

**DESIGNING LANDSCAPES FOR ECONOMY:
Designing Regional Landscape Infrastructure to Enable Economic and Environmental Benefits**

by

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Designing Landscapes for Economy

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ABSTRACT

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By Lindsay Reul

Submitted to the Department of Urban Studies and Planning on May 29, 2012 in Partial Fulfillment of the Requirements for the Degree of Master of City Planning.

This thesis seeks to deploy landscape design as a regional economic development strategy. It investigates the relationship between economic activity and the built environment. Economies transition from one trend to the next at a faster pace than urban stock, meaning the landscape and infrastructure, is able to adjust. Thus, flows of ephemeral economic phases leave patterns of durable infrastructure elements that may not serve as relevant or useful purposes in the emerging economic movements. These landscapes and infrastructure elements can then become underutilized or obsolete. Instead of allowing these facets of the built environment to fall subject to abandonment, entirely rely upon subsidies, or solely become a commodity tourist attraction, this thesis seeks to redesign and repurpose old infrastructure to deliver productive services to the surrounding contemporary society.

This paper asks if adaptively repurposing regional infrastructure can contribute positively to regional economics. In order to test this argument, it investigates a single case study – the Erie Canal in Upstate New York. The Erie Canal was a piece of 19th century infrastructure built in 1825 that gave substantial rise and economic prosperity to the region. However, since its initial opening, the Erie Canal has declined in relevance and today suffers from underutilization. This paper seeks to discover if redesigning and repurposing

the Erie Canal can generate both economic benefits and ecologic benefits to contribute positively to the surrounding urban region. It applies a systems-based design approach to assess the current conditions of the Canal, and then identifies points of leverage, or catalyst sites, along the linear system that will most greatly engender positive benefits for the entire surrounding region.

A full mapping assessment was conducted per the research principles of systems-based design. Further economic and site information was recalled through secondary source reports and interviews. From these research methods, three typologies of catalyst sites and spaces were identified along the linear canal system and five potential economic opportunities were identified in the Erie Canal Region. This thesis proposes three alternative trajectories to move forward with these physical and economic findings: conduct a primary source investigation to discover the true potential of the latent economic opportunities surrounding the canal; remove the subsidy from the Canal budget all together and deinfrastructure the waterway to a natural state; or amplify the natural strengths of the Canal by diversifying its utilization.

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I. Setting the Stage

Economic development is a pervasive objective for regions around the globe that seek to improve their standard of living and economic vitality. Depending on the regional needs, these improvements have been met through developments in increased literacy, environmental sustainability, social inclusion, public health, and basic infrastructure. Using place-based capital projects, such as the construction of infrastructure, as a means of delivering economic development has long-term challenges. There is a fundamental tension between the enduring nature of the built environment and the ephemeral nature of elastic economic phases. In other words, landscapes support urbanization and the economy by supplying ecosystem services and environmental resources to those societies. When economies shift and markets demands change, the utilization of the landscape and the purpose of the infrastructure sometimes become obsolete.

As economies transition from one trend to the next, the urban stock in the landscape may not necessarily update to fit the newly emerged economy, and instead falls into an underutilized state with antiquated logistics, infrastructure, programming, or scale. Upon construction, the built environment is matched to the social and economic needs. However, once that economic phase has passed, and the next phase emerges, the durable elements of the original infrastructure build-out are already lagging (Berger & Sagan, 2006). The prevailing

CHAPTER ONE | INTRODUCTION



economy takes on a different focus, a modernized technology, or a different location – all changes that diminish the employment of the developed built environment.

A good example of this phenomenon, when landscape utilization becomes obsolete over time, can be seen in the post-industrial regions of the Northeast and Midwestern United States. Historically, these regions rapidly developed as part of the booming manufacturing economy that developed over the course of the 19th and 20th centuries. The majority of the US economy was based on manufacturing the raw resources harvested from the American landscape into goods and commodities. After World War II, the American economy began to radically shift from an industrial economy to a predominantly service economy. Service economies provide services rather than goods, such as consultation, communication, banking, and retail (Merriam-Webster, 2012). They require proximity to people and as a result are usually drawn to urban centers (Glaeser & Kohlhase, Cities, Regions and the Decline of Transport Costs, 2003). This was primarily fueled by vast improvements in technology, in both transportation and communication, and globalization. The landscape in many of these intensely industrialized areas could not modernize with the times and as a result, many post-industrial landscapes have since the end of the Second World War devolved into so-called post-industrial “Rust Belts”. These regions are commonly recognized by their shared characteristics: obsolete industrial infrastructure laying in ruins in the landscape;

over-sized cities for modest-sized populations; quietly stagnant or decreasing economies; and steady population drains (Berger, Drosscape: Wasting Land in Urban America, 2006).

With the dawn of the environmental movement, a rising awareness in climate change and anticipated crises to access clean drinking water has inspired widespread concern for the diminishing state of our finite resources, which has encouraged a global value for sustainable practices. In this light, developing disposable landscapes in response to emerging and ephemeral economies is problematic. Periods of economic growth give rise to the construction of public infrastructure in order to keep up with the rapidly expanding pace of urbanization. Entire regions spring up to development pressure, but when the economic impetus subsides, large networks of infrastructure lay underutilized in the landscape.

Expanding the urban footprint unnecessarily is highly wasteful of the natural resources in the environment – especially if the urban expansion leaves a trail of abandoned, degraded habitat in its wake. It is also detrimental socio-culturally to individuals who have limited mobility and are not able to readily transplant themselves in light of economic opportunities. Strategies for reutilizing our existing built environment are needed to reinvest in the infrastructure and landscape we currently inhabit such that they support the continuously evolving economy and demands of society.

II. Current Address: The Problem

When major economic forces are on the rise, so are the landscape and urban infrastructures that support the trends. However, since economic trends tend to have a more ephemeral life span than constructed elements in the landscape, shifting economies cause landscape uses to be rendered obsolete. Designing fixed, single-purposed infrastructure for fluid processes, physical milieu (ecology) and the intangible forces (economics), is the key problem. Residual architecture, contamination, and functionality are left as entropic processes and disvalued over time.

The current address of these residual landscapes is also problematic. Many of them are taken out of primary productivity and forced into tourism, heritage, or neglected categories. Their only economic value is in their spectacle attraction as a tourist site or subsidized preservation as a historic landscape. For those landscapes that are neglected, many become vandalized or are eventually abandoned.

In order to reconcile this discordant relationship between the fluid forces of the natural environment and the static properties of the built environment, this thesis addresses the design and program of large infrastructure developments in the landscape.

Landscape and Infrastructure

The term infrastructure is used to describe the elements of the built environment, such as bridges, roads, buildings, canals, bike paths, loading docks, water and sewer utilities,

and electricity grids. These are considered hardscape infrastructure because they are constructed out of cement, stone, brick, and other hard building materials. However, this thesis uses the term to also include softscape infrastructure such as levees, public open space, water reservoirs, and bioswales.

Landscape and Infrastructure have a strong relationship to one another. Infrastructure is built as components of large networks that deliver services to entire urbanized regions. A road is useless unless it links to a network of other roads that lead to desired destinations. It provides the physical base structure for urbanism, upon which all other components of community, culture, program, and manmade activity build. Because of its large scale and basic nature, infrastructure is often built into the landscape, and can be viewed as the manmade extension of the landscape.

III. Proposed Address: My Argument

I argue that a strategy to deploy systems-based design interventions in a regional landscape can identify catalyst sites, where interventions in physical design improvements, may release economic potential such that a more robust and stable local economy can emerge in the region over time. I am applying this argument to economically stagnant Rustbelt regions in America, where physical design improvements refer to the adaptive repurposing of old infrastructure in concert with landscape services to spur economic activity as a means

of economic development. In this paper economic development is used to mean the development of economic activity and the increased quality of life that results? By reprogramming or redesigning old landscapes with new and current purposes, I argue that they can be reintegrated into society and contribute to an economic revitalization effort.

In order to apply my method in practice, I have established a series of analytic parameters, strategies, and applications to serve as a guide to both identify and develop the project site. The method is broken up into a research phase and a design phase. In the research phase, I seek to make observations and draw relationships about the analytic parameters: dynamic system; regional scale; and multi-use landscapes. I employ two application ideas in the design phase in order to address the observations and relationships from the research phase. The two applications for the purposes of design action are multi-purpose infrastructure, and reclamation or retrofitting. The strategy connects the research and design phases with a guiding process. My strategy takes a systems-based design approach to identify catalyst sites identified in the research where the design can be implemented.

This methodology draws comparable similarities to the strategies taken by systems design and landscape urbanist practitioners and academics. The previous applications of these similar methods have aimed to reclaim segments of a regional landscape through a systems-based design strategy as a means of

capturing greater ecological co-benefits while serving urban needs. This argument distinctly differs from previous concepts because it suggests that repurposing the landscape can not only capture greater ecosystem services, but it can also and simultaneously capture multiple economic services.

IV. Post-Industrial Regions in the United States

North America once exhibited several regions of highly productive manufacturing in the turn-of the nineteenth century US industrial revolution. Economic regions sprung up around the country to exploit the natural resources of the landscape. Small cities surfaced in the interior where rich bounties of natural resources could be extracted to provide basic services to the men who worked the productive landscapes. The areas in and around the Great Lakes were abundant in resources and, once discovered for their economic value, were particularly heavily harvested and industrialized (Bélanger, 2009). Large cities emerged along the coast on the eastern seaboard where deep harbors could be built as terminals of exchange for goods passing from the interior to foreign countries. Through a connected series of waterways and railroads, resources were extracted from the landscape, shipped out of the interior, and transported into the city centers where they were manufactured into commodities and further distributed.

Available transportation at that time dictated where people settled and resources shipped.

Before 1900, transportation costs were enormously high in the United States, as they were primarily restricted to water-borne transit and the railroads (Glaeser & Kohlhase, 2003). Rail deposits and water ports created natural city centers, where manufacturing activities, and the people who powered these facilities, would cluster to gain access to the only means of transportation for goods (DiPasquale & Wheaton, 1996).

Twenty-first century economic forces are vastly different from the past and cities take on entirely different forms. Industry is becoming increasingly mechanized, or outsourced from US locations, and no longer requires large labor forces commuting to one location. Manufacturing firms do not need to pay for proximity to their customers or suppliers and therefore locate outside of urban centers or in foreign markets entirely (DiPasquale & Wheaton, 1996). Transportation technology shifted from heavy fixed infrastructure, such as railroads and ports, to light infrastructure, meaning cars and trucks. This gave rise to a more flexible means of mobility. People were no longer tethered to the site of the productive landscape and began to migrate away from these regions in favor of more urban settings (Glaeser & Kohlhase, Cities, Regions and the Decline of Transport Costs, 2003).

The reduction of manufacturing paralleled the reduction of extracting natural resource in the United States. Service economies now monopolize urban centers and natural productive resources play a nearly irrelevant

role. A general exodus from the regions that exist only to extract natural resources on the interior can be observed in favor for more highly desirable metropolitan areas on the coasts, leaving a pattern of deindustrialization in its wake. These landscapes were now burdened with oversized infrastructure, contaminated vacant land, and heavy taxes (Bélanger, 2009). These post-industrial regions are now commonly dubbed “rust belts” which commonly suffer from population loss, aging infrastructure, and economic stagnation. In this thesis I will map where and how many post-industrial regions exist in the US.

V. The Case: The Erie Canal

The Erie Canal is located in one of these American Rustbelts; I use it and its surrounding region to exercise my proposed strategy of repurposing existing infrastructure with landscape improvements for economic development. The Erie Canal is a piece of 19th century landscape infrastructure that gave substantial rise to the American built environment and economic prosperity during the industrial period. It connected the Eastern Atlantic Seaboard with the Great Lakes and the Northwest Territories for the first time with an efficient route through the Appalachian Mountains. Before the construction of the Canal, population and trade were largely confined to the coastal regions. Once the Canal was opened, it spurred immediate and spectacular changes; it prompted the first real wave of American westward migration,

stimulated the aggressive extraction of resources from the Interior followed, and turned New York City into the preeminent commercial city in the United States (New York State Canal Corporation, 2012). The scale and speed of the resulting economic growth was extraordinary.

Built from 1817 to 1825, the Canal was an engineering marvel for its time. It reduced freight transportation rates from \$100 per ton by road to \$10 per ton by water, and within 15 years made New York City the busiest port in America (New York State Canal Corporation, 2012). Within the first few years of operation, the Erie Canal paid for itself several times over, such that it was declared, “forever toll free” in 1882 (New York State Canal Corporation Interagency Task Force, 2005). However, the success of the Erie Canal was short lived since it could not compete with the growing railroad industry. Plans to enlarge the Canal began in 1895, and from 1905 to 1918 New York State constructed the expansion and addition to the old canal system to create the New York State Barge Canal. Even at its onset, the Barge Canal was never as successful as its predecessor.

The State Barge Canal reached its peak in 1951, shipping 5 million annual tons of freight. This rate was half the capacity of the system, which was built to accommodate 10 million tons of shipped goods annually. The construction of the St. Lawrence Seaway and the US Interstate Highway system further contributed to the Barge Canal’s decline. By 1980, only 1.1 million of annual tonnage was being shipped

on the Canal. By the late 1980s, State leaders were looking for different uses of the Canal. A 1989 Study identified recreation as the key goal to reutilize the Canal System (New York State Canal Corporation Interagency Task Force, 2005). Today this is the Canal System’s primary function – a water channel for recreational passenger boats. However, instead of paying for itself several times over, the Canal System is now heavily subsidized annually (Harris, 2012). The vitality of the surrounding region in Upstate New York parallels the history of the Canal. Earning its title as the “Empire State”, New York led the country in a movement towards modernism and experienced spectacular population growth between 1825 and 1860 (Klein, 2001). Now, 150 years later, the region around the Erie Canal teeters between a stagnant and dwindling economy.

