County) level. The core of this report includes important educational content and one major opportunity for Erie County in each of three areas of focus: Science, Infrastructure, and Economic Development. Ultimately, we hope to find a local partner to share this information through an educational display in order to drive broader awareness of this topic and build momentum for key opportunities in our region.

Mission Statement: To educate residents and visitors of Erie County about the Blue Economy and vast opportunities that exist in the areas of science, infrastructure and economic development.
Vision Statement: To create broader awareness through an educational exhibit that showcases the current state of the Blue Economy and key opportunities that exist for Erie County.

History

The world economy and modern civilization that we know today arose from access to trade and resources offered by oceans and waterways. For centuries, industries and communities thrived along coastal waterways exploiting the benefits of shipping routes that expanded trade beyond local markets. These very industries are to blame for decades of neglect to waterways as communities traded economic development for pollutants from mills and factories located on the shorelines. Only in recent decades have people begun to recognize the importance of living seas and coasts.

Before the term Blue Economy, the buzzword was “Green Economy,” a term first used by a group of leading environmental economists in a report for the Government of the United Kingdom in 1989. The first version of their report focused on how “economics can and should come to the aid of environmental policy,” while sequels to the report in the early 1990s extended the message to key issues of the global economy – climate change, ozone depletion, tropical deforestation, and resource loss in the developing world.[1] In 2008, the United Nations Environment Program (“UNEP”) commissioned one of the authors of the original study to prepare a report entitled “Global Green New Deal.” This report catapulted the term onto the global scene and sought to “provide analysis and policy support for investment in green sectors and for greening

[1] Green economy. (n.d.). Retrieved from https://sustainabledevelopment.un.org/index.php?menu=1446

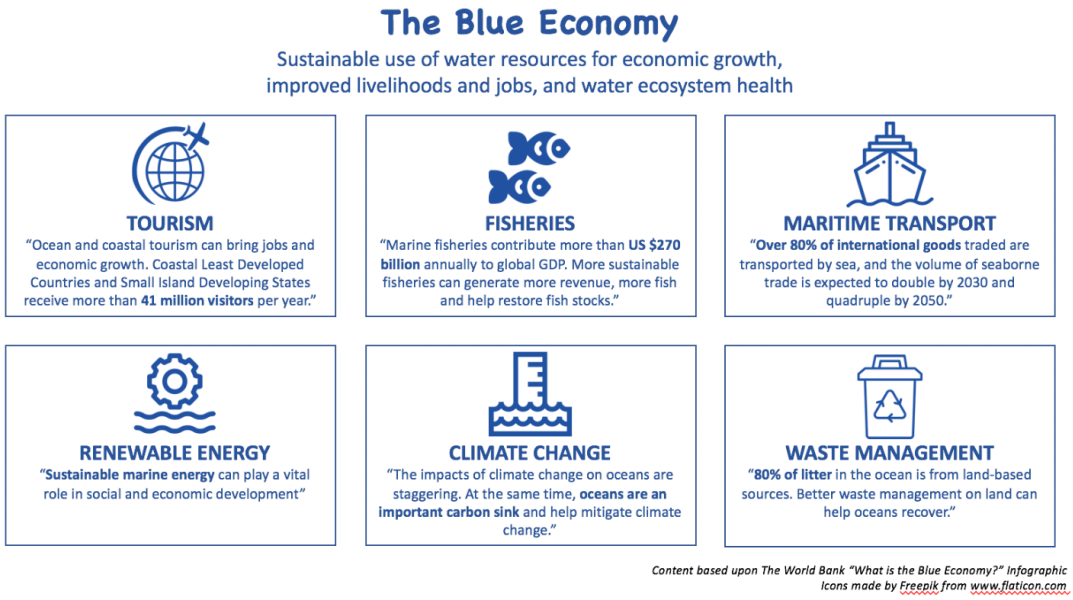
environmentally unfriendly sectors."[2] The Global Green New Deal called on governments to allocate resources to stimulate green sectors and outlined three key objectives: economy recovery; poverty eradication; and reduced carbon emissions and ecosystem degradation.

In 2012, the "Rio +20" United Nations Conference on Sustainable Development was held in Rio de Janeiro with a focus on advancement of the Green Economy concept on a global stage. During preparation for the global summit, many coastal countries questioned the relevance of the Green Economy initiative to their locales. They argued for this initiative to expand more broadly to include the concept of a Blue Economy that would include sustainable practices to ensure the long-term health of their most prominent resource, the ocean. Since this time, the concept of a Blue Economy has received considerable attention on a global scale resulting in a growing appreciation for the importance of a more in-depth and coordinated evaluation of the world's oceans and seas.[3]

What is the Blue Economy?

According to the United Nations, the Blue Economy concept describes the circumstances and needs of countries whose future resource base is dependent on water.[4] As a result, a key initiative of the Blue Economy is to understand and improve on the various attributes that make up oceanic sustainability, such as ensuring the health of living organisms in our waterways and avoiding pollution.

The Blue Economy concept may include well established industries such as fisheries, tourism, and maritime transport, but also new and emerging activities, such as offshore renewable energy, aquaculture, seabed extractive activities and marine biotechnology.[5] The concept goes well beyond viewing the ocean economy solely as a mechanism for economic growth. It aims to improve human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.



[2] Ibid.

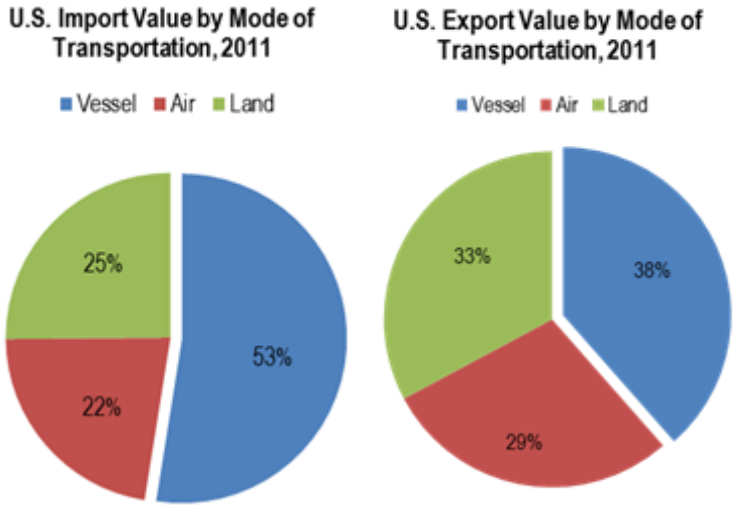
[3] Blue Economy Concept Paper. (2014, January 15). Retrieved from https://sustainabledevelopment.un.org/index.php?page=view&type=111&nr=2978&menu=35

[4] Ibid.

[5] World Bank Group & United Nations, (2017). The Potential of the Blue Economy – Increasing Long-term Benefits of the Sustainable Use of Marine Resources for Small Island Developing States and Coastal Least Developed Countries. doi: sustainabledevelopment.un.org/content/documents/15434Blue_EconomyJun1.pdf

The United States Blue Economy

With the West Coast bordering the Pacific Ocean and the East Coast bordering the Atlantic Ocean, the United States sits in an enviable position in terms of trade. The process of opening world markets and expanding trade has played an integral role in the development of American prosperity. According to the Bureau of Transportation Statistics, ships carried 53 percent and 38 percent of U.S. imports and exports in 2011 (data from most recent U.S. census), respectively – the largest share of any mode of transportation.[6]



For nearly a century, the U.S. economy has been an undeniable beneficiary of global maritime trade through its various saltwater coastal ports or freshwater ports of the Great Lakes region. Furthermore, nearly 40 percent of the U.S. population now lives in coastal regions with the growth of maritime jobs now exceeding other sectors by nearly four times. In 2014 alone, the oceans and Great Lakes supported $352 billion in gross domestic product and 3.1 million jobs in the U.S.[7]

The U.S. plays an important role in the Blue Economy, as evidenced by substantial research and funding. In 2014, the U.S. hosted the first Our Ocean Conference to bring together both public- and private-sector stakeholders from around the world to identify solutions to improve ocean productivity, prosperity, and security. During this annual conference, participants are encouraged to make voluntary commitments for significant and meaningful actions toward a clean, healthy and productive ocean. In 2019, the U.S. announced 23 new commitments valued at $1.21 billion to promote sustainable fisheries; combat marine debris; and support marine science, observation, and exploration. In aggregate, the U.S. has now made 113 commitments valued at more than $4.3 billion in conjunction with this ongoing initiative.[8]

The Great Lakes Blue Economy

The Great Lakes make up the largest body of freshwater on Earth and account for one-fifth of the freshwater surface on the planet. According to the U.S. Environmental Protection Agency, more than 30 million people live in the Great Lakes basin, which equates to 10 percent of U.S. residents and 30 percent of Canadian residents.

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[6] Chambers M., Liu M. (2012, May). Maritime Trade and Transportation by the Numbers. Retrieved from https://www.bts.gov/archive/publications/by_the_numbers/maritime_trade_and_transportation/index

[7] Callender, W.R. (2017, November 30). Our Blue Economy: The U.S. Economy Relies on Ocean, Coastal, and Great Lakes Resources. Retrieved from https://oceanservice.noaa.gov/aa-updates/ocean-economy-113017.html

[8] U.S. Announces $1.21 Billion To Support Blue Economy: Commitment Strengthens Sustainability of Ocean Economy, Enhances Health of Planet, and Advances Global Economic Security. (2019, October 23). Retrieved from https://www.state.gov/u-s-announces1-21-billion-support-blue-economy-commitment-strengthens-sustainability-of-ocean-economy-enhances-health-of-planet-and-advances-global-economic-security/

The Great Lakes region was a direct beneficiary of the industrial and agricultural revolutions and related growth that provided jobs and wealth to its inhabitants. Today, the region is home to multinational corporations such as Ford, General Motors, Chrysler, Bombardier and GE Aviation. Agriculture is a mainstay of this region given its temperate climate and it "generates more than $15 billion a year from livestock, dairy, grain and corn, and accounts for 7 percent of U.S. food production."[9] In addition, the region produces billions in minerals every year and is home to three of the 10 largest U.S. oil refineries. In 2017, total cargo of 230.9 metric tons moved across the Great Lakes-St. Lawrence River Waterway valued at $77.4 billion. In aggregate, the Great Lakes region accounts for $6 trillion of total gross domestic product, which would make it the world's third largest country by this metric.[10]

The heavy industry and agriculture led to enormous pollution in and around the Great Lakes waterways in the late 1900s. Chemicals, toxic pollutants, pesticides, and heavy metals were all present throughout the region with some of the most dangerous levels being found in Lake Erie. "With 11.6 million people living in its basin, and with big cities and sprawling farmland dominating its watershed, Lake Erie is severely impacted by human activities."[11] In the late 1960s, Lake Erie waters became so polluted that people began to coin the phrase "Lake Erie is dead," as dead fish became a common occurrence along its Western Basin due to reduced oxygen levels in the water.