Erie Canal Description

The Erie Canal and the surrounding region serves as an (1) industrial corridor, (2) natural system, (3) post-industrial region, (4) economic territory, and (5) transitioning landscape. It is located in Upstate New York and runs laterally from Albany to Buffalo. Approximately 234 communities align directly along the canal, and an estimated 531 total are calculated in the Erie Canal Region. Nearly 80% of Upstate New York’s population lives within 25 miles of the Erie Canal, and with the exception of Binghamton and Elmira, every major city in Upstate falls along the Erie Canal (New York State Canal Corporation, 2012). The Erie Canal Region traverses through five state-recognized economic development districts:

the Capital Region, Mohawk Valley, Central New York, Finger Lakes, and Western New York from east to west respectively.

The Erie Canal is a functional leg of the entire New York State Canal System. In addition to the Erie Canal, the Champlain Canal, Oswego Canal, Oswego Lake, the Mohawk River and the two Finger Lakes – Seneca and Cayuga, construct the State’s expansive canal system that taps into the Hudson River to complete the Statewide navigable waterway system. There is still commercial activity on the canal system, but the predominant users are recreational passengers (Mantello, 2012).

Significance to this Thesis

“In the late twentieth century, cities in North America and Europe are coming less and less to represent the culmination of local and territorial cultures. Many of these cities themselves threaten to become residual; abandoned and obsolete monuments to an earlier epoch. Or else, as twilight regions of once confident and rational projects, they are transformed into aestheticized cityscapes (in architecture and art galleries, cultural and heritage centers, loft living and designer homes), while their previous populations, if they have no role to play in this act, are inserted into other discourses...” (Chambers, 1990, p. 53)

The manipulation or design of a physical landscape can repurpose and adjust the function of that landscape such that greater habitability, or economic activity, is able to take

place (MacKaye, 1968). The Erie Canal is a case example of a large piece of infrastructure that modified a natural landscape to enable a greater level of habitability for the nation’s residents. The Erie Canal was designed and built along the natural Mohawk River Valley to bring about great efficiency in transportation to benefit the contemporary economy in nineteenth century America. However today, instead of contributing to the economy of the twenty-first century, the Canal consumes financial resources from subsidies. While it provides great quality-of-life value to users who recreate on it, these are services that do not generate direct revenue streams. The story of the Erie Canal is an unsustainable one; if the landscape cannot generate greater financial profits, or if the funding sources cannot recognize all of the co-benefits it provides, then the future of the Canal is in jeopardy.

VI. Intent of Thesis

I am exerting this argument as a regional economic development strategy.

I observe that there are latent potentials in the landscape that have yet to be capitalized on either due to (1) a current or emerging economic trend that did not exist in the past or (2) the availability or accessibility to a source of natural capital is obstructed or unavailable. Landscapes in industrial regions have historically been built up to maximize the single duty of the economic activity as if it were a cog in the machine. Each city was

pecially oriented towards the extraction, transport, or fabrication of its natural capital. “City appellations signified their might: Pittsburgh the Steel City, Sudbury the Nickel City, Hamilton the Steel Town, Sarnia the Chemical Valley, Detroit the Motor City, Cleveland the Bridge City, Toledo the Glass City, Buffalo the City of Light, Milwaukee Supplier of the World (Belanger, 2010).” This familiar trend has occurred repeatedly throughout US history, giving rise to the built environment we see today. Similar to the American Industrial Revolution, a period of suburbanization maximized the single use of residential services after World War II. Suburban communities began to proliferate around city centers. These communities were designed purely as bedroom communities and hosted residential activities in isolation.

In both of these periods, urban environments were built up to cater to a single specific purpose – the demand at the time. However in both cases, the economic generator, whether it was the mechanized processing of natural resources into commodities or the maximizing of residential functions in isolation from commercial and industrial uses, subsided with time. The factors that made these places central places of human habitation are not important 100 or even 50 years later. The ephemeral nature of the economic trends contrasts with the durability of the physical infrastructure that was erected to support the original economy. Even after the economic impetus has climaxed and passed, residual infrastructure lingers in the landscape.

Can adaptively repurposing regional infrastructure contribute positively to regional economics? Repurposing the landscape implies that new infrastructure and landscape formations will need to be designed and developed. By reconfiguring or designing regional landscape formations, I hypothesize that one can release latent economic potentials in (1) productive landscapes, meaning either products or services, (2) economic processes, or (3) regional communication, knowledge, or transaction flows.


This research will answer whether such reconfigurations or redesigns can prevent landscapes with obsolete uses from further deterioration due to (1) neglect (ABANDONMENT), (2) becoming preserved in a state of underutilization as a museum or heritage piece (SUBSIDIZATION), or surrendered as a single-purposed tourist exhibition (COMMODIFICATION).

In applying this argument as a contribution to the revitalization of economically depressed regions, I will make observations about the relationship between LANDSCAPE (spatial), ECOLOGY (resources), and ECONOMY (capitalization), and will reflect on how design can be instrumental in generating a cyclic relationship between ecology and economy (SUSTAINABILITY).

This hypothesis is effective more as a set of theories and guidelines to inform a process of discovery for latent potentials and physical design responses, and less as a general method

of design rules or master plans. It will vary from location to location. I deploy this argument on one case study, the Erie Canal in the Mohawk River Valley of Upstate New York, to demonstrate its potential effects. While some argue that locations are nuanced in their site conditions and history, and generalities do not exist, the Erie Canal region is comparable to many other post-industrial regions within the US.

This thesis suggests a new method of sustainable economic revitalization that leverages landscape as the driving force for much larger systemic change for a region. I will describe certain unifying traits between these regions and give descriptors that can then become targets for revitalization efforts later. The traits and descriptors will be translated into a set of “ideas” for deploying across rust belt areas to begin regenerative processes. I then will describe a strategy that begins to link the rejuvenation and reactivation of regional post-industrial zones with the programming and renewed links of a landscape system.



THEORY | CHAPTER TWO

I. Literature Review of Thinkers and Practitioners in Regional Urban Studies

Our previous understanding of cities is increasingly anachronistic. While prevailing urban models are helpful for understanding the urbanization of the 19th century, much of which still stands around us, they do little to help us with the 20th century trends or project 21st century guidance for us. The regional urbanism of today can be understood as the product of intensified globalism. Chambers states that the contemporary city is increasingly becoming dislocated and decentered from its fixed location. “Deterritorialization refers to the weakening attachments to place, to territorially defined communities and cultures ranging from the household, the urban neighborhood, and the town or city, to the metropolis, the region, and...the modern nation-state. (Soja, 2000, p. 151)”

The central argument presented in this thesis was drawn from literature in urban economics, critical urban geography and landscape architecture. These fields very rarely speak to one another, however, they are surprisingly compatible when engaged in dialogue with one another. This discovery gave strength to the validity of the perceived need for further discussion in this field, and confidence in our communal intellectual-capacity to understand the dynamics of urbanism at a scale and depth of complexity that is far too expansive to observe from a single vantage point.

What is a Region?

Consensus from among practitioners from fields as diverse as planning, design, economic, and urban studies suggest that the scale of urbanization has increased tremendously in recent decades from that of the traditional city; such consensus indicates a shift in thinking about the city that is more compatible with regional-scale thinking, regardless of how much disagreement there is about a definition of progressive regionalism and what metrics establish this emerging understanding of a region. MacKaye understood a region as it was based on the state of the American urban form in the first half of the 20th century; cities still maintained a mono-centric structure and there was a clear division between urban and rural. Urbanization clearly evolved into a new form since the time of his observations, and the unfamiliar nature of this new type of development solicited the attention of many additional scholars who attempted to define its meaning. Designers and landscape architects tend to rely on physical characteristics of the urban landscape as the metric to identify the limits of a space, economists are more likely to observe the transactions as the defining unit, and urban theorists generally understand disparate locations according to their political culture and social interfaces. Even in stating these salient generalizations, the three bodies of study are beginning to demonstrate a distinct convergence of opinions.

Benton MacKaye

An early multifaceted understanding of the

region can be found in Benton MacKaye's notion of habitability. He popularized the term *geotechnics*, which he defines as "the applied science of making the earth more habitable," (MacKaye, 1968, p. 24) and described it as a proactive study that combines and builds upon the studies of geography, forestry, conservation, engineering, colonization, regional planning, and economics. He identifies three kinds of habitability:

Physical habitability is that quality of an area whereby its natural resources remain intact. To preserve this quality requires sustained use: soil fertility renewed; forest cut limited to growth; water tables maintained; restoration to nature of what is taken from her (including garbage and sewage), in a word – maintenance of ecological balance... The key problems are river regulation and erosion control. The "region," or unit of activity, is the sphere of water flow, or watershed. *Synonyms:* conservation (of land and forest); multiple use (of waters).

Economic habitability is that quality of an area, or sphere of activity, whereby men and women are enabled to make a living. This involves the problems of commodity flow from natural resources to consumers, and the balance between surpluses and deficiencies. (From this angle: follow the commerce chart and "carry no empties.")... The "region," or unit sphere of activity is the subject to two forces: (a) the centripetal, or flow from periphery to center, illustrated by the "milkshed" of a city; (b) the centrifugal, of flow from center out, illustrated by electric power system.

Social habitability is that quality of an area whereby men and women are enabled to enjoy living. This involves movement of population, or folk flow. The typical "region," or unit sphere of activity, consists of a flow of people to and from a given metropolitan center and its environs... The problem is to preserve a healthful balance between three essential settings or environments – the urban, the rural, and the primeval... Factors playing creatively on these settings are the new community, the townless highway, the wilderness area.

(MacKaye, 1968, p. 111)

Successfully applied geotechnics employ all three kinds of habitability. The watershed is the geotechnic unit; it is both a physical landscape and a boundary of sovereign identity. The objective of employing geotechnics is to establish all around habitability, or a balance of environmental sustainability, job creation, and community enrichment, in a single unit. Genuine culture springs from the environment.

MacKaye is credited as one of the first systems thinkers in planning. More fortuitous is that he had the pivotal position of bridging the passive knowledge of ecological science with the active practice of design. His application of design manipulations at strategic locations in the physical, economic, and social flows of a region gave rise to such legacy successes as the Tennessee Valley Authority and the Appalachian Trail (MacKaye, 1921; MacKaye,

1968).

MacKaye did not extend his professionalism to regional planning until the 1920s, but even as he entered the field, he maintained his clear objective as achieving habitability. He understood a region to be an area that was an indigenous unit culturally, economically, and physiographically. At the time of MacKaye's 1962 publication, *The New Exploration*, the "regional city" was a concept that he designed from his professional hypotheses and asserted opinions on (MacKaye, 1962). MacKaye's work lays important theoretical groundwork for thinking about the region in terms of economic and social development as well as ecological processes; however, the theories do not address contemporary urbanization since the influences that gave shape to regional urbanism did not occur until after his death. Since the last of MacKaye's writings in the 1960s, theorists and practitioners have advanced the collective understanding of regional urbanism as the phenomenon itself has been evolving.

[Contemporary Approaches to the Region](#)

HOW URBAN ECOLOGISTS DEFINE A REGION

Urban ecology, a science based field related to landscape architecture, identifies the metropolitan area as one component of an urban region. Natural systems, such as ground water and wildlife migration, are so large that their movement across the land far supersedes the limits of a city. People in the urban area are dependent on these local resources and

are therefore connected into the same system. Biologically, there is little difference between a dense city center and the surrounding suburban development – they are simply different degrees of urban disturbance (Del Tredici, 2012). Urban ecologists differentiate from many conventional ecologists in their anthropomorphic belief that people are considered to be a vested component of the ecosystem, and major factors in urban ecosystems. Forman identifies climate and cultural-social patterns as the two central characteristics of a region. He defines the urban region as the “area of active interactions between a city and its surroundings”, identifying its edge by the extent where the rate of flows and movements that permeates from the city center drops off (Forman, 2008).

HOW LANDSCAPE URBANISM DEFINES A REGION

Landscape Urbanism is a recently recognized design approach that emerged out of the profession of landscape architecture in the 1990s (Waldheim, 2006; Berger, 2012; Corner, 1999). It developed as a field aimed at better equipping designers to manage the regional scale development that occurs in the contemporary built environment. Landscape urbanism asserts that the landscape practitioner should play a significant role in the design and planning of large complex spaces. The built environment is expanded at such a voracious horizontal pace, that the scale and style of urban development is occurring at the regional, not the city scale, and requires the employment of landscape, not architecture, as the unit by which to organize space. While the field of landscape architecture

was traditionally interested in such large scale interventions (think Olmstead’s urban plans in the late nineteenth and early twentieth century’s), such master planning practices do not have a sustained cultural appetite in an era of economic crises and reduced taxation for urban investment.

HOW URBAN ECONOMISTS DEFINE A REGION

Urban areas grow and develop in a polycentric form now that the pressures to cluster around the harbor industry have evaporated. There is no endogenous limit to the extent of sprawl; if the urban growth extends too far from one of the city’s sub-centers, a new node of employment and services will establish as a new sub-center. So long as there is demand, the city will grow horizontally. The primary forces obstructing growth may be the natural terrain or the political incentive of the localities. The urban form has transitioned from forming monocentric cities to polycentric regions. Populations are observed to be increasingly centralized in a few metropolitan regions, but that these regions are becoming increasingly decentralized and sprawling. (DiPasquale & Wheaton, 1996; Glaeser E. L., 2007).

The twenty-first century city primarily serves to put people and their ideas in closer proximity to one another. They are the incubators for people (human capital) and knowledge (innovation) (Florida, 2002). Increasingly so, cities specialize in services, not in manufacturing. The cost of a person’s time is large and force their transportation

costs and employee wages to also remain high. The close proximity in urban centers keeps transportation costs small, so service firms, who are driven by proximity to people since they require face to face interactions, locate in city centers. However, what seems to be evident is that the relevant economic units are now regions, not city centers. (Glaeser & Kohlhase, *Cities, Regions and the Decline of Transport Costs*, 2003)

While a region can be defined by political, physical, economic, ecologic, or social metrics, the latent potential of regions for economic revitalization can be most effectively revealed when the metrics are engaged with one another in a complex system (Berger, 2009). The urban economists do not think about the landscape, but the landscape people are also not very much engaged with the economy – both are necessary (Berger, 2009). Through the layering of these different fields are given a truly deep understanding of the forces in a landscape, unclouded by political biases and partial information.