The cleanup and restoration of the Great Lakes region has been a complicated endeavor given the various government jurisdictions at play. Stakeholders include eight U.S. states, two Canadian provinces, 40 Tribal Nations, 10 U.S. federal agencies and more than half a dozen major cities. In 1985, the U.S. and Canada formed an International Joint Commission to commit to cleaning up the Great Lakes and began to "focus on what came to be termed Great Lakes 'Areas of Concern,' (AOCs) the most dangerously fouled waters in the Great Lakes, its bays, harbors, and connecting rivers."[12] Under the 1987 Great Lakes Water Quality Agreement, the commission identified 42 AOCs and work began on developing a remedial action plan to restore these waters. In 1991, a 43rd AOC was added to the list to include Presque Isle Bay. Today, the U.S. EPA, in conjunction with other federal and state agencies, is still working on 27 remaining AOCs in the Great Lakes Basin. Seven of the original AOCs have been delisted, including Presque Isle Bay in February 2013.

The Erie County Blue Economy

Much of the land in Erie County was known as the Erie Triangle during the late 1700s. This portion of land, often described as the "chimney" of the state, represented an area that was ultimately purchased by Pennsylvania from the federal government in 1792. This 300-square mile triangle comprises the northern portion of Erie County spanning from Springfield Township to Wattsburg, including Presque Isle. The purchase of this plot of land along the Erie lakeshore was strategic to Pennsylvania as it represented the Commonwealth's only access point to the Great Lakes region.

The Erie region made history again during the War of 1812 when the American Navy, under the command of Master Commandant Oliver Hazard Perry, defeated the British in the Battle of Lake Erie. In August 1812, America faced a major setback when U.S. soldiers were forced to surrender Detroit and the entirety of the Michigan territory to Britain. "The concession of these territories opened up the whole northwestern frontier of Ohio, as well as northwestern Pennsylvania, to incursion by the British and their Native American allies."[13] Lake Merchant Daniel Dobbins convinced President James Madison that Lake Erie was a crucial asset to the U.S. in terms of trade and communication and he became determined to thwart any further invasion by Britain. Dobbins also persuaded Madison to choose Erie as the construction site of the American fleet because of Presque Isle Bay's restricted access that would keep their ships safe from attack. Erie was only

[9] Great Lakes Protection Fund: Agriculture in the Great Lakes. (n.d.). Retrieved from http://glpf.org/about-us/ideas-in-action/agriculture-in-the-great-lakes/

[10] Martin Associates, (2018). Economic Impacts of Maritime Shipping in the Great Lakes – St. Lawrence Region. 2-8. http://www.greatlakes-seaway.com/en/seaway/facts/eco_impact.html

[11] Give Earth a Chance: Environmental Activism in Michigan. (n.d.). Retrieved from http://michiganintheworld.history.lsa.umich.edu/environmentalism/exhibits/show/main_exhibit/pollution_politics/great-lakes-pollution

[12] Hartig, J.H., Krantzberg, G., Austin, J.C. & McIntyre, P. (2019). Great Lakes Revival: How Restoring Polluted Waters Leads to Rebirth of Great Lakes Communities. *International Association for Great Lakes Research*, http://iaglr.org/

[13] Zwiebel, D. (2009). Battle of Lake Erie: Turning Point of the War of 1812. *Pennsylvania Cetner for the Book,* https://pabook.libraries.psu.edu/literary-cultural-heritage-map-pa/feature-articles/battle-lake-erie-turning-point-war-1812

a small village at this time and had no major industrial capabilities, so workers and materials were largely sourced outside of the region to build the naval fleet. In only nine months' time, a fleet of six ships was constructed, the largest of which included the brigs Lawrence and Niagara. These ships, along with three others brought in from Black Rock near today's Buffalo, N.Y., would ultimately square off with the British in the Battle of Lake Erie in September 1813. Perry was victorious in the battle, which represented a turning point for the U.S. because it gave Americans control of the Great Lakes. The victory was also significant because it "boosted the morale of the American troops and gave them security from an invasion from the North."[14] The U.S. went on to win the war to preserve its independence from Britain.

The victory in the Battle of Lake Erie was a pivotal moment for U.S. history, but also started Erie County on its path towards industrialization. By the end of the 19th century, Erie would become a major Great Lakes port and manufacturing center, known as "the Boiler and Engine Capital of the World."[15] Erie County continued to prosper in World War II with lucrative defense contracts being won by major employers in the region, including Hammermill Paper Company, General Electric, and Lord Corporation.

In 1959, the opening of the St. Lawrence Seaway had major implications for industry within Erie County. This waterway would allow ships to sail from Lake Ontario to the Atlantic Ocean, which opened the Great Lakes to global shipping routes. In 1956, the Erie-Western Pennsylvania Port Authority was formed by the City of Erie to prepare our bayfront for this breakthrough, which included the acquisition of land for an international marine terminal site at the foot of Holland Street. In addition, funds were allocated to dredge the entrance channel to Presque Isle Bay allowing larger ships to enter the Port of Erie.[16] Litton Industries would return shipbuilding to the Erie region when it opened Erie Marine on the bayfront in the 1960s. Today, the site is leased to Donjon Shipbuilding & Repair Company and remains one of only two drydock shipyards in the Great Lakes region that can service 1,000-foot vessels.

Globalization has had a profound impact on the Erie economy as major employers have fallen victim to lower cost production outside of our region. As a result, Erie has become more dependent on service industries including insurance, health care, education, and tourism. This transition breeds opportunity as major industries are no longer fouling our water and occupying prime real estate on the Erie bayfront. These changes are resulting in a new engagement with our waterways as witnessed by the major development projects that have taken place on the bayfront, including a convention center, two major hotels, a maritime museum, public library, transportation center, restaurants and numerous marinas. A cleaner Lake Erie and improvements to public access to its shores and tributaries are the future of Erie's Blue Economy and much needed economic revitalization.

Areas of Focus for Erie County

Science for a Blue Economy

Industrial and Urban Pollution

An oil slick on the Cuyahoga River caught on fire in June 1969.[17] This was not an uncommon occurrence for rivers flowing into the Great Lakes in this time and, in fact, the Cuyahoga River had caught fire at least a dozen times previously because industrial waste polluted the waters for years.[18] The difference in 1969 was that this event followed the publication of Rachel Carson's *Silent Spring,* a nascent environmental movement was growing, and both *Time* and *National Geographic* magazines used this event as a symbol for the severity of the issues associated with industrial pollution. After all, what does it take for water to catch on fire?

[14] Ibid.

[15] Erie Historical Marker: Behind the Marker. (n.d.). Retrieved from http://explorepahistory.com/hmarker.php?markerId=1-A-C1

[16] About Port Erie. (n.d.). Retrieved from www.porterie.org/about

[17] Rotman M (2019, October 5). Cuyahoga River Fire. Retrieved from https://clevelandhistorical.org/items/show/63

[18] Ibid.

Previously, water pollution had been considered an unfortunate, but necessary product of industrialization. For decades, industry dumped sewage and industrial waste into the rivers flowing into the Great Lakes without regulation.[19] Waterways were "yellowish, thick, full of clay, stinking of oil and sewage," a local Cleveland resident stated.[20] Cleveland pulled drinking water from Lake Erie and used the rivers to dump everything else.[21]

Environmental historians David and Richard Stradling wrote that most Cleveland residents didn't care a great deal about the fire because of all the other problems in the city. Pollution was simply the cost of progress and prosperity, that is, until the fire of 1969.[22] The way the fire hit the media and made national news changed the focus of the general public. Residents and policymakers unanimously passed a $100 million bond to initiate the revitalization of the rivers soon after.[23]

It was only 50 years ago that rivers caught fire, and these events sparked environmentalism like never before. Since that time, the Cuyahoga River has gone from a state of toxicity to a tourist destination as discussed by John Hartig, an environmental activist who wrote "Burning Rivers – Revival of Four Urban Industrial Rivers that Caught Fire"[24] which discusses the major, lasting damage done to our freshwater resources. Despite years of neglect, the health of our rivers and lakes has seen a dramatic improvement in a relatively short amount of time.

As mentioned earlier, at the time of the Cuyahoga River fire, Rachel Carson's book Silent Spring had swept the nation bringing people together to fight for the environment. Media coverage for the Vietnam War had also featured the inhumane use of Agent Orange, and the American people began to see the effect of rapid industrialization and overpopulation on their surrounding environment.[25] Further, the United Nations blamed the decline of the planet on the U.S. The Nixon administration felt obligated to respond. By 1970, the nation was ready for a shift to protect the environment: citizens, government, and organizations.[26]

The decade following the fire marked one of the most pivotal periods for the environmental movement. In quick succession, the U.S. created the Environmental Protection Agency in 1970, celebrated the first Earth Day in April 1970,[27] passed the Clean Air Act in 1970,[28] passed the Clean Water Act in 1972,[29] and signed the Great Lakes Water Quality Agreement that same year. By 1978, the Great Lakes Water Agreement between Canada and the U.S. set a new goal based on the "virtual elimination" of toxic contaminants.[30]

By 1987, the Great Lakes Water Agreement evolved into an ecosystem approach, recognizing that all components of the environment are interconnected: water, air, and land.[31] The agreement included several objectives and guidelines to achieve its goals, such as the elimination of toxic chemicals in the Great Lakes, financial assistance to construct wastewater treatment facilities, and the development of best management practices to control most sources of pollutants. The EPA identified 43 Areas of Concern (AOCs) as being environmentally degraded to the point of needing immediate remediation. One of those was our own Presque Isle Bay.

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[19] Blakemore E (2019, April 22). The Shocking River Fire That Fueled the Creation of the EPA. Retrieved from https://www.history.com/news/epa-earth-day-cleveland-cuyahoga-river-fire-clean-water-act

[20] Ibid.

[21] Ibid.

[22] Stradling, D., & Stradling, R. (2015). Where the River Burned: Carl Stokes and the Struggle to Save Cleveland. Ithaca: Cornell University Press. muse.jhu.edu/book/55617.

[23] Rotman M (2019, October 5). Cuyahoga River Fire. Retrieved from https://clevelandhistorical.org/items/show/63

[24] Lett M (2019, October 4). Trenton environmentalist John Hartig to discuss 50th anniversary of when the Rouge River caught fire. Retrieved from http://www.thenewsherald.com/news/trenton-environmentalist-john-hartig-to-discuss-th-anniversary-of-when/article_c84ee3e4-e52c-11e9-9ff5-53f612e55cfd.html

[25] Lewis, J (1985). The Birth of the EPA. EPA Journal, https://archive.epa.gov/epa/aboutepa/birth-epa.html

[26] Lewis, J (1985). The Birth of the EPA. EPA Journal, https://archive.epa.gov/epa/aboutepa/birth-epa.html

[27] Lewis, J (1985). The Birth of the EPA. EPA Journal, https://archive.epa.gov/epa/aboutepa/birth-epa.html

[28] Clean Air Act. (1970). Retrieved from https://www.epa.gov/laws-regulations/summary-clean-air-act

[29] Clean Water Act. (1972). Retrieved from https://www.epa.gov/laws-regulations/summary-clean-water-act

[30] GLWQA Annexes. (n.d.). Retrieved from https://www.epa.gov/glwqa/glwqa-annexes

[31] Ibid.