Bringing Investment to the Regional Scale

GLOBALIZATION CAUSES LOSS OF LOCAL JOBS

Globalization has majorly impacted local regions in several ways. National industries that were previously attached to local geographies have succumbed to privatization and are being sold off to foreign ownership. The effect in the local landscape is the prolific evaporation of local and regional employment,

creating economically deprived regions. This deindustrialization has devastated most of the large urban-industrial areas and centers of Fordist production; region-wide population loss and economic decline have produced what is known as the Rust Belt region in North America. (Cox, 2004)

WORLD CITIES

Globalization is responsible for the emergence of ‘world cities’ (Cox, 2004; Sassen, 2001; Friedmann, 1986). Most discussion about this new urban form revolves around megacities, or “the nodes of the global economy, concentrating the directional, productive, and managerial upper functions all over the planet” (Castells, 1996/7/8). These are the world’s largest urban agglomerations that subscribe to loose definitions of population size, number of urban centers, and extent of urban limits. The 1990 census marked the tipping point where the majority of the national population lived in one of these million-or-more metropolitan regions for the first time in US history (Soja, 2000).

New York City is one of the few American cities to be considered to be a global megacity (Glaeser & Sassen, 2011). Its urban region spans downstate NY, Long Island, Western CT, and Northern NJ, and lies a mere 150 miles from the eastern half of the Erie Canal Region. Yet, the economic and demographic vitality of these two regions are entirely opposite; New York City is a global destination while Upstate continues to fall behind national economic averages by nearly every major measure (Myers, 2004;

Pendall, Drennan, & Christopherson, 2004). The literature on world cities produces a map with very few nodes that ignores the regions in between. Second-tier cities, such as those that lie in the Erie Canal Region, are largely overlooked at the global level.

GEOGRAPHICALLY UNEVEN DEVELOPMENT

Economic geography refers to the spatial ordering of people, places, and economy in the landscape. It helps to explain the flows and patterns in the built environment. Several urban geographers identify economic forces in the contemporary landscape that have a persistent tendency to produce geographically uneven development. (Harvey, 2009; Soja, 2000; Cox, 2004) At the same time that some regions are on the decline, other regions are revivifying. Silicon Valley's emerge simultaneous to the formation of Rustbelts (Jakle & Wilson, 1992; Cox, 2004). Uneven development is systematically produced by capitalism, in which some geographies are economically developed and others are not (Smith, 1990). The concept helps to spatialize economic flows and processes and gives some explanation for high economic contrast of the Erie Canal Region and the New York City Region despite their close proximity.

The Erie Canal Region may never aspire to reach a global economic scale. Instead it should attempt to generate more of a home grown regional economy that does not seek to compete with the global economies, but rather exploits and builds upon its natural advantages and invest in their export industries. Traded

goods and services are essential for regional development because they bring outside wealth into the Upstate economy. The region's major export industry is in higher education institutions and is a key contributor to the economy. However, many students leave the area upon graduation. In order to retain this young educated work force, and invest in the future population of Upstate, the region needs to reinvest in their urban centers, making them more vibrant and attractive to this demographic (Pendall, Drennan, & Christopherson, 2004; Ferraro, 2012; Deitz & Garcia, 2007).

Re-scaling Investment to the Region

ECONOMIC TIDES SHIFT IN THE 1970S CHANGING URBAN CONDITIONS & MOTIVATE A GLOBAL CULTURAL CHANGE TOWARDS URBANIZATION

Many scholars have attributed the emerging form of regional urbanization to a dramatic shift in the economic environment in the early 1970s, when the emerging economic structure and globalization began to take effect (Harvey, 1989; Soja, 2000). Since this time, there have been profound changes in the spatial layout of the modern metropolis. What we see today, in terms of cities and regions is the geographical outcome of the new urbanization processes. The 1973 recessions coincided when many industrialized capitalist nations around the globe broadly experienced "deindustrialization, widespread and seemingly 'structural' unemployment, fiscal austerity at both the national and local levels, all coupled with a rising tide of neo-

conservatism and much stronger appeal...to market rationality and privatization" (Harvey, 1989, p. 5). These events had such universal reach, that many disparate nations took the same direction in changing their government, policy, and ultimately, urban cultures.

**RESPONSE TO NEW ECONOMIC CONDITIONS:
GOVERNING AUTHORITY DISPERSES FROM A BIG
CENTRAL APPROACH TO A SMALL LOCAL LEVEL**

Governments have been transforming their role from a managerial position to an entrepreneurial position since the shift in global forces in the 1970s, to better manage growth and development in the emerging economic environment (Harvey, 1989). Instead of managing capital development through institutional regulation (Reed, Public Works Practice, 2006), governments have become increasingly competitive with one another, acting more in the style of private entrepreneurs, and aggressively advocating for capital funds and development projects. With this new entrepreneurial form of government, economic development powers and responsibilities are decentralized to very local levels. Local governments and urban regions are induced into higher competition with one another naturally. As a result, in the United States economic development policy and politics start with localities and not much central oversight exists (Cox, 2004).

This form of urban entrepreneurialism can be observed in the State of New York when Governor Andrew Cuomo created the 10 economic regions within the NYS Economic

Development Bureau last August 2011 (Governor's Press Office, 2011). The economic regions are all pitted to compete against each other rather than the collectively competing as New York State against other states (Ferraro, 2012). The five Economic Development Regions have no facilitative authority to coordinate amongst one another for regional planning activities.

**LOCALITIES UNDERSTAND THAT THE PUBLIC HAS A
LOT OF POWER**

Because competition is high, people have a lot of purchasing power to choose where they locate. If a place is unattractive to live work or play, people have a lot of liberty to choose not to locate there, and will take their potential investment with them to another location (Tiebout, 1956). Governments find themselves vying for projects and firms by maximizing the attractiveness of their local site locations as a lure for capitalist development (Harvey, 1989).

**LOCALITIES ARE INCLINED TO USE SPECTACLE
PROJECTS TO SOLICIT ATTENTION**

One way urban regions attempt to improve their competitive positions is by seeming more attractive to consumer habits. Localities recognize that there is a lot of consumer purchasing power so they invest in facelifts and facilities designed to attract the attention of consumers. "[T]he city has to appear as an innovative, exciting, creative, and safe place to live or to visit, to play and consume in. (Harvey, 1989, p. 9)" However, competing like this tends to lead to unstable economies. Localities end

up engaging in a race-to-the-bottom or leap frog type competitions just to keep ahead of the game. However, this often results in suppression of diversity in development, and only so many successful convention centers, sports stadiums, shopping malls, or spectator attractions can be constructed before their novelty appeal becomes mundane and falls out of favor. While these projects have a strong capacity to enhance local property values, tax bases, and revenues, their successes are usually short-lived or rendered moot when a similar development erects elsewhere (Harvey, 1989; Cox, 2004).

PEOPLE HAVE A CHOICE OF WHERE TO LOCATE PER THEIR PREFERENCES FOR DIFFERENT FORCES

Both urban economists and urban geographers have attributed the reduction of spatial barriers to exacerbating inter-urban competition for capital development between urban regions. Since transportation costs have significantly dropped over the past 100 years, spatial barriers that inhibited the movement of goods, people, money, and information have also reduced (Harvey, 1989; Glaeser & Kohlhase, *Cities, Regions and the Decline of Transport Costs*, 2003). People make their decisions based on personal preferences for different forces that apply to different spaces. Where these streams flow and locate is now more reliant on differences in labor supply, infrastructure, natural resources, government regulation, and taxation for each place than in the previous era where access to transportation created natural monopolies in locations because of the high

transportation costs. Exogenous forces greatly influence settlement patterns as well. People's preferences for weather, government policy, and historically developed infrastructure prevent everyone from converging to the same location (Glaeser & Kohlhase, *Cities, Regions and the Decline of Transport Costs*, 2003).

This point is particularly relevant to the economic viability of Upstate New York, where an environment of high taxes, stringent permitting responsibilities, and higher labor costs is enforced and stagnant economic growth ensues (US Department of Commerce, 2009; CNBC, 2012; Robyn, 2012). These factors, and the far location from other urban centers, are contributing to the population decline in Upstate New York.

Planning and Designing for Urban Regions

Critically understanding the causal relationship between a capitalist economy and the resulting physical permutation in the landscape is key to taking a proactive stance in the design of its form. Urban theorist and economists are proficient at understanding and explaining the tangible and intangible qualities of the urban and the economy, but have focused primarily on explaining phenomena rather than prescribing solutions for the conditions that emerge as a result. Designers are empowered to mobilize changes in the built environment, but as an industry, they are not always aware of the larger forces that influence how locations develop.

Economists and urban theorists diagnose and hypothesize outcomes of the urban realm in terms of the government and firms. Infrastructure and public spaces are usually owned by municipal or state governments, so to repurpose infrastructure and design public landscape space, planners and designers will contract with the government. Planning can be understood to be the proactive agent of government in terms of infrastructure or landscape upgrades, and the application of government decisions are effectively actions of urban planning. This distinction seems necessary to underscore so that planning and design theory for contemporary urbanization can be pulled from both economic and design literature bodies.

SHOULD GOVERNMENTS INTERVENE IN THE PLANNING FOR LARGE REGIONAL INFRASTRUCTURE PROJECTS?

There has been some debate amongst economists whether planning should intervene at all. Pro-Intervention arguments advocate for government intervention in order to promote growth in strategic industries that can generate positive externalities for people and other firms in the city. Anti-intervention arguments assert that government is not able to do this well enough to take this initiative. To counter the inequalities produced by capitalism, governments often mistakenly seek to distribute economic growth more evenly across space. This action may backfire and actually hinder the ultimate objective of establishing higher and more equal incomes

per capita. Uneven geographic development can be a primary vehicle for stimulation growth. Areas that experience a period of disinvestment and property devaluation often create the necessary preconditions for future reinvestment just as previously healthy regions lose their competitive advantage. (Harvey, 2009; Jakle & Wilson, 1992)

Governments also implement place-based investments as a reasonable agent to enable economic development. In situations where basic public goods are necessary, such as improved public health, crime prevention, and basic infrastructure, few economists will argue against investing in place. "People's lives are certainly enriched when they live in a successful place and there surely are times when the best way to help people is to improve a place." (Glaeser E. L., 2007, p. 26) Urban regions that suffer from depressed economies may not have the physical cohesion to support the flows and synergies that define the region as an economic unit. The recent understanding of the urban economic unit being the region indicates that the infrastructure in the landscape most likely does not yet reflect the current need for regionally supporting networks in slowly developing areas. A 2004 economic study of Upstate New York identified that the built environment was not catering to the aging population and desired young work force and recommended that the state continue to invest in social and physical infrastructure systems to enable economic growth (Pendall, Drennan, & Christopherson, 2004).

The question is not whether governments should intervene with the planning and construction of the built environment, but rather how they should intervene. Conventional planning is very centralized and top down when developing large infrastructure or landscape projects for the public benefit (Reed, Public Works Practice, 2006). However the pioneering work of designers who employ systems design approaches in regions caution against centralized design solutions to these mega-scale projects (Berger, 2006; Reed, Public Works Practice, 2006). Instead, government planning efforts are more highly advised to take on the role of promoting market forces by helping people and entrepreneurs to take advantage of opportunities where and when they arise (Harvey, 2009).

Economic productivity may be the simple result of putting smart people in close proximity and having them learn from one another. Economists who oppose firm-level targeting believe that the best means of economic revitalization is to attract smart people and get out of their way (Glaeser E. L., 2007, p. 29). This new movement of progressive regionalism calls for planning and design projects to become more open-ended and flexible to enable more opportunities, latent potentials, and innovation from the public (Sites, 2004). Design solutions should not be proscriptive and concrete as was the case in the past.

FACILITATIVE PLANNING AT THE REGIONAL SCALE

Accepting that the role of planning should

be a facilitation to enable opportunities, and merging it with the understanding that urban territories function at the regional scale, planners can establish a framework for proactive design. Once a territory is defined as a region by virtue of the intra-connected flows and relationships, seeking regional-wide solutions will logically enhance the possibility that a truly sustainable solution can be found (Bélanger, 2009).

SYSTEMS DESIGN FOR REGIONS

Capitalizing on synergies and efficiencies in the region surfaces points of influence, or leverage points, as the opportune locations for design implementation. The objective of intervening in system is the increase that system's efficiency. The challenge is locating where these leverage points are and how to access them. Leverage points are not intuitive and take a systems analysis and feedback mechanism to find (Meadows, 1999; Berger, Systemic Design Can Change the World, 2009). Alan Berger has been at the forefront of applying a systems design approach to urban regions in an approach he has termed '*Systemic Design*', and identifies innovative visualization and mapping techniques as the tools necessary to conduct this analytic process in the landscape. Systemic Design consciously embeds the larger scale logic of the greater system into smaller scale proposals that serve as the leverage points (Berger, Systemic Design Can Change the World, 2009). A design framework, informed by the regional flows, should identify local opportunities for

development, which the indigenous culture can then create an innovative solution for that is specific to their preferences.

DESIGNING INFRASTRUCTURAL IMPROVEMENTS WITH MULTIPLE BENEFITS

Economic or population growth has both costs and benefits involved. Growth cannot occur without producing waste (Berger, *Systemic Design Can Change the World*, 2009). Most calculations neglect to account for the costs of growth. For each marginal unit of growth, the cost is greater environmental destruction (Meadows, 1999). Traditionally, infrastructure was designed to serve a single mono-functional purpose. Provisions for water, waste, transport, food, and energy were segregated into separate utilities, managed by unrelated departments. When landscape infrastructure is constructed to serve a single purpose, many other considerations are not factored in. As such, environmental health often gave way in the interest of industrial productivity. (Bélanger, 2009). Infrastructure in the twenty-first century should be repurposed such that it no longer perpetuates the contamination or destruction of the environment as a sacrifice to the success of the economy. Infrastructural improvements or retrofits can be coupled with landscape improvements to have a larger economic impact than just a single system fix. The advantage of implementing a landscape-based strategy to infrastructure design is that multiple benefits may materialize.

ECOSYSTEM SERVICES

Deploying landscape-based solutions to infrastructure and public space projects ensures a higher probability of attaining recreational, economic, and ecological co-benefits (Kousky, 2010). Ecological co-benefits are specific targets of these natural-capital approaches because ecological goods and services support Earth's life-support system, and landscape is the best medium to return ecological functionality to the urban terrain. The underlying concept to attaining ecological benefits is ecosystem services, or "flows of materials, energy, and information from natural capital stocks which combine with manufactured and human capital services to produce human welfare" (Costanza, et al., 1997, p. 254). Ecosystem services and landscape-based co-benefits are not fully captured in the commercial economic market and are therefore often undervalued by funding sources and governmental policy. However, a cultural movement in environmentalism is raising universal awareness that the Earth's finite resources are become incrementally stressed and our urban environments are accumulating waste at record levels (Berger, *Systemic Design Can Change the World*, 2009). Capturing those co-benefits at every available intervention opportunity is becoming a necessity for the long-term and sustainable existence of our built environment.

Designers are the proactive agents to mobilize change in the built environment, but they are not making the critical connection between landscape design and profit-generating economics. Berger's approach to waste landscapes is one exception to this norm. He

contends that reclaiming landscapes for the sake of environmental health is unfeasible and unsustainable; funding for capital inputs are not limitless and therefore projects need to engender a high enough financial or programmatic rate-of-return to commence. Berger's projects, such as the French Gulch Mine Reclamation Project, repurpose the functional utility of the landscape along with the ecological health such that it has value for, will provide services to, and can be reintegrated into society (USEPA; P-Rex, 2010).

My Contribution

This thesis explores another relationship of landscape design and economic development. Instead of investigating the economics behind landscape design projects, I will look at an example of profit generating economics that can generate from them. Specifically, I seek to discover how infrastructure repurposing or redesign, leveraged by landscape co-improvements, can create multiple benefits that unleash latent economic potential and contribute to the stimulation of economic activity in a depressed urban region – it can engender economic serves as well as ecosystem services.

My assertion that strategic redesign of landscapes and infrastructure can deliver economic services builds upon the previous research cited above. I use the following arguments, extracted from literature above, to give context and structure to my argument:

- The region is the unit of urbanization in the twenty-first century
- Economic forces impact and shape the urban form.
- People hold a lot of purchasing power and choose where to locate per their preferences
- Localities are tempted to invest in spectacle projects in order to compete for people and economic growth, but their impact is often short-sighted and unsuccessful in the long-term.
- Design and planning at the regional scale should be facilitative, not proscriptive.
- Design and planning processes at the regional scale should not be centralized and executed by one agency. Rather, this process should involve many stakeholders and a diversity of skill sets.
- Design and planning for urban regions is most effective with a systems design approach.
- Intervening at leverage points in the system will increase the efficiency of the overall system.
- Infrastructure and physical urban design elements should be adaptive and seek to achieve multiple utilizations.

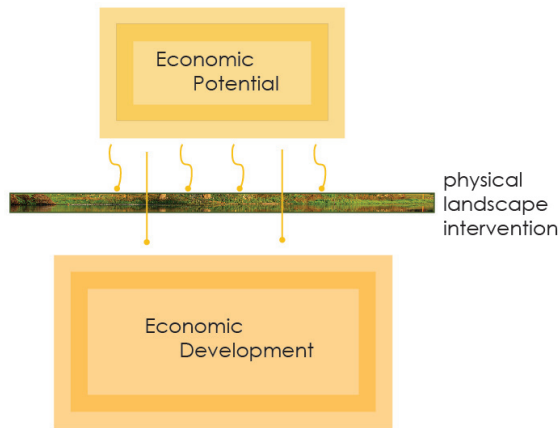


Figure 1 :: Landscape interventions need to tap into existing latent economic potentials in order to give rise to economic development. Without the latent potential, no such economic development can expect to materialize, (author, 2012).

- Leveraging infrastructure with landscape design can further capture co-benefits and ecosystem services.

Designers hold the responsibility to respond with action to these economic and ecologic forces. They are uniquely positioned as the bridge between theory and building, thinking and constructing. Channeling a systems understanding of economic and ecologic functions into the construction of designed development projects will be taking the built environment one step closer towards true sustainability.

II. Applying this Theory to this Case

The depressed economic state of the Erie Canal Region is not a surprising, and perhaps even an expected result, of the capitalist economy in the United States. Capitalist economies maximize the utilization of a region until that use is no longer demanded. This process can be observed in the Erie Canal.

“Upstate was built on the spine of some of the most advanced infrastructure of the 19th century. The Erie Canal brought Upstate close to the rest of the world, and the rapidly developed railroads only reinforced that proximity. To remain connected with the rapidly globalizing economy, Upstate needs 21st century infrastructure. (Pendall, Drennan, & Christopherson, 2004)”

The canal infrastructure positioned the Erie Canal Region as the transportation corridor for early nineteenth century America. With the introduction of an expansive rail network, the value of this corridor diminished and has never quite reached the same level of economic productivity. Today, several factors contribute to the Region’s economic stagnation – one factor being the lack of supportive infrastructure for demographic groups who have the potential to contribute to the regional economy.

Potential ‘Wave’ for Regional Revitalization 1: Proximity to New York City Region

The fact that the Erie Canal Region is composed of a string of second tier cities that do not robustly engage in the global economy gives some suggestion as to why the state of their economy is weak. New York City, once the undisputed financial capital of the world¹, is a global city whose financial success leads to the overall good economy of the New York City Region. Because of their close geographic proximity, the fact that they are both are contained within the same state boundary, and the thick network of personal family ties running between Upstate and Downstate New York, a good amount of spillover from the New York City Region enters the Erie Canal Region. Latent potential may lie in strengthening the relationship between these regions such that a reciprocal business, not a single direction spillover, can form where each region shows dependence and derives benefits

¹ Since the mid-2000s, arguments were emerging that that London was beginning to rival New York City as the financial capital of the world (Timmons, 2006).

from engaging with each other.

To amplify the success that entrepreneurial boat tours have, one of the more successful industries on the canal, we can start marketing and targeting the New York City tourists to a greater degree. This can be done by building in amenities along these Canal Towns that would encourage faster transportation from the Towns to the City, lodging, restaurants that will essentially contribute to the idea of these places serving as weekend getaways, while the Canal serves as the spectacle attraction. Currently, although Upstate New York is exponentially larger in landmass, it brings in only 20% of the domestic tourist industry. (Tourism Economics, 2010)

Potential 'Wave' for Regional Revitalization 2: Retaining Newly College-Educated Young Professionals

Upstate New York's strongest export industry is higher education. A 2004 study (Pendall, Drennan, & Christopherson, 2004) found that Upstate boasted of 206 active higher education institutions, averaging 29.8 for every million Upstate resident. This is 24% higher than the US average (24.1 for every million) and 27% higher than Downstate (23.5 per million). The study identified the higher-ed industry as a key contributor to Upstate's economy in three ways: through direct expenditures and the indirect multiplier effects it generates; by bringing out-of-state dollars into the region; by educating the future labor force. College and graduate students are more concentrated in Upstate New

York (7.0% of the Upstate N.Y. population²) than in the U.S. as a whole (6.5% of the total U.S. population³), which is significant because the area attracts more net college-aged residents from elsewhere. From 2000 to 2008, undergraduate and graduate enrollment increased by 16% (New York State Office of the State Comptroller, June 2010), indicating that the region is continuously attracting this educated and professional workforce.

However, large waves of the young educated population leave throughout the rest of their 20s, and begin to taper off by the time they reach their early 30s. This is a missed opportunity for Upstate and the Erie Canal Region. Investment should begin creating attractive environments for the 20-something educated professionals who generally seek vibrant urban centers with ample job prospects (Pendall, Drennan, & Christopherson, 2004; Ferraro, 2012; Cornell University, 2011). Reinvestment in the physical design and infrastructure of Upstate New York's urban centers, most of which lie along the Erie Canal, may help create the ambiance desired by this young demographic.

Potential 'Wave' for Regional Revitalization 3: Retiring Baby-Boomers with Newfound Time

At the other end of the demographic spectrum, infrastructure demands are also perceived from Upstate's aging population. From 2005 to 2030, Upstate New York's elderly population is expected to increase 40% as the baby-boomer

² 2000 figures

³ 2000 figures

generation graces into retirement and old age (Deitz & Garcia, 2007). This demographic is a heavy user of age-related services such as accessible housing and transportation. The majority of the population 65-years and older live in the older suburbs at the periphery of the primary Upstate cities. This fact is significant because the Erie Canal transects the primary Upstate cities at their edges – right where aging populations are likely to exist.

The Erie Canal Region's weak economic growth has contributed to the Albany, Buffalo, Rochester, and Syracuse hosting some of the highest shares of seniors in the nation which results from the simultaneous growth of the senior population and decline of the younger adults (Deitz & Garcia, 2007). However, this is notable because the poverty rate among older people is substantially lower in Upstate (7.4%) than the national average (9.9%) – an emerging population of people with money, mobility, and now time will be looking for ways to spend their retirement.

Potential 'Wave' for Regional Revitalization 4: Changing Dependence on Infrastructure as a Response to Rising Oil Prices

Economic changes on the global horizon may also directly influence the future of the Erie Canal and its Region. Now that oil has become more expensive, the transaction costs involved with transporting goods have increased. Some researchers at MIT postulate that manufacturing facilities of US companies may move to become more regional and

migrate away from the global model (Waugh, 2012). Reducing the time to market, from the point when a product leaves the plant to when it arrives on store shelves, seems to be the emerging priority for these firms. Companies may be looking to move more plants in more strategic locations in closer proximities to the consumer. (Simchi-Levi, Peruvankal, Mulani, & Ferreira, 2011). Trucking will become less feasible as the gas prices increase. Some members of the Canal Corporation believe that truck travel may not be as lucrative as gasoline prices rise. Waterways may become more competitive in the transportation of goods. In 2007 the number of cargo vessels on the canal system increased three fold (Coin, 2008). Even now, as the gas prices fluctuate around the \$4 per gallon threshold, entrepreneurs around the state press inquiries to the Canal Corporation about outfitting the Erie Canal for modern cargo transport (Harris, 2012).

Potential 'Wave' for Regional Revitalization 5: Rising High Technology Manufacturing Employment

As evidenced in recent research, there has been a rise in high technology manufacturing employment. The U.S. State Comptroller's Office posits that, "the computer and electronic manufacturing industries saw a growth in employment by 9% from 2004 to 2008." (New York State Office of the State Comptroller, June 2010) In addition, this article concludes that the products that this industry produces (computer and electronic equipment) will be the most produced items in all of Upstate New

York by 2013. Given this information and the fact that Upstate New York is a major attractor of higher education, specifically in science and engineering programs (New York State Office of the State Comptroller, June 2010), there lies the potential to leverage these two important facets of Upstate New York to benefit each other. One way would be to facilitate opportunities in this sector that would complement the qualifications of the graduates. As shown in the tables (Figure 1), there is even a potential to retain younger college graduates, as many of these employers require only a bachelor’s degree. This would significantly change the demographics of the region and the presence of younger adults can demand major urban cores of the state.

Latent Potentials do Exist to Capitalize Upon

A design approach cannot incite regional economic development by itself, but it is one factor that can contribute by making physical improvements in the urban landscape. Additionally, design interventions will not generate economic activity if no latent economic potential exists to unleash to begin with. According to economic and ancillary sources though, the Erie Canal Region exhibits several suppressed opportunities that can be brought to fruition. Infrastructure upgrades are needed in the canal cities to maintain a young population of highly educated professionals and to service the aging baby-boomers who will be retiring soon. These retiring individuals will constitute a very large demographic over the next 20 or 30 years and will be looking for ways to spend their free time. New programmed

Top Occupations for the Machinery and Computer Manufacturing Sectors in Upstate New York			
Machinery Manufacturing	Percentage of Industry	Median Wage	Training/Education/Experience Required
Team Assemblers	9.8%	\$23,710	Moderate-Term, On-the-job Training
Machinists	5.9%	\$37,690	Long-Term, On-the-job Training
Welders, Cutters, Solderers and Brazers	4.2%	\$35,750	Long-Term, On-the-job Training
Mechanical Engineers	3.6%	\$74,540	Bachelor's Degree
First-Line Supervisors/Managers of Production	3.1%	\$54,780	Work Experience in Related Field
Inspectors, Testers, Sorters, Samplers and Weighers	2.7%	\$32,610	Moderate-Term, On-the-job Training
Computer-Controlled Machine Tool Operators	2.3%	\$33,060	Moderate-Term, On-the-job Training
Bookkeeping, Accounting and Auditing Clerks	2.0%	\$36,710	Moderate-Term, On-the-job Training
Tool and Die Makers	1.9%	\$48,080	Long-Term, On-the-job Training

Computer Manufacturing	Percentage of Industry	Median Wage	Training/Education/Experience Required
Electrical and Electronic Equipment Assemblers	11.4%	\$28,110	Short-Term, On-the-job Training
Team Assemblers	5.2%	\$23,710	Moderate-Term, On-the-job Training
Computer Software Engineers	4.2%	\$97,130	Bachelor's Degree
Electrical Engineers	4.2%	\$83,120	Bachelor's Degree
Inspectors, Testers, Sorters, Samplers and Weighers	3.5%	\$32,610	Moderate-Term, On-the-job Training
Electronics Engineers	3.0%	\$89,950	Bachelor's Degree
Electro-mechanical Equipment Assemblers	2.9%	\$29,060	Short-Term, On-the-job Training
Industrial Engineers	2.9%	\$75,860	Bachelor's Degree
Accountants and Auditors	2.2%	\$72,010	Bachelor's Degree
Electrical and Electronic Engineering Technicians	2.2%	\$55,980	Associate's Degree

Figure 2 :: Unlike traditional machinery manufacturing and metal producing industries, high-tech production industries require a significant investment in education from their employees. (Source, New York State Department of Labor, Staffing Patterns and Employment Prospects Program)

uses for the Canal that are geared towards old-age recreation may greatly appeal to the New Yorkers who elected to stay, for family or personal attachment to the area, rather than leave the Region in search for better weather. Furthermore, as the economics of gas and oil prices continue to evolve, new commercial and industrial uses for the Canal will present themselves as feasible options.