Presque Isle Bay was designated an "Area of Concern" (AOC) in 1991. Before the creation of federal and state regulatory programs for waste disposal, Presque Isle Bay fell victim to pollution discharge from industrial and domestic wastewater into the bay, which ultimately fouled local streams and tributaries in Erie County.[32] The contaminants included excessive nutrients, organic compounds, and heavy metals. The sources of this pollution were local steel mills, a foundry, water treatment plants, urban runoff, and other industrial facilities.[33] In February 2013, Presque Isle was removed as an AOC after wastewater collection dramatically changed when a treatment system was installed that reduced sewer overflow and stormwater runoff into the bay.[34]

While the delisting of Presque Isle Bay provides us hope for what can be accomplished when we are aware of an issue and focus our efforts on remediation, emerging threats remind us that we must be ever vigilant. In addition, many environmentalists fear that lifting the designation gives the region an unjustified level of complacency. What emerging threats are facing our Great Lakes? In the words of Mr. McGuire from *The Graduate*, "I want to say one word to you, just one word: PLASTICS."

Plastics

Yes, that ubiquitous material of all our modern conveniences is making its way, in ever smaller and smaller particles, into our water and ultimately, therefore, into us. It's no secret that plastic pollution is a global issue to the point that a recent report by the Ellen MacArthur Foundation, in partnership with the World Economic Forum, found that the amount of plastic in the ocean will outweigh the fish population by 2050.[35]

Plastics present a variety of concerns for all types of environmental compartments (like air and soil), but especially for water: fresh, salt, or brackish. While in the environment, plastics can absorb persistent organic pollutants. Over time sunlight causes plastics to weather and degrade break into smaller and smaller pieces.[36] Another microplastic was intentionally manufactured small for use in cosmetic products called polyethylene plastic, although banned by Obama in 2015 with the Microbead-Free Waters Act 2015.[37] These smaller particles are more easily ingested by birds, aquatic life, plants, and humans. Perhaps worse, plastics can leach out additives into the environment and secrete chemicals into host species.[38]

Across the world, scientists are focusing on the impact of plastics on the environment. The University of Denmark is mapping microplastics in the northern Atlantic Ocean[39]; Spain is studying why animals eat plastics[40]; and a local university (Penn State Behrend) has begun to research the types of plastic that are accumulating in our waterways.[41]

Why are plastics harmful? Plastics are made with chemicals like cadmium, mercury, lead, and diethylhexyl phthalate - they are all carcinogens and hormone disruptors.[42] When chemicals like these are added into plastics and ingested by humans,

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[32] Presque Isle Bay AOC - Delisted. (2019, September 17). Retrieved from https://www.epa.gov/great-lakes-aocs/presque-isle-bay-aoc-delisted

[33] Ibid.

[34] Ibid.

[35] http://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf

[36] Mason, S. A. (2019). Plastics, Plastics Everywhere. *American Scientist*, *107*, 284–287.

[37] US Department of Commerce, & National Oceanic and Atmospheric Administration. (2016, April 13). What are microplastics? Retrieved January 7, 2020, from https://oceanservice.noaa.gov/facts/microplastics.html.

[38] Mason, S. A. (2019). Plastics, Plastics Everywhere. *American Scientist*, *107*, 284–287.

[39] Svennevig, B. (2019, December 9). Microplastic to be mapped in the North Atlantic Ocean. *EurekAlert!* . Retrieved from https://www.eurekalert.org/pub_releases/2019-12/uosd-mtb120919.php?fbclid=IwAR3z2k9tGpiC1nIBUU5Ldrwkr-F_njPgXhES0bPP-vtOkSNfz4z38LhRcv8

[40] Daly, N. (2019, December 5). Why do ocean animals eat plastic? Retrieved December 11, 2019, from https://www.nationalgeographic.com/animals/2019/12/whales-eating-plastic-pollution/?fbclid=IwAR00X4R_lqH8xv5jXAoFPn-j9EXHOPppwYw_gDNxxKOasmqqMgLbsohszxM#close.

[41] Mason, S. A. (2019). Plastics, Plastics Everywhere. *American Scientist*, *107*, 284–287.

[42] Knoblauch, J. A. (2009, July 2). Plastic Not-So-Fantastic: How the Versatile Material Harms the Environment and Human Health. *Scientific American*. Retrieved from https://www.scientificamerican.com/article/plastic-not-so-fantastic/

fish, or animals, they are absorbed into the fatty tissues of our bodies. On a macro level, plastics in marine waterways or shorelines disrupt the habitats.[43]

Plastics are literally everywhere; plastics big and small are in clothing, electronics, cars, restaurants, businesses, and now food. A recent article revealed that nearly 60 percent of our clothing has polyester and the wash wastewater sends almost 500,000 tons of microplastics into our waterways each year.[44] That's the equivalent of 40,000 school buses. Further, World Resources Institute repeats that polyester emits nearly three times more carbon than when manufacturing cotton, exacerbating the impact of climate change.[45]

A study of the Great Lakes reveals that wastewater treatment plants, as well as storm water and sanitation runoff from cities, contribute significantly more to microplastics.[46] The Great Lakes system holds more than 20 percent of the world's fresh water and is rapidly becoming polluted with plastics.[47] The most abundant type of plastic is microfibers.[48] A recent study of Lake Erie showed that it has 46,000 plastic particles per square kilometer, second to Lake Ontario.[49] The contributing factors to the problem could be overflow from the connecting lakes and rivers, from microfibers in the air, from industry surrounding the coast lines, and from sewage, storm water and sanitation runoff. Another consideration for Erie is the presence of the plastics industry.

There are at least fifteen established businesses in Erie County alone in the plastics industry[50], not to mention the new plastics manufacturing plant planned in 2020 just outside of Pittsburgh.[51] Plastics is the future of economic development of Erie County. The previously mentioned cracker plant that can convert natural gas into resin is seen as the next economic boost for Erie County and the plant is partnering with engineers from Penn State Behrend .[52] The question is, how can the plastics industry work in harmony with the environment? Some assessment of the impacts on the industry level, whether it is manufacturing, molding, or assembling parts, should be considered.

Everyone should be encouraged to take responsibility to reduce the amount of plastic that we use in our everyday lives. Erie Insurance, a local Fortune 500 business, has taken steps to integrate new water fountains to reduce the number of plastic bottles on its campus. Over the last five years, these fountains have saved more than 4.6 million plastic bottles from production, the company states. In addition, it has nearly eliminated regular use of plastic packaging in its corporate cafeteria as its contracted food service provider now charges customers a fee for using plastic containers. Some local restaurants have also started to do their part by reducing plastic packaging and straws, seen most recently at establishments owned by Red Letter Hospitality, such as Molly Branigans and The Skunk & Goat.

What can individual consumers do? Buy less plastic, encourage academic research on plastics in the area, and try using alternatives. Never underestimate the power of one to make a change because the one becomes the many.

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[43] Ibid.

[44] Hanson, M. (2019, December 9). Fashion contributes to 10 percent of humanity's carbon emissions. Retrieved December 11, 2019, from https://bigthink.com/politics-current-affairs/is-fashion-bad-for-the-environment.

[45] Drew, D., & Yehounme, G. (2017, July 5). World Resources Institute: The Apparel Industry's Environmental Impact in 6 Graphics. Retrieved December 11, 2019, from https://www.wri.org/blog/2017/07/apparel-industrys-environmental-impact-6-graphics.

[46] Mason, S. A. (2019). Plastics, Plastics Everywhere. *American Scientist*, *107*, 284–287.

[47] EPA. (2019, April 4). Facts and Figures about the Great Lakes. Retrieved December 11, 2019, from https://www.epa.gov/greatlakes/facts-and-figures-about-great-lakes.

[48] Mason, S. A. (2019). Plastics, Plastics Everywhere. *American Scientist*, *107*, 284–287.

[49] Ibid.

[50] Erie Regional Chamber and Growth Partnership. (n.d.). Erie Region Manufacturers - Plastic. Retrieved December 11, 2019, from https://web.eriepa.com/manufacturers-plastic.

[51] Vazquez, M., & Diamond, J. (2019, August 13). Trump touts US energy production at new plastics plant in campaign-like event. Retrieved December 11, 2019, from https://www.cnn.com/2019/08/13/politics/donald-trump-pennsylvania-plastic-plant/index.html.

[52] Martin, J. (2018, July 8). There is an argument to be made that the cracker, capable of converting natural gas liquids into 3.5 billion pounds of polyethylene a year, could do more than preserve an already healthy slice of the economy. *GoErie.com*. Retrieved from https://www.goerie.com/news/20180708/eries-plastics-industry-could-be-helped-by-shell-cracker

Harmful Algal Blooms and Lake Erie

Harmful Algal Blooms (HABs) are colonies of organisms that are made up of a variety of microscopic algae, bacteria, and phytoplankton. Colonies can form in all types of water, and the presence of HABs is occurring across the world, the U.S., and the Great Lakes.[53]

HABs can produce toxins that are detrimental to marine life, birds, shellfish, waterways, and humans, and they create oxygen-poor zones in water, referred to as "dead zones." HABs can hurt economies in the Great Lakes region because they increase the cost of water sanitation systems, hurt tourism, and harm the ecosystem.[54]

The Great Lakes region has had several outbreaks of blue-green algae that has spread across the five lakes.[55] Although HABs are a persistent issue, HABs have plagued the Great Lakes region since the 1960s. The most significant outbreak in Lake Erie happened in August 2014 when the public water intake was clogged in Toledo.[56] Because Lake Erie is the shallowest of the lakes, the pollution is more pronounced than that of the other lakes. HABs proliferate in slow moving water, sunlight, and high levels of nitrogen and phosphorous.[57]

Photo: HABs in Lake Erie.[58]

Four identified factors contribute to the rise of HABs: stormwater and sanitation runoff from cities, agricultural runoff, raw sewage disposal from faulty sewage treatment lines and illegal dumping, and climate change. All of these deposit high levels of nutrients, particularly nitrogen and phosphorous, into marine ecosystems and create a warm stagnant environment perfect for HABs to flourish.[59]

Lake Erie saw a rapid growth of HABs in the 1970s from high levels of phosphorous as a result of untreated sewage seeping into the lake. It wasn't until the 1980s and 1990s, when cities installed more modern wastewater treatment plants to treat sewage, that phosphorus levels decreased, and HABs appeared better managed. Waste-water treatment plants were

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[53] NOAA (2019, October 2). Harmful Algal Blooms - Tiny Organisms with a Toxic Punch. Retrieved from https://oceanservice.noaa.gov/hazards/hab/

[54] Ibid.

[55] Lynch, J (2018). The Lurking Threat: Harmful Algal Blooms Pose Local, Global Hazard. Retrieved from https://www.jeserie.org/uploads/Essays/69729%20JES%20Algae%20Book.pdf

[56] Ibid.

[57] Redling A (2011, September). Lake Erie's ecosystem declining due to poisonous algae. Retrieved from https://www.lakescientist.com/lake-erie%E2%80%99s-ecosystem-declining-due-to-poisonous-algae/

[58] Stevens J (2019, July 30). Eerie Blooms in Lake Erie. Retrieved from https://earthobservatory.nasa.gov/images/145453eerie%20blooms%20in%20lake%20erie/eerie-blooms-in-lake-erie

[59] Rastogi R. P. (2015, Dec). Formation of cyanobacterial blooms. Retrieved from https://www.researchgate.net/figure/Formation-of-cyanobacterial-blooms-Schematic-illustration-showing-the-key-factors-such_fig6_284019974

successful in maintaining HAB levels until the 2000s, when fertilizer runoff from agricultural practices offset nitrogen levels in coastal ecosystems.[60]

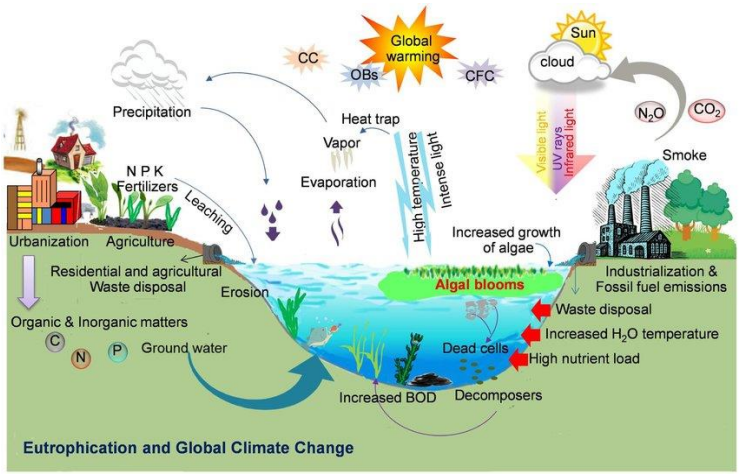


Photo: Flow Chart Showing Contributing Factors for HABs.[61]

Lake Erie still struggles with HAB levels. In July 2019, NOAA reported a severe outbreak of blue-green algae across Lake Erie. The primary bacteria are called microcystis cyanobacteria, which gives off a toxin that causes harmful health effects to humans and animals, causing liver damage and sometimes death, especially in dogs.[62] Researchers state that 2019 levels are the highest yet, according to NASA's Earthobservatory.[63] These high levels result from excessive rainfall that rushes agricultural runoff to rivers and lakes. Low to no wind allows algal blooms to accumulate at the surface of water, where it is warmest, creating an optimal condition for HABs to multiply.[64] Further, climate change exacerbates the issue at all levels by creating an optimal growth environment.[65]

An essay by Judith Lynch, the Jefferson Educational Society's Decadian Scholar, outlined what HABs mean to Erie County. As of 2018, Lake Erie and Presque Isle (though removed from as an AOC) still has water quality issues and high levels of HABs, particularly in Presque Isle Bay.[66] The HABs are still reported at high enough levels, often triggering the banning of swimming. She wrote that, given more research about the lake, there may be a connection between HABs and invasive species like Zebra Mussels or Quagga Mussels, both of which excrete phosphorus.[67]

For those looking to assist with the issue of HABs, plenty of organizations look for volunteers to monitor outbreaks. Many scientists call for an aggressive change to agricultural methods to reduce nitrogen and phosphorous runoff to waterways.[68] Using minimal or recommended amounts of fertilizers and employing proper septic system maintenance can reduce the amount of nutrients entering waterways like lakes and ponds, according to the Center for Disease Control.[69] A recent

[60] Genlang (2018, October 11). HARMFUL ALGAL BLOOMS AND DRINKING WATER PROBLEMS. Retrieved from https://www.michiganseagrant.org/?s=harmful+algal+blooms

[61] Rastogi R. P. (2015, Dec). Formation of cyanobacterial blooms. Retrieved from https://www.researchgate.net/figure/Formation-of-cyanobacterial-blooms-Schematic-illustration-showing-the-key-factors-such_fig6_284019974

[62] EPA (2019, July 17). Harmful Algal Blooms: Nutrient Pollution. Retrieved from 5.1. https://www.epa.gov/nutrientpollution/harmful-algal-blooms#effect

[63] Patel K (2019, July 2019). Eerie Blooms in Lake Erie. Retrieved from https://earthobservatory.nasa.gov/images/145453/eerie-blooms-in-lake-erie

[64] Ibid.

[65] Glibert, P. M. (2019). Harmful Algal Blooms: A Threat to the Waters of the World. Retrieved from https://www.jeserie.org/uploads/Algal%20Bloom%20Glibert%20FINAL%20VERSION.pdf

[66] Lynch, J (2018). The Lurking Threat: Harmful Algal Blooms Pose Local, Global Hazard. Retrieved from https://www.jeserie.org/uploads/Essays/69729%20JES%20Algae%20Book.pdf

[67] Ibid.

[68] Oregon Public Health (n.d.). Prevention & Control. Retrieved from https://www.cdc.gov/habs/prevention-control.html

[69] Ibid.

Jefferson Education Society Global Summit speaker, Patricia Glibert, addressed the global, regional, and local urgency of addressing these issues to combat climate change. The warmer our climate becomes, the more these issues persist.[70]

Water Levels

Across the globe, cities are being affected by rising water levels and communities are seeing the effects on infrastructure, tourism, and business. This rising phenomenon has recently been seen in Erie County along Lake Erie coastlines and throughout Presque Isle State Park. In 2013, experts feared that water levels would decline due to overall climate change and human-related interference. In a turn of events, however, the opposite has proved to be true, according to a June report in *Scientific American*. High water levels can be attributed to shoreline erosion, flooding, and property damage, among many other factors. If water levels continue to rise, we could potentially be living in a very different Erie County, with much of our current land area underwater.

In May 2019, Lake Erie broke its monthly record water level by a half a foot. The previous record was set in June 1986. According to the *Scientific American* report, there are three main influences on water levels: rain/snowfall, evaporation, and runoff.[71] This is evident on Lake Erie, as a greater amount of snow falls in the winter and melts more quickly due to shorter winters and rising temperatures. When the atmosphere is warmer, such as in the spring and summer, more water vapor is collected through evaporation. When temperatures cool down again, the saturated atmosphere releases all the water vapor it can no longer hold through large amounts of precipitation. On a global scale, these occurrences can be attributed to climate change.

On a local level, individual actions can further impact high water levels, such as greenhouse gas production. According to Clean Ocean Action, a New Jersey nonprofit organization devoted to protecting waterways, efforts can be made to reduce impacts once citizens are aware of their carbon footprint.[72] Local and state governments and private industry of Erie County can also promote practices that preserve waterways and coastlines. One such way is to develop policies that push for environmentally friendly infrastructure and business in the area. At least two local governments, the City of Erie and Millcreek Township, are proposing evaluations of our storm and sewer systems.[73]

Opportunity for Erie County: Obtain a research vessel to be used on Lake Erie

One opportunity for science and the Blue Economy in Erie County is to obtain a research vessel that is open to independent research scientists. Despite ongoing challenges in the lower Great Lakes ecosystem, research has been on the decline for the past 10 years. A significant reason for this reduction is the lack of access to the public research vessels combined with research facilities.

Two federal agencies operate research vessels on the Great Lakes: United States Geological Survey (USGS) and the EPA. The USGS vessels are devoted entirely to fisheries research projects and management.[74] The EPA vessel operates throughout all five of the Great Lakes, conducting two extended survey trips a year.[75] Non-federal researcher time on these vessels is minimal. Time ultimately depends on the schedule decided by the USGS or the EPA rather than on the needs of the accompanying independent research scientists. Some academic researchers do have access to working skiffs. However, these vessels are not appropriate for the open-waters of Lake Erie and Ontario. Research on the skiffs

[70] Glibert, P. M. (2019). Harmful Algal Blooms: A Threat to the Waters of the World. Retrieved from https://www.jeserie.org/uploads/Algal%20Bloom%20Glibert%20FINAL%20VERSION.pdf

[71] Gronewold, D., & Rood, R. B. (2019, June 8). Climate Change Sends Great Lakes Water Levels Seesawing. Retrieved from https://www.scientificamerican.com/article/climate-change-sends-great-lakes-water-levels-seesawing/.

[72] Clean Ocean Action. 10 Tips on Sea Level Rise. Retrieved from http://cleanoceanaction.org/fileadmin/editor_group2/COAST/10_Tips_on_Sea_Level_Rise_final.pdf

[73] Rink, M. (2019, July 16). Stormwater studies to help determine Erie-area needs, funding. Retrieved from https://www.goerie.com/news/20190716/stormwater-studies-to-help-determine-erie-area-needs-funding

[74] Lubeck M (2013, August 8). USGS Research Vessel Muskie. Retrieved from https://www.usgs.gov/media/images/usgs-research-vessel-muskie

[75] Lake Erie Research Vessel Argo. (n.d.). Retrieved from https://www.dec.ny.gov/outdoor/9243.html

can only deploy under the calmest of weather conditions, one day at a time (when most studies need multiple days), and do not offer the variety of platforms necessary for in-depth scientific research, such as, an onboard laboratory.

Currently, any projects that involve deep-water research, shoreline research, or any other open-water research are severely limited by the absence of a Lake Erie/Ontario based research vessel with capabilities for long-term travel and time on site.

A research vessel for Lake Erie and Lake Ontario could open funding opportunities through federal and state agencies; present a revenue stream from other Great Lakes researchers from across the region that could use the vessel; and initiate much-needed research. Research on plastics pollution, deep-water research on the ecosystems on the lake floor, pollutant changes in the water, invasive species maintenance, and broader data collection to track questions related to acid precipitation, climate change, and food webs in Lake Erie is necessary to understanding the ecosystems of the lake. Further, a healthy lake is vital for the economic development of Erie County.

Infrastructure for a Blue Economy

There is a growing awareness in cities that green and blue infrastructure can offer a wide range of ecosystem services to support a healthy urban environment. For example, landscape architects explore possibilities in their designs to use the potential of green elements for regulating air temperature, air quality, water storage and drainage, and noise reduction. Two areas that have a direct impact on Erie County's future are water management and alternative energy. Successful management of these two areas are critical to ensuring health and wellness in Erie County as it becomes more energy dependent but would also enhance an environment in which people want to live and conduct business.