Moving from Subsidization to Profit Generating

At current, the Thruway Authority heavily subsidizes the operations and maintenance of the Erie Canal with a revenue stream from the toll fees paid by vehicular passengers using the New York State Thruway system. The New York State Canal System was transferred from the State Department of Transportation to the jurisdiction of the Thruway Authority in 1992, and created the Canal Corporation as a subsidiary of the Authority (New York State Thruway Authority, 2009). This move essentially erased the annual net deficit of the Erie Canal from the New York State budget; no longer to be paid with taxpayer dollars. The healthy and reliable revenue stream that the Thruway Authority had in the 1990s to subsidize the Canal Corporation has incrementally declined in the 2000s.

The Thruway subsidizes the Canal Corporation approximately \$70 - 75 million annually, depending on the capital expenditures of that year. Capital expenditures, which can include emergency expenditures, natural disaster

damages, and the rehabilitation of a lock, can cost \$10-15 million. The annual budget of the canal system hovers around \$80 million. The canal system usually only generates between \$2 - 4 million annually from its own revenue stream. The 2011 budget included \$2.4 million in Canal Development Fund monies. This figure includes Canal toll fees, which amounted to \$216,895, and proceeds from Canal land permits, leases and sales (New York State Thruway Authority, New York State Canal Corporation, 2011; Dimura, 2011; Leighton, 2012).

The Canal is considered a financial burden on the Thruway by some locals. It was the easy scapegoat to target when the Thruway Authority held public hearings to debate increasing the Thruway toll rate (Harris, 2012). A larger obstacle inhibiting the Canal is that many New Yorkers are not even aware that it is still in operation (Mantello, 2012). While it provides a lot of recreational value to the locals who live or boat on the water, passive recreation does not largely generate direct revenue streams for the canal or surrounding communities. If repurposing the Canal infrastructure through strategic design, leveraging it with landscape improvements, is able to tap into some of the identified latent potentials, new direct and indirect economic activity may ensue. Right now the Thruway Authority is solely responsible for financing infrastructural upgrades, but if the Canal can demonstrate net profit generating capabilities, the funding sources for capital projects is likely to diversify since private entities will enter the arena. Transitioning the development decisions that shape the future of the Canal from a single

I. Landscape Systems Design to Enable Economic Development

This text suggests that systems-based design interventions in a regional landscape can identify catalyst sites and intervene with physical design improvements that release economic potential, such that a more robust and stable local economy can emerge in the region over time. To realize this potential, I am deploying kit of ideas as an economic development strategy, where the redesign or repurpose of old infrastructure can leverage landscape improvements to advance the social, cultural, ecological, and economic environment (Verzone, 2011). Place-based investments can enhance the value of the accumulated man-made assets in the landscape and increase the utility of the region's natural capital. By critically mapping and assessing the systemic processes in an urban region, sites in the landscape will emerge as key locations that may either hinder or enhance the development of the regional systems. These catalytic sites can be designed to release the latent economic potential in the landscape that can then be driven by natural demand in the market.

Observed Problem

The pace of the economy is faster than the pace at which the built environment can adapt. Development can occur quite rapidly in response to the spontaneous demands of the economy, but even in the most robust of markets, it will lag slightly behind the time the perceived demand emerges (DiPasquale & Wheaton, 1996). This newly formed development, regardless of the

CHAPTER THREE | ARGUMENT



quality of construction, outlives its economic demand. This disjoint solicits a decision: either refurbish the buildings, roads, and terrain to fit the emerging economy of the region, or abandon the obsolete landscape and build new infrastructure from scratch. Americans are commonly criticized for taking the latter approach, expanding their urban footprint with disposable landscapes, but the built environment in the US exhibits a composite of both decisions.

This thesis will lend insight to attempts at reconciliation of the static nature of built elements with the dynamics of ecology and economics. The built elements in the manmade urban environment have been engineered for durability and longevity, but the physical (ecology) and the intangible (economics) forces are fluid and in constant fluctuation. Solely designing fixed, single-purposed infrastructure for fluid processes is the key problem; it is short sighted and fragmented as history has proven (Hill, 2010; Bélanger, 2009). Change in the built environment is the slowest and most expensive type of change to make in a system (Meadows, 1999), so when opportunities to upgrade regional infrastructure emerge, planners should consider leveraging the structures with landscape properties. Doing so would expand all project investments to achieve the largest amount of positive gains. By repurposing infrastructure in this fashion, planners can strive to capture multiple economic and ecological benefits sustainably.

Concepts Drawn from Systems and Landscape Design Principles

I argue that exploiting old infrastructure for new landscape programs could be leveraged to promote new economic activity in urban nodes that touch the infrastructure system. The strategies for deploying this landscape-based type of economic development are inspired by several concepts written by systems-based designers and self-identified landscape urbanists. I have identified seven principles that inform my strategy.

1. **Flows & Processes:** The understanding that environmental elements are highly fluid and their dynamic properties should be accounted for in designing the built environment. Rivers, groundwater, wind, and pollination flow between regions, just as a denuded area will transition from weeds to shrubs to trees as succession takes place over time (Berger, Systemic Design Can Change the World, 2009; Bélanger, 2009).
2. **Ecological Properties:** Ecology is a branch of science that studies the relationship between an organism and its environment. Designers consider the scientific prerequisites required to maintain a healthy ecology and emphasize the ecosystem services of plants to create multiple benefits. They design in anticipation of how plants and fauna will evolve with time (Forman, 2008; Kousky, 2010; Berger, 2009; Costanza, et al., 1997; Reed, 2010;

Odum, 1973; Naidoo, et al., 2006).

3. **Decentralized Decision-Making:** In the past, great infrastructure projects were funded and implemented by a central authoritative government agency. Several authors, however, believe that a decentralized process for making decisions at a large scale – that will impact many people, economies, and ecologies – is more successful (Berger, 2012; Reed, Public Works Practice, 2006).
4. **Landscape Systems Design:** A design process that takes into account the dynamics of environmental, industrial, and material systems of a landscape. This system is premised upon the dynamics of landscape systems as opposed to looking specifically at the space of a site. It accounts for such large dynamic systems as watersheds (Berger, Systemic Design Can Change the World, 2009; Bélanger, 2009; Meadows, 1999; Reed, 2010).
5. **Flexible & Adaptable Infrastructure:** Infrastructure is traditionally considered a concrete static element of the built environment. It refers to bridges, roads, buildings, and utilities that traverse water, support vehicular traffic, house people, and pipe sewage respectively. Landscape urbanism broadens this definition of infrastructure to account for green open spaces, constructed

ecologies, cyclical waste, and soft approaches to providing the same uses (Bélanger, 2009; Hill, 2010).

6. **Community Ownership:** Solely reclaiming a contaminated site to improve its environmental health is insufficient. Fencing off the newly reclaimed area will lead to negligence and decay. Instead, the landscape should generate enough of a benefit – in the form of a community asset – to make capital inputs justifiable. If a community has a sense of ownership over the site due to their ability to use it, for a nature preserve or recreational area, the landscape will have realized value and be maintained (Berger, 2012; Eckbo, Kiley, & Rose, 1940).
7. **Landscape as a Medium:** The scale of urbanization has expanded to such a large scale that the medium to deploy urban design is through landscape, not the architectural building. Using landscape as a medium recognizes the logistics of large regions and can better leverage resources and activities within relatable proximity (Berger, 2009; Bélanger, 2009; Waldheim, 2006; MacKaye, From Geography to Geotechnics, 1968).

I have extracted the principles for my strategy from these seven concepts. Landscape urbanists fundamentally frame their design practice around the understanding of systems.

Systems and flows inform most of their values in designing spaces because their objective is to include ecology as a fundamental consideration for which to design, and their designs are applied to very large landscapes. We cannot design regions in the same way that we design backyards; a region is simply too large to develop such concrete and prescriptive elements (Berger, 2012; Sites, 2004). As such, I subscribe to this method of designing with systems at a regional scale, rather than first designing with space, which is more effective at the property level.

Landscape Systems & Design Principles for Deployment as an Economic Driver

These guiding concepts strive to infuse the dynamic properties of ecology into the relatively static built environment. I argue that the same strategies taken to accommodate the flows of ecology can be modified to also include the flows of economy. Similar to the dynamic properties of ecology, economies exhibit properties of boom and bust, seasonality, and transitioning phases. Just as concrete structures can be designed to account for the successional properties of plants and the migration patterns of animals, they can also be designed to host one set of economic activities in the summer and another set in the winter. In order to better design or redesign infrastructure for changing economies and fluid ecologies, I have identified a series of analytic parameters, strategies, and applications to guide design interventions into enabling greater or more sustainable economic activity.

Analytic Parameters for the Purposes of Analysis

Three concepts are parameters that analyze the environments where the landscape interventions will be deployed. They describe the scope and function of the landscape being addressed. I refer to them as analytic parameters.

- **Dynamic Systems**

The pioneering individuals in design and urban studies are starting to recognize the dynamic nature of elements in the landscape and built environment. Ryan reflects upon the growing and shrinking trends of cities and their urban fabric as they experience periods of prosperity and decline (Ryan, 2012). The literature body of landscape urbanism and systems design extensively documents the fluctuating properties of ecosystems and the successional nature of plants¹. While the economic properties are intangible forces and the ecologic properties are physical forces, both are fluid systems that create material and spatial areas. Designing fixed structures in the built environment poses a conflicting challenge for these reliably dynamic ecologic and economic systems.

The summer months are flush with more volumes of ecology and economy streams in the Erie Canal Region than in the winter months when these flows both constrict.

¹ Refer to the seven principles for the literature citations

Upstate New York's plant hardiness zone ranges from zone 3 to zone 5 meaning that vegetation is very cold hardy and seasonal (USDA; Dirr, 1998). Plants survive in a dormant state in winter and have a short summer period where their foliage, pollination, and growth prime. Summer tourism conditionally brings more people in for recreation and lodging in these spaces. Just before the recession took effect in 2008, the tourism sector support 666,915 jobs, or 7.8% of all private non-farm employment in New York State, but contracted by 13.8% in the year following (Tourism Economics, 2010).

In turn, there are two types of flows: 1. Small cyclical flows that have some consistent pattern, such as seasonality, in a year and 2. large flows that form more of a trend that can extend over years, decades, and centuries, such as succession (DiPasquale & Wheaton, 1996). Both types of systems should be considered when designing the built environment. Planning for this fluctuation in the year, and long-term planning for any unpredicted system trends, will optimally capitalize on the assets and currents available.

- **Regional Scale**

Understanding system processes and flows, like the economic and ecologic flows, helps define the natural boundaries of the urban region. For example, the territory of the region is likely to change depending

on the metric that is used to define it. The territory of a specific region may be small if measured by its workforce, and large if its natural ecological systems are the focus. Through the research process of systemic design, the appropriate economic metrics and cultural flows will emerge and ultimately define the limits and boundaries of the region. A litany of authors from disparate fields have drawn consensus that the urban unit is now the region². However nebulous the universal definition of a region is, this paper approaches the region as a spatial unit that can incorporate city, peri-urban, and rural forms of urbanization.

Approaching a project at the regional scale is really enforcing that the entire context of the site should be analyzed before making interventions in the ground. In this light, no firm boundary exists to define a region and one site may belong to several overlapping regions. However, to be constructive, some definition of a region must be made. I identify a region by its shared characteristics that unify the surrounding communities in the strongest way. In the case of the Erie Canal Region, the shared history of the urban centers, the physical canal infrastructure, and the topography of the landscape define its limits. Buffalo, Rochester, Syracuse, Utica, and Albany really urbanized during nineteenth century as a result of the construction of commercial shipping

² See Chapter 2

corridor. The Canal is a physical connector that links 234 communities (Dimura, 2011; Leighton, 2012) along the system by a fluid conduit. The corridor between Albany and Buffalo is defined topographically by land forms to the north (Lake Ontario, the Tug Hill Plateau, and the Adirondack Mountains) and south (the Southern Tier).

A region is also defined in part by the objective of the project. Since many sub-regions exist with regions, similar to how sub-watersheds exist within larger watersheds, identifying the objective of the project will help inform at what scale and focus to analyze. The Erie Canal Region can be broken down into five MSAs (Metropolitan Statistical Areas, or metropolitan cities) or projected up as one segment of the Great Lakes Region (Belanger, 2010).

- **Multi-Use Landscapes**

The landscape has a multitude of potential uses. The natural environment yields flows of ecological benefits and services that are considered to be the natural capital of a landscape. But the way in which society elects to use the landscape and its flows, the amount and types of uses that society extracts for their unique habitation, depends on the society that inhabits the territory and the phase of the market at the time. In this understanding of multi-use landscapes, both natural and manmade landscapes are considered natural capital

because the existing built infrastructure, as much as the green infrastructure, are both existing elements in the landscape that can be utilized or programmed for the needs of the inhabiting community. The fact that communities can use elements of the manmade landscape for their benefit repurposes built landscape into natural capital.

Multiple economies generated on or from a given landscape, can be understood as multiple uses of that land. An urban region can support primary, secondary, and tertiary economies for example, that take full advantage of multi-faceted environs. Economic stability is strengthened from hosting several concurrent economies that are not reliant on one another for their success. A 2010 study showed that while the primary industry (agriculture) in China had been on the decline for the past 20 years, the region was accumulating jobs in the tertiary industry (services) such that employment overall was increasing (Salmon, 2012).