Water Management

Erie County's water assets are a critical component to a successful and vibrant Blue Economy. Given that rivers and lakes are important resources for drinking water and aquatic life, pollution risks both public health and economic well-being. Maintaining healthy water systems is critical for Erie County to maximize its Blue Economy.

Watersheds

A watershed includes the entire drainage area of water sources. Erie County straddles the Lake Erie Watershed and the French Creek Watershed. Watersheds can be nested inside larger watersheds. The French Creek Watershed is part of a much larger system that includes the Allegheny, Ohio, and Mississippi River watersheds. The Lake Erie Watershed flows into Lake Ontario and out of the St. Lawrence River to the Atlantic Ocean.

[76]

The idea of watershed management is to effectively conserve soil and water resources. It involves management of land surface and vegetation to conserve the soil and water for immediate; and long-term benefits to the community. Protecting our watersheds can have a significant impact not only in our backyard but farther downstream.[77]

Two critical challenges that must be managed in Erie County are stormwater runoff and nonpoint source pollution. The Erie County Department of Planning defines these as:

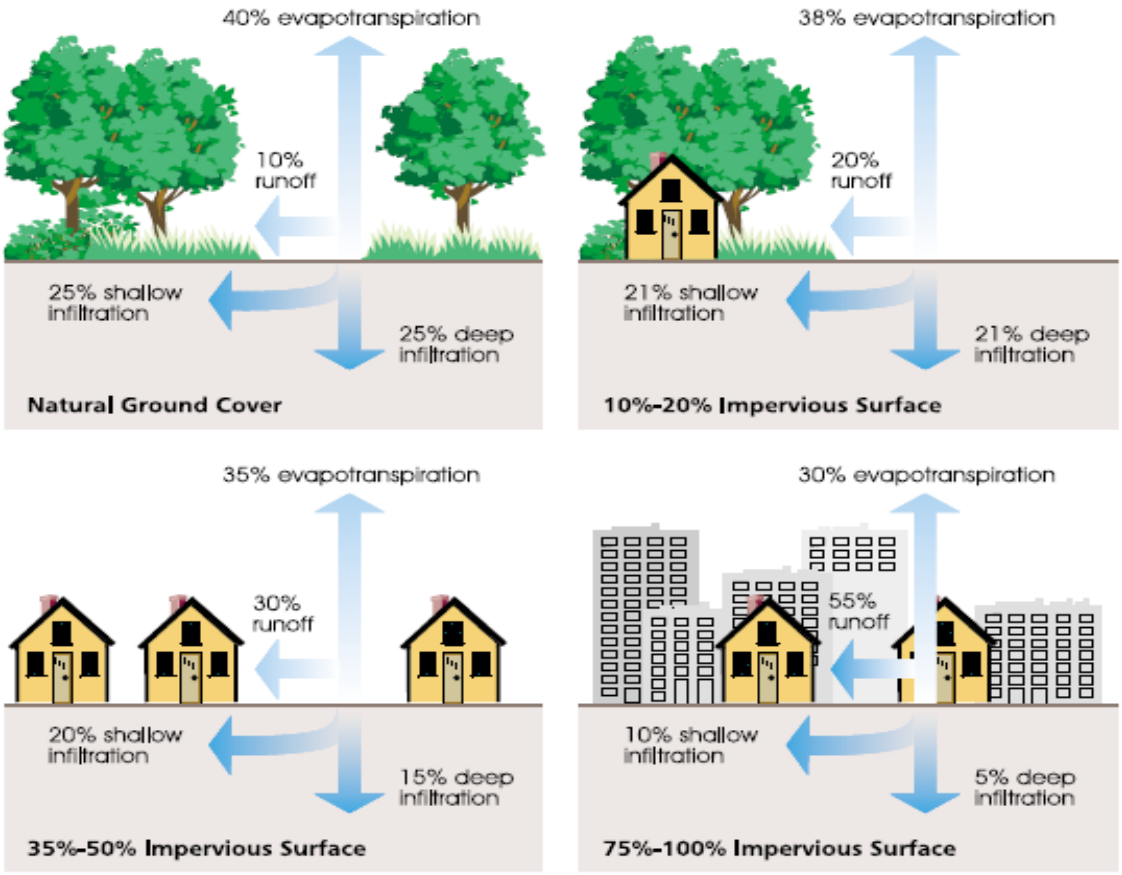
Stormwater

Stormwater is water runoff created by precipitation events, such as rainfall or snowmelt, which flow over land or impervious surfaces and does not infiltrate into the ground. Impervious surfaces include roads, parking lots, driveways, rooftops, or compacted soils, such as lawns or construction sites. These surfaces do not allow stormwater to percolate through the soils below. As the stormwater flows across these surfaces, it accumulates pollutants, debris, and sediment, which are then deposited into streams, rivers, and lakes. These contaminants have many negative effects on our watersheds.[78]

[76] (n.d.). Retrieved from https://www.bing.com/images/search?view=detailV2&id=55B0FA5EACE2A38CEFC6675C4CBF9597B0BF51BC&thid=OIP.EAE9odMRLXY9AvJUv3AMswHaFo&mediaurl=https%3A%2F%2Fwww.canada.ca%2Fcontent%2Fcanadasite%2Fen%2Fenvironment-climate-change%2Fservices%2Fgreat-lakes-protection%2Fmaps%2Flake-erie-drainagebasin%2F_jcr_content%2Fpar%2Fimg_0_0%2Fimage.img.jpg%2F1506361557477.jpg&exph=579&expw=762&q=pictures+of+the+lake+erie+watershed&selectedindex=17&ajaxhist=0&vt=0

[77] (n.d.). Retrieved from https://www.eriecountypa.gov/county-services/county-offices/planning-department/municipal-separate-storm-sewer-ms4.aspx

[78] (n.d.). Retrieved from https://www.eecenvironmental.com/what-is-stormwater-management/



[79]

Currently, Millcreek Township and the City of Erie are looking into repairs and upgrades of stormwater systems due to roads and other structures that were created over green space, watersheds and wetlands dating back to the 1970s and earlier.[80] Given that Erie County receives approximately 45 inches of rainfall each season, there is a need to address these impervious surfaces. This average rainfall, spread over Erie County's 799 square miles, puts Erie County's total rainfall at around 694,273,472,000 gallons per season. There is also approximately 104 inches of snow per year in Erie County, which add to the amounts of accumulated water that travels the county waterways as runoff.

The topography of Erie County is another factor working against it in the battle against pollution runoff and the contamination of our waterways. Erie County's highest elevation measures at 2,277 feet, while Erie County's lowest elevation measures at 1,137 feet. Lake Erie's shoreline elevation is 571 feet. With the different ranges of elevation, the urgency to keep polluted runoff out of Lake Erie is clear.

Furthermore, Erie County features 38 municipalities. Erie County's Act 167 planning process provides a county-wide program to assists all municipalities with planning and managing of stormwater for cooperating members. Participation and cooperation by each municipality is critical to ensuring efficient stormwater management and cost-effective maintenance.

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[79] (n.d.). Retrieved from https://www.bing.com/images/search?view=detailV2&id=612979A79F553893349ED0E4887982F921A687A8&thid=OIP.LfCt8nFFSGCyMxbZdKlA1wHaG2&mediaurl=http%3A%2F%2Fwww.ct.gov%2Fdeep%2Flib%2Fdeep%2Fwater%2Fpercent_impervious_cover.png&exph=500&expw=541&q=Types+of+Impervious+Surfaces&selectedindex=2&ajaxhist=0&vt=0&eim=0,1,2,3,4,6,8,10

[80] Rink (2019, July 16). Municipalities could consider new fee to address repairs, upgrades of stormwater system.. Retrieved from https://www.goerie.com/news/20190716/stormwater-studies-to-help-determine-erie-area-needs-funding

Nonpoint source (NPS) pollution

Nonpoint source (NPS) pollution comes from many distributed sources. Most nonpoint source pollution occurs as a result of runoff. When rain or melted snow moves over and through the ground, the water absorbs and assimilates any pollutants it encounters.

NPS pollution can include:

- Excess fertilizers, herbicides and insecticides from agricultural lands and residential areas
- Oil, grease and toxic chemicals from urban runoff and energy production
- Sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks
- Salt from irrigation practices and acid drainage from abandoned mines
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems
- Atmospheric deposition
- Land use changes and hydromodification or channelization of streams[81]

Potential issues if stormwater and nonpoint source pollution are not managed appropriately[82]

The Erie County Department of Planning also lists the following as potential issues that may arise if these two are not managed properly:

- Rivers and lakes are an important resource for drinking water. When they are polluted public health risks can increase.
- Sediment can clog pore space and damage important habitat for macroinvertebrates and other aquatic life.
- Fertilizers can cause excessive algae growth which depletes the oxygen in the water. Fish and other aquatic life need oxygen in the water to survive.
- Bacteria and other pathogens can create health risks when washed into beaches and other swimming areas.
- Debris, such as plastic bags, six-pack rings, and cigarette butts, washed into rivers can choke, suffocate, or disable ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, and motor oil can poison aquatic life.
- Polluted water or diseased fish is a public health hazard and can spread illness to people and pets.
- A lack of infiltration and recharge causes the groundwater level to drop and will lead to wells and springs going dry.

Sustainable Energy Possibilities

Erie County's landscape and environment lends itself to be an ideal home for various alternative energy solutions. The conversation has already started with the launch of the "Erie Emerging 2030 District" initiative in early 2019. Recently, the Erie 2030 District has been officially designated by the National 2030 Districts network. This means Erie County will focus on the promotion of clean and cost-efficient energy and water use while reducing transportation emissions.[83] This local effort is still in the planning stages but would encourage property owners to reduce their building's energy use, water consumption, and transportation emissions by at least 50 percent by the year 2030.

The initial partners in Erie's Emerging 2030 District are the City of Erie, Erie County, UPMC Hamot, Benedictine Sisters of Erie, Sisters of St. Joseph, Emmaus Ministries, Erie City Mission, First Presbyterian Church of the Covenant, and Mercyhurst University. In total, these partners have pledged nearly 2.5 million square feet of space to this initiative.

Elsewhere in the county, operators of the Union City Dam on French Creek were recently approached by a renewable energy firm that is considering the installation of a new hydropower system at the facility. Hydro Green Energy has applied for a preliminary federal permit to start the project that would create a new alternative energy facility with the capacity to provide power to as many as 1,000 households each year.[84]

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[81] (n.d.). Retrieved from https://www.eriecountypa.gov/county-services/county-offices/planning-department/municipal-separate-storm-sewer-ms4.aspx

[82] Ibid.

[83] Flowers (2019, February 25). "Erie Emerging 2030 District aims for energy, water, emissions efficiency." (n.d,). Retrieved from https://www.goerie.com/news/20190225/erie-emerging-2030-district-aims-for-energy-water-emissions-efficiency

[84] Palattella E. (2019, October 10). Go Erie.Com. Retrieved from https://www.goerie.com/news/20191010/hydroelectric-project-proposed-for-union-city-dam

As these opportunities present themselves, it is critical that residents and local officials embrace the path to a diversified energy portfolio. Knowing that there is support in Erie County for alternative energy, we outline two relevant applications that could build on this momentum – solar and wind.

Solar Energy

By using heat and light taken from the sun, and then changing it into thermal or electrical energy, solar power works as an alternative energy to dirtier energy sources like oil and gas. Solar energy is one way to generate heat, light and other forms of electricity. It is also one of the fastest growing energy sources in the world. With solar energy, the goal is to capture a small amount of energy from a giant energy source, the sun. Light travels from the sun and includes tiny packets of energy called photons, which generate heat and electricity.[85]

A common misconception is that sunshine fuels solar energy only during daylight. In reality, energy can be stored during the day to then be used at night. Even more relevant for Erie County, energy can be stored during the summer months to help with needs in the grayest of winter days.

Solar power in Erie can be seen at several sites. For example, the newly built housing on Parade Street, between East 19th and 20th Streets uses a passive housing model for better energy efficiency. Solar panels have been installed in various locations across Erie County and western Pennsylvania, including the Asbury Woods entrance sign, Erie Federal Credit Union, Millcreek Township Municipal Building, Phoenix Laser, Tom Ridge Environmental Center and many residential homes.

Wind

When renewable energy is thought of in northwestern Pennsylvania, offshore wind usually comes to mind. Pennsylvania isn't land-locked thanks to Lake Erie. Erie County is in the far northern corner of the state with almost 50 miles of shoreline and features ownership with control of more than 759 square miles along Lake Erie. This geography places Erie in an ideal position for offshore wind generation. Not only is Lake Erie close to major sources of energy consumption within a 500-mile radius (Detroit, Cleveland, Pittsburgh, Buffalo, Rochester, Chicago, Philadelphia, Toronto, etc.), but its shallow west basin and strong winds make it an ideal site for offshore-wind development that could provide much-needed carbon-free energy to the Pennsylvania, Jersey, Maryland (PJM) grid.

Wind turbines and offshore and onshore wind farms

A wind turbine is a device that converts the winds kinetic energy into electrical energy. A wind farm or wind park, also called a wind power station or wind power plant, is a group of wind turbines in the same location used to produce electricity. Wind farms can be based onshore (on land) or offshore (sea or freshwater), with key differences between the two. Below are some of the advantages and disadvantages of each. [86]

Offshore wind

Offshore wind power, sometimes referred to as offshore wind energy, is when wind over open water, usually in the ocean, is used to generate power. Wind farms are constructed in bodies of water where higher wind speeds are available.

One example in close proximity to Erie County, is a fresh-water wind farm being created on the shores of Lake Erie targeted for completion in 2020. This innovative project, being called the Icebreaker Wind project, may catalyze future offshore wind projects throughout the Great Lakes to create thousands of jobs and help to clean the air and water. It

[85] Naroju (n.d.). Why Is Renewable Energy Important For The Future?. Retrieved from https://www.riddlelife.com/why-renewable-energy-important-for-the-future/

[86] (n.d.). Retrieved from https://www.nesgt.com/blog/2019/07/offshore-and-onshore-wind-farms

should also lessen the nation's overall carbon footprint, which could reduce problems associated with climate change. Long-term effects of this project include the reduction of the emission of greenhouse gases into the air.

By 2020, this project is expected to produce about one gigawatt of power from its six-turbine offshore farm just eight miles from downtown Cleveland in Lake Erie. It is the first freshwater offshore wind project in North America. This project will provide energy for up to 16,000 homes.[87] [88]

Opportunity for Erie County: Develop new policies and invest in sustainable infrastructure that promotes clean water.

Erie County would benefit from a broad-scale strategy that focuses on green infrastructure and revitalization of non-utilized brownfield revitalization with an aim toward more sustainable practices that protect waterways. Development in these core areas would lead to new job opportunities, improve the environment and create a community where a diverse population could build new businesses and raise families.

Green Infrastructure

Green infrastructure is a new approach to stormwater infrastructure through organic growth, landscape design, water preservation, and retention. A few components of green infrastructure include water quality preservation, anti-flooding principles, rainwater harvesting, water/energy nexus (the relationship between the water used for energy production, including both electricity and sources of fuel), green space and property preservation.

Reducing the potential of impactful heavy stormwater occurrences can reduce the burden on both the cities and individuals alike. Erie County could benefit from increased investment in green infrastructure in these ways:

- *Water Quality*
  Stormwater peaks in urban areas deliver pollutants to our local streams, Lake Erie, and land areas. This includes pathogens, nutrients, sediment, and heavy metals. High stormwater flows can send untreated sewer water into our waterways. By retaining rainfall from storms, green infrastructure reduces stormwater discharges. Lower discharge volumes translate into reduced combined sewer overflows and lower pollutant loads. Green infrastructure also has an impact on stormwater that is not retained and reduces nutrients and sediment loads upon local waterways.

- *Flooding*
  Conventional stormwater infrastructure quickly drains stormwater into rivers and streams, increasing peak flows and flood risk. Green infrastructure can mitigate flood risk by slowing and reducing stormwater discharges through strategic planning.

- *Water supply*
  Rainwater harvesting and infiltration-based innovations increase the efficiency of the Erie water supply system. When water is collected through rainwater harvesting systems it can be used for outdoor irrigation as well as various indoor uses. Rainwater harvesting can significantly reduce municipal water use.

- *Water/Energy Nexus*
  Treating and moving drinking water and wastewater takes a lot of energy. By reducing stormwater inflow into sewer systems, recharging aquifers, and conserving water, green infrastructure could significantly reduce the energy burden on the Erie City Wastewater Treatment plant.

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[87] Fresh-Water Wind Farm on Lake Erie. (n.d.). Retrieved from http://www.alternative-energy-news.info/fresh-water-wind-farm-lake-erie/

[88] Lillian Hall, Moira Ledinsky, David DuBois (n.d.). Lake Erie Off-Shore Energy Project. Retrieved from https://aim2flourish.com/innovations/lake-erie-off-shore-energy-project

Another opportunity in Erie County is a Downspout Disconnection. This practice involves rerouting rooftop drainage via pipes down the side of a building. While similar to the design of gutters, the water will not be given free runoff. Instead, it would be redirected into the soil or bedding around buildings to be absorbed. The water can also be stored in rain barrels that allow homeowners and businesses to store water for future use, similar to the system being used at the Jefferson Society. Climate change is expected to continue to result in higher rainfall, which makes these options viable alternative in today's environment.

At left, water from a roof flows from this disconnected downspout into the ground through a filter of pebbles. At right, water is collected in rain barrels that store water for gardening, etc.

According to a recent study by Gannon University students, there are 300 potential commercial green roof sites within the Erie Emerging 2030 district.[89] The district consists of everything north of 19th Street, between Cranberry and Parade Streets, and is part of a national initiative to reduce energy, water, and transportation emissions by 50 percent by 2030.[90] Students graded the roofs of 465 commercial spaces in the district and found numerous buildings that could be fitted with green roofs. Elsewhere in the state of Pennsylvania, the Pittsburgh Water and Sewer Authority has plans to invest $130 million into green infrastructure projects over the next five years.[91] Forest Hills Borough building in the eastern suburb of Pittsburgh, also provides an example of good practices. It was designed to have no carbon footprint and offers numerous environmentally friendly features, such as rain gardens and bioswales. Councilwoman Patricia DeMarco led the initiative to update the building and invest in the green infrastructure that is intrinsic to the building.[92]

Although green infrastructure practices have not been widely embraced in our region, Erie County does have some local examples of where this technology has been fitted:

- The Whole Foods Co-op has developed a rain garden next to its parking lot that helps with stormwater filtration, while also helping to create a better flow for traffic.[93]
- The LEAF Education Center in Frontier Park uses stormwater filtration. LEAF's roof also helps with heating and cooling in the building, a secondary benefit of green roofs.[94]
- The Asbury Woods Nature Center and Gannon University's Nash Library are two examples of several properties in Erie County that have installed green roofs.[95]

[89] Ibid.

[90] (n.d.) retrieved from https://www.2030districts.org/about-network

[91] Colao (2019, October 16) "A Growing Opportunity: Green Roofs in Erie" retrieved from https://www.go-gba.org/a-growing-opportunity-green-roofs-in-erie/

[92] Morrison(2019, December 5) "How much green infrastructure will be included in ALCOSAN's $2 billion upgrade to prevent sewage overflows?" retrieved from https://www.publicsource.org/how-much-green-infrastructure-will-be-included-in-alcosans-2-billion-upgrade-to-prevent-sewage-overflows/

[93] (2017, September 7) "Environment Erie and Co-op Unveil Rain Garden" https://www.environmenterie.org/events-resources/newsroom.html/article/2017/09/07/environment-erie-and-co-op-unveil-rain-garden

[94] (n.d.) retrieved from https://www.leaferie.org/green-roof/

[95] Colao (2019, October 16) "A Growing Opportunity: Green Roofs in Erie" retrieved from https://www.go-gba.org/a-growing-opportunity-green-roofs-in-erie/

The benefits of a Green infrastructure include a reduction in the cost of infrastructure, promoting economic growth and creating construction and maintenance jobs. A range of new training and certification programs will continue to emerge as demand for green infrastructure skills increase in our region. Erie County should consider offering financial incentives to those who integrate green infrastructure practices.

Brownfield Revitalization

A brownfield is a property that has been reclaimed from industrial purposes, manufacturing, tool and die, or other kinds of industrial application. It is likely that contamination may have occurred during industrial operations, meaning there is a presence or potential presence of a hazardous substance, pollutants, or contaminants in the soil of the now vacant property requiring remediation. A shuttered industrial facility will likely cause painful economic hardships for a community, but may also leave behind vacant land that is environmentally compromised due to the amount of pollutants that have been introduced into the soil over many years.[96] This is a common issue for Erie County given the amount of industrial facilities that once fueled our economy.