Specific to my research, the Erie Canal was constructed to transport barge cargo from Lake Erie in the west to the Hudson River in the east. In less than 20 years of its completion, the advent of the railroad network largely replaced the utility of the canal as a commercial shipping vessel. While the Canal still hosts commercial traffic today, it is largely used for recreational purposes. The demand for intensified

commercial boating traffic exists, however the infrastructure of the Canal has not been upgraded sufficiently to accommodate the larger size of the contemporary shipping vessels and the loading docks to transport cargo to and from the barges. Instead, the Canal serves a recreation use in addition to tourism, heritage, and occasionally flood control. Marginal commercial shipping activity on the Canal is left.

The Canal indeed serves multiple functions at present. However, most of the current utilizations contribute to a quality of life that does not necessarily generate an economic revenue stream. The canal tolls generate approximately \$5million of the \$80million annual operating and capital investment budget (Dimura, 2011; Leighton, 2012; Harris, 2012). The high value of the passive recreation activities, the bike and pedestrian traffic along the corridor, is an indirect or induced value and does not generate as much revenue as it does benefits. Passive recreation does not create direct economy when it is contained to the canal right of way. Some commercial traffic does persist on the Canal. However, interest from New York State entrepreneurs has been expressed to increase the capacity of this use. With capital investments to improve upon the interconnectedness between other modes of transit and the reliability that the canal will regularly and consistently operate, this potential can be met. Leveraging these existing uses, with the creation of additional program uses

from this single nineteenth century canal system will diversify and potentially amplify the economic activity at the location of the intervention.

Strategy for the Purpose of Planning

One concept is the strategy that is used to plan where and how to deploy the landscape intervention. It describes the process used to incorporate the knowledge of the analytic parameters into the applications.

- **Catalyst Sites**

Designing improvements in large regional landscapes poses several challenges primarily because of the sheer scale of the territory. However, understanding that regions are products of the flows that traverse through them directs designers to employ a systems design strategy.

A systems-based design approach is a process that identifies the flows that pass through a region and then selects sites where the manipulation of, or addition to, the landscape can make the greatest impact on the entire operating region or system. There exists a strong correlation between the systemic process of dynamic activities in the landscape and the specialization of the physical built environment. The flows of people, capital, knowledge, mobility, hydrology, energy, political interests, and economy create conditional patterns that logically result in the physical forming of space and land. Spaces are formed

as a result of the perpetual cadence of a process. In tracing the forces of a process that gave rise to the resulting physical form of a place, it is important to realize the different scales that are at play. A site can be measured in acres, but the system in process that materialized the site may stretch across several metropolitan areas. Discovering the intersection of these small and large scale, systemic and spatial, landscape issues is key to devising a successful response.

In this paper, I utilize an approach that has a research phase, followed by a design phase. The research phase is a comparatively large portion of the methodology and the product of this process is a valuable contribution even without the design solution. It is spent uncovering the systems, synergies, and site locations that most greatly impact the region and hold the greatest potential to influence and dictate changes. Locating these catalyst points is directing attention to the areas where one can get the biggest bang for their buck – an invaluable service to a planning agency with limited funds.

The design phase of a systems design methodology is equally contributory. Once the research has been completed, the recovered information informs the optimal program of a site design and what components the site should encompass. This is consistent with a traditional design approach. The specific physical design of

the site can take a multitude of alternative forms depending on the personal preferences of the stakeholders at the table.

While the New York Regional Economic Council defines five distinct economic regions along the Erie Canal corridor, the goal of deploying the systems design strategy is to identify the natural regional unit per the flows and processes that pass through. The strategy redefines the regional territory to enable more accurate observations and assessments that are not artificially truncated at the imposed political boundaries.

The operating region of this paper is clearly identified by mapping the historic location of the industrial regions that supported the excavation and manufacturing processes of raw materials during the American Industrial Revolution. This historic map is overlaid with current urbanization patterns to reveal the cohesive regions in the United States that were related by historic functions and terrain. This mapping process identifies the Erie Canal area as a single region which has a central spine that stretches from eastern urban banks of the Hudson River at Troy to the western shore of the city of Buffalo on Lake Erie, and upon further mapping assessments, the sub-regions of the Erie Canal emerged in its composition.

Once the prevailing location of the region is established, several key metrics are mapped to reveal the points of greatest significance

within the area. The key metrics that are mapped included: major infrastructure (highways, airports, train rails), canal infrastructure (locks, terminal lands, water reservoirs, dredging settlement areas), hydrology (perpetual flooding locations, point source contamination), environmental degradation (reported water pollution, toxic spills, land contamination), gross domestic product (GDP per metropolitan area), population (growth, density), and employment (major employers, manufacturing versus service industries).

Surfacing all of these metrics in a consistent format, i.e. spatial mapping, allowed for a holistic assessment of the region. By looking across the five or six disciplines of economics, transportation, urban design, landscape architecture, recreation, and heritage, specific catalyst sites were identified. These sites are recognized as locations that can potentially incite the greatest amount of change in the region. The sites were identified as the locations where clusters of residual architecture still existed in close proximity to a concentration of urban population such that the water activity of the canal could be connected to the community downtowns. The pertinent canal architecture in the leftover clusters could be some combination of terminal lands, reservoirs, waterfront harbors, locks, dredging settlement areas, or storage areas in close proximity to one another.

The objective of the systems design process

is to identify these locations of greatest opportunity in the landscape, and describe a set of design interventions at each location that, when accumulated, posit a strategic design for the betterment of the entire region.

The systems design approach serves as value engineering to agencies and funding sources that have only a limited amount of capital to invest. The catalyst points are the locations with the greatest influence where capital investments are most likely to retrieve the highest rate of return. From an economic standpoint, getting these landscape infrastructure projects funded is a major challenge. Devising a strategy to optimize what funding is sequestered for the nodal improvements can present a more robust argument to politically advocate for financial support.

Application for the Purpose of Design Action

Two concepts are the actual practices that specify the design actions needed to repurpose old infrastructure for new landscape programs.

- **Multi-Purpose Infrastructure**

Infrastructure is conventionally designed and developed for a single purpose. This model for constructing the built environment is short sighted since the need and function of those structures transition with time, rendering some of them underutilized and underinvested. As population masses migrate, they displace

the need for infrastructure in the region they left to the region they move to. This decreases the use and available capital of the roads, bridges, waterlines, and electric systems in the original area. As technologies advance, the need for canals, harbors, and trains reduce, giving way to cars, trucks, and light rail.

Designing infrastructure to suit several purposes is an application both to accommodate the changing nature of the economic systems that flow through a space and also to provide ecological benefits by working with natural processes. If the landscape offers many products and services, the infrastructure built from the land should channel the multiple yields and represent their effects in the urban environment.

The canal was constructed purely for the pursuit of more efficient commercial transportation. It served this function for over 100 years until the commercial traffic tapered off so much that it only survived from large subsidies and new recreational programming. The canal is an existing structure, and therefore approached as an element of the manmade landscape that has multiple services to offer. However, in the redesign of select segments of the canal, new multi-purpose design and program can be employed. The locks can raise and lower the water level in the channel, but can also be outfitted to produce energy from the hydrological

pressure streaming through the controlled section.

- **Reclamation & Retrofitting**

So why preserve habitation in a region that was constructed to serve an economy that no longer exists? For one reason, the area still has existing infrastructure. These assets hold value that can be built off of to leverage additional development, and provide free or subsidized services through a spill-over effect (Odum, 1973). Also, the region will likely maintain the natural advantage that it was originally valued for. “Although the specific assets of the individual cities are obviously varied, each is able to offer a host of structural reminders of just what made them great in the first place. (Harvey, 1989, p. 9)” Natural capital is what gives a location its identity and its competitive advantage in certain economic or cultural arenas. Benton MacKaye believed that a location’s indigenous culture is formed by the environment; the natural and man-made topography of a place. Regardless of how the inhabiting society chooses to use their environment, these qualities are engrained into the landscape and generate value. Finally, it is worth recognizing the legitimacy of maintaining a habitation in a location for nostalgia. While not necessarily effective as a sole impetus, the preservation of society’s oral and material history is important to the present and future identity of people. There is a great value in remembering where and how various communities have

emerged. This thesis advocates for people to find significance in the existing built up urban environment through repurposing it.

In line with extracting greater value and more uses from a landscape, I argue that old, neglected, dilapidated, or underutilized pieces of infrastructure can be reclaimed and exploited for new program uses that fit the current needs and demands of the society inhabiting them. Reclaiming sites creates an opportunity to correct the mistakes of the past. Significant capital investment has already been exerted in the area; recapturing that value, and leveraging it with new design and program, will create a multiplier effect on the value of the site due to the layered accumulation of history and function. In my thesis, I look into how this is the case with the Erie Canal. The Canal was engineered to host commercial shipping activities for freight. However now that there is not enough commercial activity to fill the hours of operation, additional uses can be applied to it and recover additional benefits. In addition to commercial shipping, the Canal can potentially serve as an exercise trail, recreational water corridor, wildlife sanctuary, a detention cell, and a means of generating hydropower. The same infrastructure that gave rise to commercial shipping can also support, perhaps with mild adjustments, a myriad of other uses. The tradition of the Canal will feed into itself, and the Erie will become more valuable to the heritage of the area as time passes. Reclamation and retrofitting

seeks to platform off of the original use of a structure, layer a heritage value over it, and repurpose new uses that are better suited for the contemporary period.

The residents in the Erie Canal Region capitalized on the recreational services that the canal has to offer once the Canal Corporation programmed it for recreational boating and constructed the bike path. While it no longer served as a valuable commercial corridor for the national GDP, it supported a high quality of life to local residents by providing outlets for recreational cycling and jogging.

II. Research Questions

The key questions for determining whether or not this set of guiding principles is an effective means of generating economic development are tailored to the exploitation of the Erie Canal for greater economic activity and ecological purposes. Can nodal investments along a massive linear regional infrastructure make a difference economically, ecologically, and programmatically? How does one prioritize a system so large? Specifically in the Erie Canal Region, what kinds of landscape activities can activate economic activity? This research was guided by these questions, where I will address them through my case research in Chapter 4.

III. Marshall Evidence that this Argument Works

The economic success of past projects that have leveraged old infrastructure for new landscape program poses strong evidence that infrastructural improvements or retrofits can be coupled with landscape improvements to have a larger economic impact than just a single system fix. If projects are too narrowly defined they can have less of an impact on existing conditions, including economic and ecologic conditions. In turn, the responsibility falls on the planner to consider how to couple or expand all project investments to the widest positive gains.

Not many precedents exist for deploying landscape strategies through a systems design approach at a regional scale as a means of generating economic activity in that region. This systems approach to regional design is at the forefront of design practices and not yet largely adopted into mainstream practice. However, systems design is primarily a research tool that identifies the catalyst sites where the one can design landscape and repurpose infrastructure.

Since the redesign and reprogram of the Erie Canal intends to stimulate additional economic development in the surrounding region, the catalyst sites will locate within a populated area, whether that is a city, suburb, or town, where economic activity can aggregate through spillover effects and where large pools of people are accessible. The following examples of infrastructure upgrades and landscape improvements exist within an urban context, but persist through several districts and neighborhoods that resonate, to a smaller degree, similar challenges when designing for

regions.

The Richmond Canal Walk, Richmond Virginia USA

The Richmond Canal Walk is a 1.25 mile corridor along the James River adjacent to a 32 acre old industrial district. The Haxall and Kanawha Canals were unearthed during a combined sewer utility project in 1999 (Wallace Roberts & Todd, 2012). It has since been revitalized and reprogrammed into a public landscape corridor that adaptively reuses the industrial infrastructure of the James River. Portions of the Richmond Canal, similar to segments of the Erie Canal, were inaccessible from public access, locked behind a 15-foot high floodwall. The canal was outfitted with a 1.3-mile, 8-foot wide combined sewer overflow interceptor that diverted raw sewage from the James River to the canal bed during heavy rain events.

The construction of the Canal Walk and canal restoration cost \$26million to construct. Another \$20million was spent on the sewer overflow pipe. Private land was donated to the Canal Walk property equal to \$6million making the total cost of the project \$52million. The installation of the sewer overflow interceptor was mandated by the EPA, however, if installed in isolation, the interceptor was unlikely to generate any additional benefit to the city. The additional \$26million allotted for the construction of the public landscape amenity increased the total assessed value by \$480 million over the following 13 years.

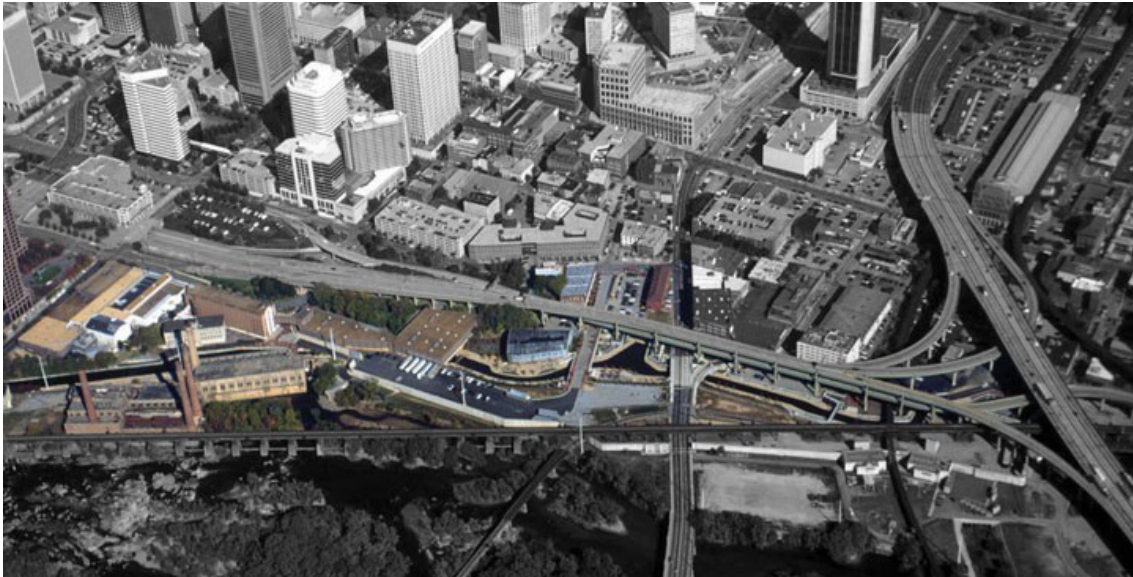


Image 1 :: Aerial view of the Canal Walk, WRT



Image 2 :: Triple Cross, so named for the rare vertical congruence of three separate rail lines, adjacent to the CSO retention basin, highway and floodwall, Michael Geffel (Landscape Architecture Foundation)

The redesign of the old canal system catalyzed economic reinvestment in the Riverfront District. The private sector development nearly tripled from an assessed value of \$242million in 1998 to \$722million in 2011. About 1.8million square feet of new mixed-used space was constructed, adding 2,570 new employees to the district. This development included 750,000 SF of commercial space, nearly 200,000 SF of retail and restaurant space, and 328 new condominiums. The old industrial district continues to attract new development in spite of the 2007 recession, planning for \$40 million of addition investment between 2011 – 2014. The Canal Walk additionally draws on average 19,000 tourists annually with the canal boat tours and chartered cruises. Ecologically, the infrastructure upgrade in the canal bed eliminates sewer discharges and reduces sewer overflows from an average of 32 occurrences per year to less than once a year (Hill & Geffel, Richmond Canal Walk, 2011).