Brownfields can be remediated through various means, dependent upon the amount and types of contamination that may have occurred, as well as the knowledge available about processes and chemicals utilized on the site.[97] Below is a list of various remediation processes available for these polluted sites:

- Point-source contamination removal: removal of polluting pipes, tanks, or other objects.
- Excavation and disposal: a common practice if an area is already going to be excavated; difficulties can include site accessibility, depth of contamination, and area safety issues; soil can be treated off-site and returned to the project site, or it may be used on a landfill site.
- Containment: for complex pollution problems or large areas; sites that are surface-sealed must be maintained like a landfill with consideration to groundwater; containment may be used for parking lots or industrial buildings without basements, but this can restrict future changes to site use.
- Immobilization: for sites with heavy metal contamination of groundwater; metals may include lead, chromium, arsenic, zinc, and mercury, among others, and immobilization uses chemical processes to fix these metals to soil particles so that they cannot leach out.
- Soil vapor extraction: used for contamination above the water table; involves drilling of extraction wells and creation of a vacuum to pull out underground VOCs in vapor form.
- Phytoremediation: planting species that produce chemicals that react with or immobilize contaminants, species that can degrade contaminants around their roots, or species that draw up contaminants from the soil into shoots and leaves, which must then be disposed of.
- Microbial remediation: speed the degradation of hydrocarbon contaminants with the use of microbes.
- Mycoremediation: use of fungal species to degrade contaminants.
- Thermal desorption: heating of soil to make contaminants more volatile; when contaminants off-gas from the soil, they can be collected and destroyed.

The City of Erie has already seen benefits realized through the revitalization of the former GAF site on the bayfront. Today, the site is home to a parking facility that is available for use by guests of the Courtyard Marriott, the Bayfront Convention Center, and others. The exciting news is that more funding is funneling into Erie County. An Erie Times-News article from July 2019 pointed out that Erie County will receive $526,000 from the EPA to assess brownfield sites and prepare cleanup plans. The money has been awarded to the Erie County Industrial Development Authority, which will conduct environmental site assessments and prepare cleanup plans for several sites in Erie County. Partners in the project include the Corry Redevelopment Authority and the Enterprise Development Center of Erie County.[98]

[96] (n.d.). Retrieved from https://www.go-gba.org/resources/green-building-methods/brownfield-remediation/

[97] (n.d.). Retrieved from https://www.epa.gov/brownfields

[98] Times-News staff (n.d.). Erie, Crawford counties receive brownfield grants. Retrieved from https://www.goerie.com/news/20190702/erie-crawford-counties-receive-brownfield-grants

Economic Development for a Blue Economy

Today, economic development in the Erie region cannot be fully evaluated without considering the evolution of the economic drivers of our community – past, present and future. Tourism is a key component of the Blue Economy and has become an increasingly important economic driver in our region. Erie County is continuing to develop into an attractive place to both visit and live. From natural resources to the arts and entertainment offerings, Erie is continuing to expand its offerings within tourism.

History

The emergence of the Erie region started with the early American settlers, who quickly realized its strategic port location. Erie's development relied heavily on its identity as a port city for the next 150 years. Erie became an important location for manufacturing during the Industrial Revolution, manufacturing primarily iron and steel. Over the years, Erie has slowly shifted to a more service-oriented economy, and is now becoming increasingly dependent on insurance, health care, education and tourism. Manufacturing accounted for more than half of all Erie jobs in the early 1950s but accounts for only 14.4 percent today.[99] This evolution has allowed for a new engagement with our waterfront as prime real estate on our bayfront has opened to new uses that will support our expanding tourism industry.

Present

As anti-pollution measures have taken effect, tourism in Erie County has grown. The county's greatest assets as a tourist destination are the miles of beach, boating, fishing and access to Lake Erie. These assets are a vital piece of Erie's economy. As a result, there have been millions of dollars invested to help transform local tourism into a billion-dollar industry. With Erie's tourism lure increasing there has been an uptake in visits yearly. According to VisitErie, visitors spent $463 million in Erie in 2001, compared to $1.2 billion in 2016.[100] This reflects a dramatic increase in Erie's tourist attractions. VisitErie President John Oliver has stated that over the span of the last five years VisitErie has run over 25,000 television advertisements in bordering cities such as Pittsburgh, Buffalo, Cleveland and Columbus.

The region has seen considerable development of its tourism assets in the past 15 years with various new hotels, a casino, minor league sports teams, Splash Lagoon Indoor Water Park, numerous brewpubs and wineries, as well as continued expansion and investment for existing properties such as Waldameer Park & Water World. All of these investments have contributed to increasing tourism visits in the Erie region which will continue to be a vital driver of future economic development.

In addition, Presque Isle State Park, a 3,200-acre sandy peninsula, offers visitors many recreational activities that include seven miles of beaches, swimming, fishing, hiking, boating, bicycling, in-line skating, cross country skiing, kayaking, canoeing, rollerblading, ice skating, and scenic boat tours. Presque Isle boasts many unique habitats and is home to several of Pennsylvania's endangered, threatened, and rare species. It is a favorite spot for migrating birds. Presque Isle Bay is a beautiful 3-mile body of water that stands between the park and the City of Erie. This protected harbor made Erie County an important shipping port in its early years and remains one of the only two ports that can accommodate a 1,000-foot shipping vessel on the Great Lakes.

Formerly a commercial fishing center, Erie is now a Sport Fishing attraction with many charter boat operations headquartered here. An average of 1.5 million fish are caught by anglers each year in the lake, Presque Isle Bay, and tributaries.[101] There is a total of 14 lake tributaries throughout the Erie region allowing for both local and non-local

[99] Klingensmith, J.Z., & Louie, K. (n.d.). Erie. Guide to the Erie Economy. Economic Research Institute of Erie. Retrieved from https://eriedata.bd.psu.edu/sites/default/files/2019-07/2019%20ERIE%20Guide%20-%207th%20edition%20-%20FINAL.6%20-%20Combined.pdf

[100] Martin, J. (2019, February 19). Erie's tourism business continues to grow. Erie Times News. Retrieved from https://www.goerie.com/news/20190219/eries-tourism-busienss-continues-to-grow

[101] Lake Erie. (n.d.). Retrieved December 7, 2019, from https://www.fishandboat.com/resources/lakes/pages/lakeerie.aspx.

fishermen to experience a variety of habitats for fishing. Also, fishing in Erie is not just limited to the summer months. Some of the best fishing is taking place in the cooler months of fall or early spring. In the winter, Presque Isle Bay's ice-covered waters become a haven for ice fishermen.

Throughout Erie County there are a total of 23 wineries, 14 breweries, and five distilleries. The wineries are a large tourist attraction in the county, and they are constantly attracting both out of town and local residents. The industry reports that guests will often visit wineries and then support other local businesses, such as restaurants and hotels, in the area.

Utilizing natural resources and creating new tourism opportunities is often the goal for attracting visitors to the region. For example, the North East Chamber of Commerce has hosted the North East Wine Festival for the past 38 years, bringing nearly 20,000 people into town each year. In 2019, the festival hosted more than 22,000 attendees over a three-day period in September. Holly Ferrugia, Executive Director of the North East Chamber, stated: "It brings in 75 percent of our budget annually. Retailers who specialize in goods and not services, say the festival represents 35 percent of their annual budgets in just a three-day period. Eight out of the 10 wineries that participate have expressed that Wine Fest is their largest grossing weekend of the year. Also, for the past five years, the festival has donated an average of $10,000 each year among five non-profits that volunteer their time carrying out the tasks that make the event a success. The weekend is about so much more than wine drinking and entertainment. It is a major source of income for the community and helps to keep our economy growing," Ferrugia said.

A large variety of fairs and festivals also attracts many visitors who enjoy the various municipalities and their unique offerings. Some of the most popular include:

- Summer Ethnic Festivals
- North East Wine Festival
- North East Firemen's Cherry Festival
- Wattsburg-Erie County Fair
- Waterford Fair
- Waterford Heritage Days
- Albion Fair
- Dan Rice Days in Girard

Future

The City of Erie is currently going through what many are calling a "Renaissance Period," with increased focus on both the downtown and bayfront area. A number of public and private enterprises have been created in recent years to help reshape and steer Erie's economic future. Following is a short list of projects that will have a major economic impact to Erie's Blue Economy.

- **Port Authority Master Plan**
  - The Port Authority's Master Plan for bayfront Development is a 20-year plan to redevelop the City's bayfront area. This plan intends to add:[102]
    - 500-plus residential units to the bayfront
    - 160,000 square feet of office space
    - 107,500 square feet of retail space
    - Three restaurants
    - 2,000-plus parking spaces
    - Two hotels with more than 220 rooms
    - The Master Plan predicts it will have a financial impact of more than $1 billion for Erie with a projected $48.3 million coming from tourism and recreational sources.

[102] Port Erie Master Plan. (n.d.). Retrieved December 10, 2019, from http://beattydevelopment.com/harbor-point/.

- **UPMC Ball Park**
  - Received a $12 million grant to upgrade: [103]
    - Park Entrance, Ticket Office and Team Store
    - UPMC Park Stadium Club
    - Scoreboard
    - Picnic and Beer Gardens
    - Visitor Suites
    - Playing Surfaces

- **Harbor Place Development**
  - Proposed 10-Phase $160 million development on the East bayfront by Scott Enterprises
  - Projects include:
    - Residential Units
    - Office Space
    - Parking Garages
    - Skating Rink
    - Green Spaces
    - Restaurants

- **Erie County Convention Center: GAF Site**
  - Currently a vacant 12.5-acre waterfront site
    - GAF closed its shingle plant in 2007 and demolished the site in 2010
    - Property has seen $7 million state-funded environmental cleanup
    - One parking garage has been built on the site
    - Plans have been developed for a possible mixed-use site which may include space for offices, retail shopping, and restaurants

- **Erie Downtown Development Corporation**
  - Development focused on the poorest zip code in the commonwealth of Pennsylvania, with an average median income of less than $10,000 per year.
  - Initiatives include:
    - Renovating properties on lower State Street
    - Ground-up development for new office, multifamily and retail outlets
    - Increasing job opportunities in the downtown area
    - Increasing community engagement around the common goal of revitalization

Erie Bayfront: Reaching its Full Potential

The bayfront presents a large opportunity for development and tourism in Erie. In 2007, Erie built a major convention center on its bayfront. The $44 million and 145,000-square-foot facility is now home to many different events and ceremonies during the year. Although the convention center was built more than ten years ago, bayfront development from private investment remains unrealized.

Hotels, restaurants and bars drive foot traffic to the bayfront along with recreational attractions such as mini golf, museums, the Bicentennial Tower, and walking paths along the water. Unfortunately, the recreational attractions are largely seasonal with few opportunities for tourism spending between the months of October and May. This represents a huge loss of revenue and should be addressed to help improve seasonality on the bayfront. For instance, an ice-skating rink would be a nice complement to the current offerings as it would help to drive tourism spending during colder months.

[103] UPMC Park Improvements. (n.d.). Retrieved December 10, 2019, from https://www.milb.com/erie/ballpark/upmc-park-improvements.

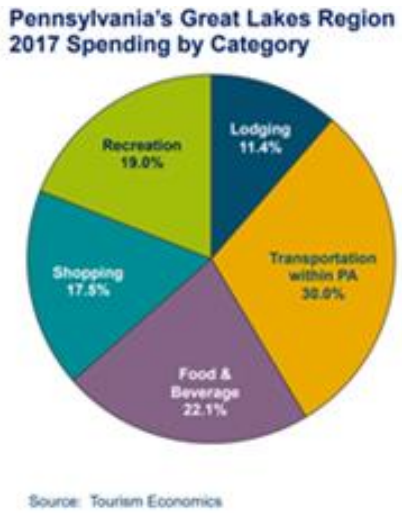
Another well-documented issue is the lacking pedestrian linkage from downtown to the bayfront. Today, downtown visitors are challenged with crossing four lanes of traffic to reach the bayfront which is quite dangerous and limits this area from reaching its full potential as a tourist attraction. Seven projects are currently underway to address the lack of connection between the downtown and the bayfront. The Pennsylvania Department of Transportation is developing a $30 million master plan to develop a pedestrian connection which will likely include bridges over the roadway to help encourage foot traffic. Additionally, urban planners have suggested the use of a trolley system as a connection, but this proposition has been met with some resistance locally. A trolley would be an attraction itself and has been used successfully in many U.S. cities, including Dallas, Kansas City, Seattle, Portland, Detroit, and Cincinnati.

Economic Impact and Growth Thus Far

Being located on Lake Erie is extremely beneficial to our local economy. Our location uniquely positions the Erie Region as the prime Pennsylvania location for Blue Economy related tourism. Erie is Pennsylvania's only Great Lakes Port City and features one of state's top attractions and National Natural Landmarks, Presque Isle State Park. The peninsula provides 11 miles of hiking trails, 13.5 miles of biking, plus birding, fishing, boating, kayaking and more.[104] Tourism brings money into the region leading to job development and business growth plus it helps to increase our sense of local pride. Other attractions, such as the Tom Ridge Environmental Center (TREC), U.S. Brig Niagara, Splash Lagoon, Presque Isle Downs & Casino, and Waldameer Park & Water World, are draws for not only out-of-town guests but also local residents. These large attractions lead to growth in related ventures such as wineries, brewpubs, restaurants, hotels, performing arts, sports events, and festivals.

This is an exciting time for the Erie region with a large amount of energy directed toward growth and development in the tourism industry. Positive indicators include: [105] [106]

- Wages earned through tourism related employment increased from $187 million in 2001 to $404 million in 2016.
- Tourism-related employment increased from 10,000 jobs in 2001 to 17,000 jobs in 2019.
- Hotel room sales have increased from $43.4 million in 2006 to $87.8 million in 2018.
- Travelers spent $1.7 billion in the Great Lakes Region (Erie, Crawford, Mercer, and Venango Counties) in 2017 - a new record high. Erie County's share was close to $1 billion.



[104] VisitErie. (n.d.). Retrieved from https://www.visiterie.com/press/

[105] The Economic Impact of Travel in Pennsylvania. Tourism Economics, An Oxford Economics Company. Retrieved December 6, 2019, from https://visitpa.com/sites/default/files/pdfs/2017_Economic_Impact_of_PA_Travel_and_Tourism_FINAL.pdf.

[106] Klingensmith, J.Z., & Louie, K. (n.d.). Erie. Guide to the Erie Economy. Economic Research Institute of Erie. Retrieved from https://eriedata.bd.psu.edu/sites/default/files/2019-07/2019%20ERIE%20Guide%20-%207th%20edition%20-%20FINAL.6%20-%20Combined.pdf

There is more good news statewide. Pennsylvania is expected to benefit from a recent bill signed in 2018 by Governor Tom Wolf that closed a tax loophole being exploited by discount travel sites. Act 109 is expected to generate an extra $23.8 million in tax revenue, which will be used to promote Pennsylvania tourism.[107] Efforts by VisitErie, the regional tourism promoter, are already taking advantage of this new funding. A recent increase in newspaper and TV ads in the Pittsburgh market may increase the market share within the state.[108] While the Great Lakes Region is seeing substantial growth, the overall share of traveler spending is relatively small within the state.[109]

The Erie Community Foundation cites six peer counties as identified by the Erie County Department of Planning and the Erie County Data Center.[110] A county with similar Great Lake access is Brown County (Green Bay), Wis. Brown County attracts tourists with attractions similar to Erie, such as amusement parks, sports arenas, lake access, and state parks. Brown County is also seeing similar growth in 2018 within traveler spending, business sales, and jobs.[111]

Without the tourism draw of an NFL football team like Green Bay, indications are that Erie is doing well when comparing tourism jobs and spending to a peer county.

	Tourism Jobs	**Traveler Spending**	**Population**
Erie County, Pa.[112]	17,000	$1.2 billion	272,061
Brown County, Wis.[113]	12,143	$697 million	263,378

*All data as of 2018 excluding Erie County traveler spending (2016)

[107] Klingensmith, J.Z., & Louie, K. (n.d.). Erie. Guide to the Erie Economy. Economic Research Institute of Erie. Retrieved from https://eriedata.bd.psu.edu/sites/default/files/2019-07/2019%20ERIE%20Guide%20-%207th%20edition%20-%20FINAL.6%20-%20Combined.pdf

[108] Ibid.

[109] The Economic Impact of Travel in Pennsylvania. Tourism Economics, An Oxford Economics Company. Retrieved December 6, 2019, from https://visitpa.com/sites/default/files/pdfs/2017_Economic_Impact_of_PA_Travel_and_Tourism_FINAL.pdf.

[110] Erie Community Foundation. (n.d.). Erie Vital Signs. Retrieved from https://www.erievitalsigns.org/dashboard.

[111] Ryman, R. (2019, May 6). Brown County tourism continues to grow, business sales topped $1.15 billion last year. Green Bay Press Gazette. Retrieved from https://www.greenbaypressgazette.com/story/news/2019/05/06/brown-county-tourism-spending-up-4-percent-last-year-worth-1-15-billion/1118073001/

[112] Martin, J. (2019, February 19). Erie's tourism business continues to grow. Erie Times News. Retrieved from https://www.goerie.com/news/20190219/eries-tourism-busienss-continues-to-grow

[113] Ryman, R. (2019, May 6). Brown County tourism continues to grow, business sales topped $1.15 billion last year. Green Bay Press Gazette. Retrieved from https://www.greenbaypressgazette.com/story/news/2019/05/06/brown-county-tourism-spending-up-4-percent-last-year-worth-1-15-billion/1118073001/

Opportunity for Erie County: Evolution of Tourism in a Blue Economy

The seasonality of the Erie region continues to have a negative impact on the local tourism economy. There are many activities from June to September that drive and showcase the potential for Erie. However, in the fall and winter months, Erie tends to hibernate. This is a missed opportunity that we can showcase our outdoor attractions, i.e. parks, ice skating, ice fishing, and so on. By building traffic in these winter months, it will continue to grow and better the local tourism economy.

Despite the inherent challenges the climate imposes on Erie County as a year-round tourist destination, the region's current assets lend themselves to supporting the industry 365 days a year. Erie is home to three professional sports teams, with their seasons of play covering all 12 months. It also has 14 breweries, 23 wineries, numerous museums and concert venues as well a robust theater scene. Additionally, Presque Isle State Park offers a wide variety of activities throughout the winter months.

As organizations such as VisitErie, The Erie Chamber & Growth Partnership, Erie-Western Pa. Port Authority, and the Erie Downtown Development Corporation continue to invest time, capital and resources into downtown and the surrounding areas, Erie continues its forward momentum toward realizing its full potential as the true "Riviera of Pennsylvania," as Governor Wolf likes to say.

In addition to the current investment and economic development involving Erie's Blue Economy, there are a multitude of potential industries. Blossoming Blue Economies around the world have integrated their waterfront and economy with renewable energy, marine biotechnology, fisheries and aquaculture. These are definite possibilities for the Erie region and would complement the tourism industry. The evolution of a Blue Economy in today's age thrives with the incorporation of multiple industries seamlessly.

Summary of Core Themes

Given Erie County's rich history of manufacturing, to a community reinventing itself through diversified commerce and investment in new opportunities, embracing a Blue Economy is more relevant in 2019 than ever before. Erie is addressing economic challenges head-on by bringing together community, business, philanthropic, and political leaders to develop initiatives to serve the city's residents and meet the community's needs. In doing so, it is imperative that Erie County capitalizes on its largest natural resource, Lake Erie, by incorporating sustainable solutions that will attract new economic opportunities and engage responsibly with its water assets.

The Blue Economy conversation has expanded from its roots in ocean communities and their ecosystems across the globe, to the exploration and investment at the federal level in the United States, to grants and research at the state level and throughout the Great Lakes region. For Erie County, the time is now to set the foundation for a vibrant future filled with economic opportunity.

The mission of the 2019 Jefferson Civic Leadership Academy cohort is to create a dialogue about the Blue Economy concept and highlight areas of opportunity within three focus areas: science, infrastructure, and economic development. While this is only the beginning of serious consideration, we believe that education and investment in these areas will create the momentum necessary to put Erie County on the path toward a sustainable Blue Economy.

Science

The big opportunity the cohort highlights regarding science is the potential to obtain a research vessel for Lake Erie. Having this tool in Erie County would provide critical data needed to make decisions in a variety of areas (i.e. water management, fishing, waste management, etc.) and could support educational programing both in and outside the region. This vessel could create the possibility for deep-water, shoreline, or any other open-water research that requires long-term travel and time on-site. This would benefit Erie County by opening new research opportunities for regional universities to expand

research, enable better data collection to monitor aquatic life and potential energy opportunities, and serve as a tool to attract more state and federal funding to Erie County.

Infrastructure
We have identified green infrastructure and brownfield revitalization as the major opportunities for infrastructure in a blue economy given Erie County's history as a manufacturing hub, the Erie Emerging 2030 District initiative and recent momentum around sustainable infrastructure funding in Pennsylvania. A well-designed green infrastructure would lay the foundation for improved water management that would help to reduce contaminants in our waterways caused by various sources of stormwater runoff and nonpoint source pollution. We also believe this initiative would promote economic growth and create new job opportunities given the ongoing maintenance needs of these systems.

With funding support recently announced for Erie County, we believe brownfield revitalization is a highly relevant opportunity for our local blue economy. Capitalizing on this opportunity will help to remediate more abandoned industrial sites and create opportunities for new development to drive economic growth.

Economic Development
Tourism is a key component of the Blue Economy and has become an increasingly important economic driver in our region. Recent development on our bayfront further enhances the appeal of our region as a tourist destination. Further investment in tourism is a major opportunity for Erie County, which should emphasize our blue assets to drive economic development.

Call to Action

This report is intended to define a Blue Economy and examine problems, solutions, and future opportunities for Erie County. The cohort hopes that content from this report will create a unified approach for a Blue Economy in Erie County and ultimately be showcased in an educational exhibit that will be sponsored by a local partner. The educational display could serve as a medium to educate a broader audience and highlight shared objectives.

Potential partners are listed below for each area of focus:

Science: TREC, DCNR, Local Universities

Infrastructure: Erie Water Works, Erie-Western Pa. Port Authority, City of Erie, Erie County

Economic Development: VisitErie, Erie Chamber, TREC

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