The project functions at the regional metropolitan scale, addressing water quality protection, and the urban city scale, investing in urban redevelopment and livability. Without the sewer interceptor project, the canal would not have been restored, and without the development of the Canal Walk, the district would not have been revitalized. This case highlights how multi-tasking infrastructure projects to invest in the public landscape can increase the economic sustainability of a community. (Landscape Architecture Foundation, 2011)

Retrofitting the Haxall Canal and the utility overflow pipe with the landscape improvements in the Canal Walk public waterfront did not single-handedly revitalize the Richmond economy. It did however force attention and investment in the Riverfront District that would otherwise locate elsewhere. The canal improvements attract a lot of local foot traffic, and import attention for the native region for rallies and events. President Obama gave a rally at the site of the Canal Walk while on the campaign trail for the 2012 Presidential Election to a crowd of 8,000 people (Cooper, 2012). This kind of pedestrian concentration is very attractive to service industries that are likely to spring up due to regional growth. The business that started up in the Riverfront District capitalized on this flow of people rather than locating closer to the firms themselves that are largely locating in the outskirts.

The Richmond Metropolitan area was one of three cities with the largest growth rate in the state, which when combined, account for 82% of the state's population growth in the last decade – more than half sequestered to Northern Virginia (Cai, 2011). However, most of the growth in the Richmond metro area was targeting the two suburban counties that circumvent it. The city itself experienced a much more moderate growth rate and hosts a smaller population than either Chesterfield or Henrico counties (Jones, 2010). Amazon is one of the companies to recently establish a facility in the Richmond area. They set up a distribution center in Meadowville Technology Park in Chesterfield County but are planning

to recruit employees from the local labor force (Blackwell, 2012).

Vacant Lands Project, Philadelphia Pennsylvania USA

Pennsylvania Horticultural Society’s (PHS) Philadelphia Green Program has launched a large-scale urban place-based investment strategy that deploys landscape services to combat the urban decay that was caused by pervasive vacant lots throughout the city. The vacant lots tend to be accompanied by vandalism, criminal activity, illegal dumping, and other activities that diminish quality of life for residents. The program stabilizes vacant parcels by removing signs of decay, reinvesting in landscape improvements by simply installing trees, top soil, grass, and general “greening” elements, and reprogramming the site as a public community asset. The process includes a third component that is tailored to community outreach by employing transition-to-work and homeless citizens. The green sites are not meant to be permanent, but rather stabilize the state of decay until the property reaches its full potential

The greening program was supported with a \$3 million annual budget from the City of Philadelphia (Citizens for Pennsylvania’s Future, 2011). Through this process, PHS has converted over 7 million SF of land from vacant lots to green parks. Philadelphia once had over 40,000 vacant properties in 1990, but due to the systematic greening of vacant lots, now exhibits half that number. Cleaning and greening vacancies have

increased adjacent property values as much as 30%. The total value of property in the New Kensington neighborhood increased about \$4 million due to tree plantings alone, and by \$12 million due to lot improvements (Wachter, 2005). A local community development corporation has cited that their renovated houses are now selling for thousands of dollars in lots adjacent to the green sites, whereas before the landscape investments, little to no demand existed for the houses (Pennsylvania Horticultural Society, 2011).

The accumulated rise in residential and commercial property values is increasing the city’s property tax base. Reducing physical decay through landscape improvements has reduced public safety crimes as well. Gun assaults across all four studied sections of Philadelphia have significantly subsided due to vacant lot greening. Additionally, residents have reportedly been experiencing significantly less stress and exercise more in certain sections due to the improved urban conditions (Cheney, Tam, Jackson, & Ten Have, 2011). The Philadelphia Green Program has the unique permission to enter private property through city ordinance. As a result, one-third of the city’s vacant lots have become public property (Nelson-Jones, 2012). The vacant lots are essentially being reprogrammed as public open space.

The Vacant Lands Project is a coordinated and effective strategy that systematically reclaims dilapidated properties over a recognized network of vacant lands. In the sites where



Image 3 :: A city wide approach is taken to systematically revitalize the Philadelphia’s vacant lands with green infrastructure, (Pennsylvania Horticultural Society)

landscape investments are made, economic revitalization follows in the surrounding area. These green sites are being deployed as a form of green infrastructure that forms a system of detached sites throughout the entire city fabric, which catalyzes investment and enhances value where they occur. (Vacant Land Stabilization Program, 2011)

I. The Erie Canal Region as a Case Study

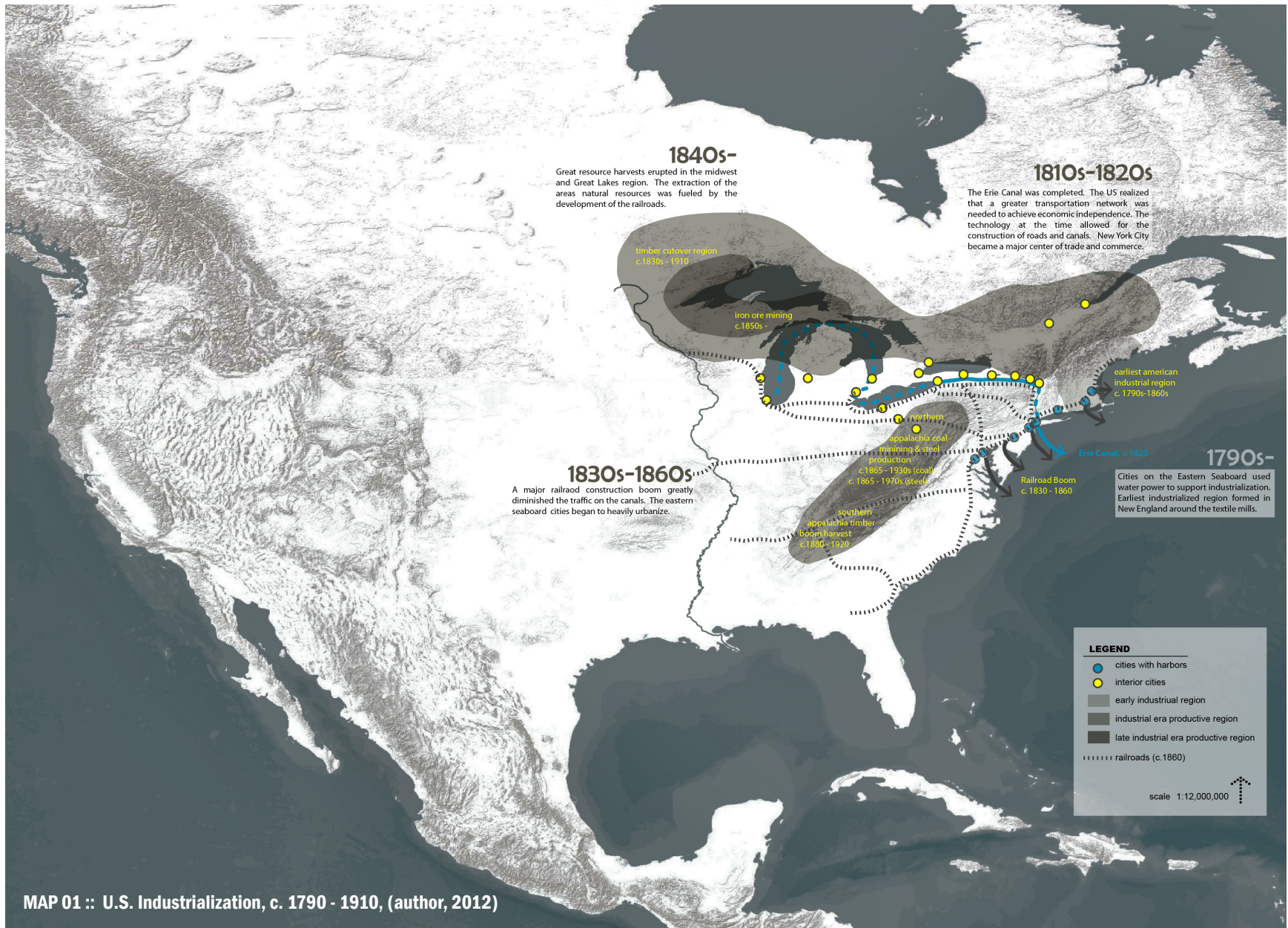
What retains people in a region that no longer supports a healthy economy? Aside from individual preferences for weather and social networks, historic infrastructure is fairly extensive in many regions, so abandoning the area all together would be very costly. The Erie Canal is an extensive infrastructure network that completely traverses the center of the economically depressed Upstate New York region. The thesis of this paper posits what would happen if the built-out canal system were repurposed to serve as a regenerative economic force in the Erie Canal Region. In pursuit of this end, I conduct a series of mapping exercises in accordance with the analytic parameters, strategy, and applications of my methodology. Through these research mappings, I will identify the catalyst sites and will prescribe the design program most suited for their reclamation.

II. Assessment of System and Region: Maps

[MAP 01] U.S. INDUSTRIALIZATION :: C.1790 – 1910

This map introduces the historical development of the site. I started the mapping assessment by identifying the context of the case region. In order to understand the significance of the Erie Canal region, it was important to observe where it was located geographically and economically.

CHAPTER FOUR | CASE STUDY



MAP 01 :: U.S. Industrialization, c. 1790 - 1910, (author, 2012)

Following the War of 1812, the United States invested heavily in transportation infrastructure, primarily through the construction of roads and canals, as a means of promoting economic independence and growth. The Erie Canal was opened in 1825 to connect the area surrounding the Great Lakes to the rapidly urbanizing East Coast. The Great Lakes region was rich in natural resources and the urban centers of the East Coast were well suited for manufacturing and shipping; the construction of the Erie Canal enabled the growth of a regional economy whereby the natural resources from the Great Lakes were harvested out of the region and moved east for manufacturing and export.

Cities sprung up in the interior of the country along this fixed infrastructure, first the water routes and later the railroads. This was in response to the mass extraction of natural resources that fed the growing manufacturing economy that was developing on the East Coast. Urbanization along the Eastern Seaboard (blue dots) and around the Great Lakes (yellow dots) grew largely out of this regional economy and throughout the 19th century, cities worked in concert from the Midwest to the East Coast.

[MAP 02] U.S. REGIONALIZATION :: C.2010

This map represents the transition from a single resource-based region to a series of functional urban regions in the area between the Great Lakes and the East Coast.

Over the course of the 20th century, cities in the Eastern United States have expanded into large agglomerations that function very much like

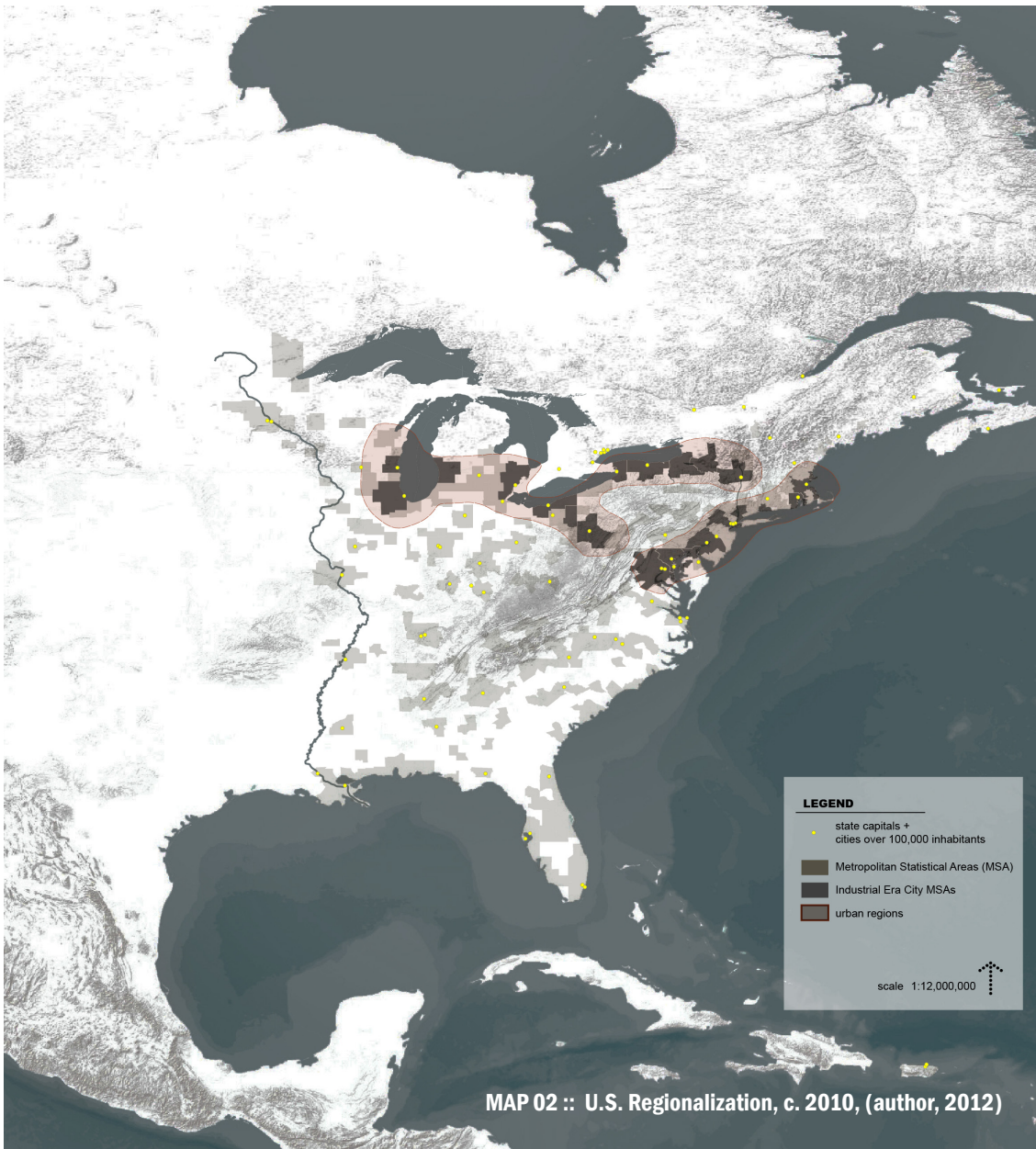
urban regions, in which a series of metropolitan areas are connected through communication, transportation and commuting infrastructure (Gottmann, 1961). There are two such agglomerations in my area of study. First, the harbor cities along the East Coast form the 'Bos-Wash megalopolis' (Gottmann, 1961). Second, the smaller cities along the Erie Canal and around the Great Lakes form the region now known as the Rust Belt.

The historical proximity of these cities has enabled the formation of urban regions, as opposed to the satellite cities that have emerged in the post-WWII era, particularly along the Sun Belt. The fragmentation of cities remain a great challenge to regionalism in the 21st century (Sites, 2004; Berger, Advanced Seminar in Landscape + Urbanism, 2012).

[MAP 03] SHIFT IN ECONOMIC FORCES LEAD TO URBAN POPULATION DECLINE

This map represents the demographic impact of regional urbanism, as over time city centers have lost population to surrounding suburbs and peri-urban areas. The resulting demographic landscape is one in which the population of the MSA is much larger than that of the city.

This map shows sixteen cities in the Rust Belt that have experienced significant population loss over a 50 or 60 year period. The outer ring of the mapped cities displays the city's peak population and the darker inner ring shows the 2010 population. Population in this region peaked in the 1950s for thirteen of



sixteen cities. Moreover, all the cities, except for New York City, have lost at least a fifth of their population. Economic forces, such as the development of a more flexible transportation system and the replacement of manufacturing jobs by service-driven jobs, enabled this population movement.

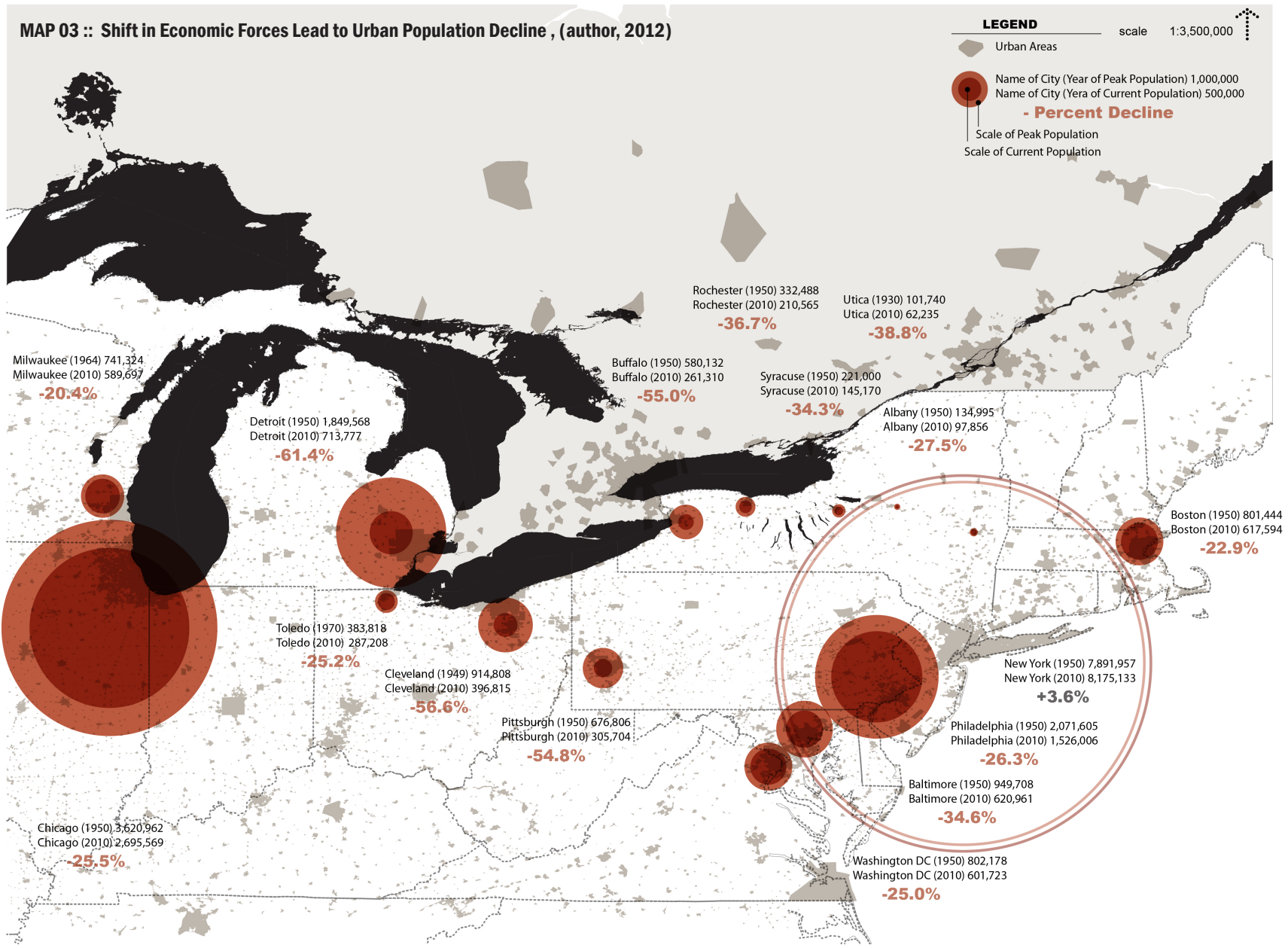
These demographic shifts suggest that there is a residual built infrastructure remaining in cities that were originally designed for a significantly larger population. The resulting urban landscape is one that is marked by the presence of unused, underused, and obsolete infrastructure.

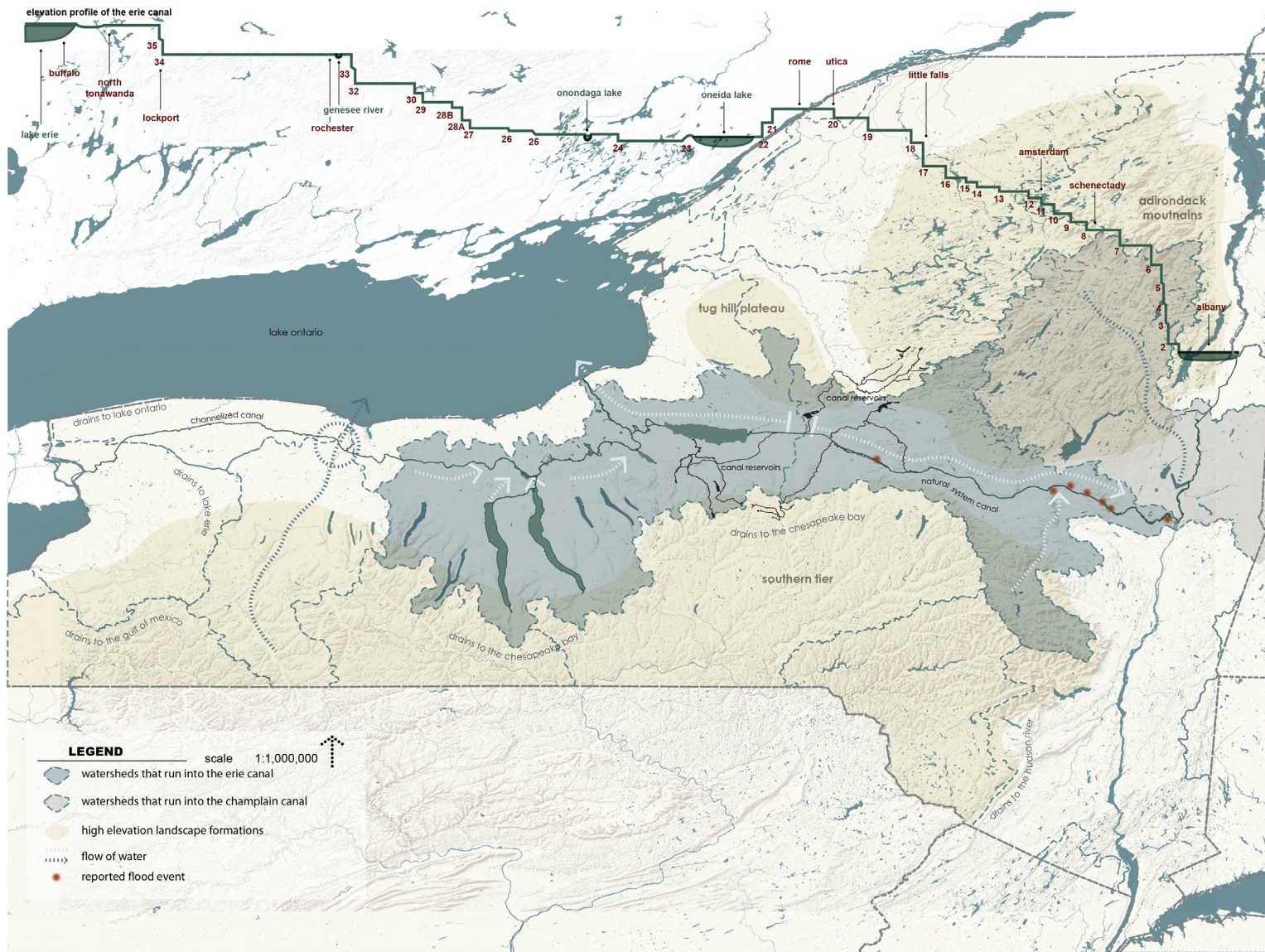
[MAP 04] SITE HYDROLOGY & TOPOGRAPHY

This map represents natural water bodies within the region. The natural watershed in the region has a major impact on the functionality of the canal. There are seventeen watersheds in New York State, many of which serve as the start of water systems, such as the Hudson River, the Chesapeake Bay, and the Mississippi River that runs into the Gulf of Mexico, in addition to two Great Lakes. Three of the watersheds run into the New York State canal system.

The Erie Canal runs along the region’s natural low points, which includes the Mohawk River Watershed and the Oswego River/Finger Lakes Watershed. The Champlain Canal, which flows into the Upper Hudson River Watershed, receives a substantial amount of run-off water from the Adirondack Mountains during rain events. The Mohawk River is the lowest point between high land forms to the north (Adirondack Mountains

MAP 03 :: Shift in Economic Forces Lead to Urban Population Decline , (author, 2012)





MAP 04 :: Site Hydrology + Topography, (author, 2012)

and the Tug Hill Plateau) and the south (Southern Tier) ; as such the river valley acts as the bathtub for this entire region. A lot of water flows into this area from the Erie and Champlain Canals, often causing a great deal of flooding during rain events, particularly in the segment of the Canal between Utica and Waterford. As a result of frequent flooding, the Canal is often required to close down. The western part of this region has a channelized canal, noting the presence of a man-made intervention, which is placed in a peculiar manner. Specifically, there is a location where the Genesee River flows north out to Lake Ontario, but crosses over the channelized canal creating an unnatural linkage, which may be environmentally significant to the water quality and ecology of this area.

[MAP 05] WATER INFRASTRUCTURE

This map represents the man-made waterways and navigable routes that build upon the natural hydrology of the region.

Navigation by the East Coast follows up the Atlantic Ocean to St. Lawrence by way of Hudson and Champlain Rivers. Near the port of Albany, at Waterford, the Erie Lake branches off to run east to west. To the west, this network reaches the ports of Buffalo, Rochester, and Oswego, all ports that carry container ferries for cargo and passengers to get across the Great Lakes. This water system is supported by hard infrastructure, such as the formalized ports; but also by forms of soft infrastructure, such as reservoirs and feeder waterways that flow into the Canal.

The original design of the Canal included the development of water reservoirs that connected into the water channel. The reservoirs were designed to provide the canal with extra water in the event the waterline was in danger of dropping too low to ship on. Today, these features look like small lakes in the landscape and have been adopted by the native communities as recreational boating lakes. In periods of heavy rain, when large quantities of runoff are flowing off of the impervious urban structures and roads, the Canal Corporation will take on excess water from other agencies to the extent possible to store them in these reservoirs. While this seems to be a nice symbiotic service that the Canal can provide to the region, the reservoirs were not designed to detain additional water quantities and have a limited capacity to do so. Flooding still persists in the eastern half of the canal.

[MAP 06] CANAL INFRASTRUCTURE

This map represents the infrastructural system of the Erie Canal.

The Erie Canal is a man-made waterway that traverses the entire length of the State of New York at its widest part. In addition to the water channel, the Canal incorporates an infrastructural system that is necessary to make the Canal operational; this includes a series of locks, terminal lands, terminal walls, and Upland Disposal Sites (UDS).

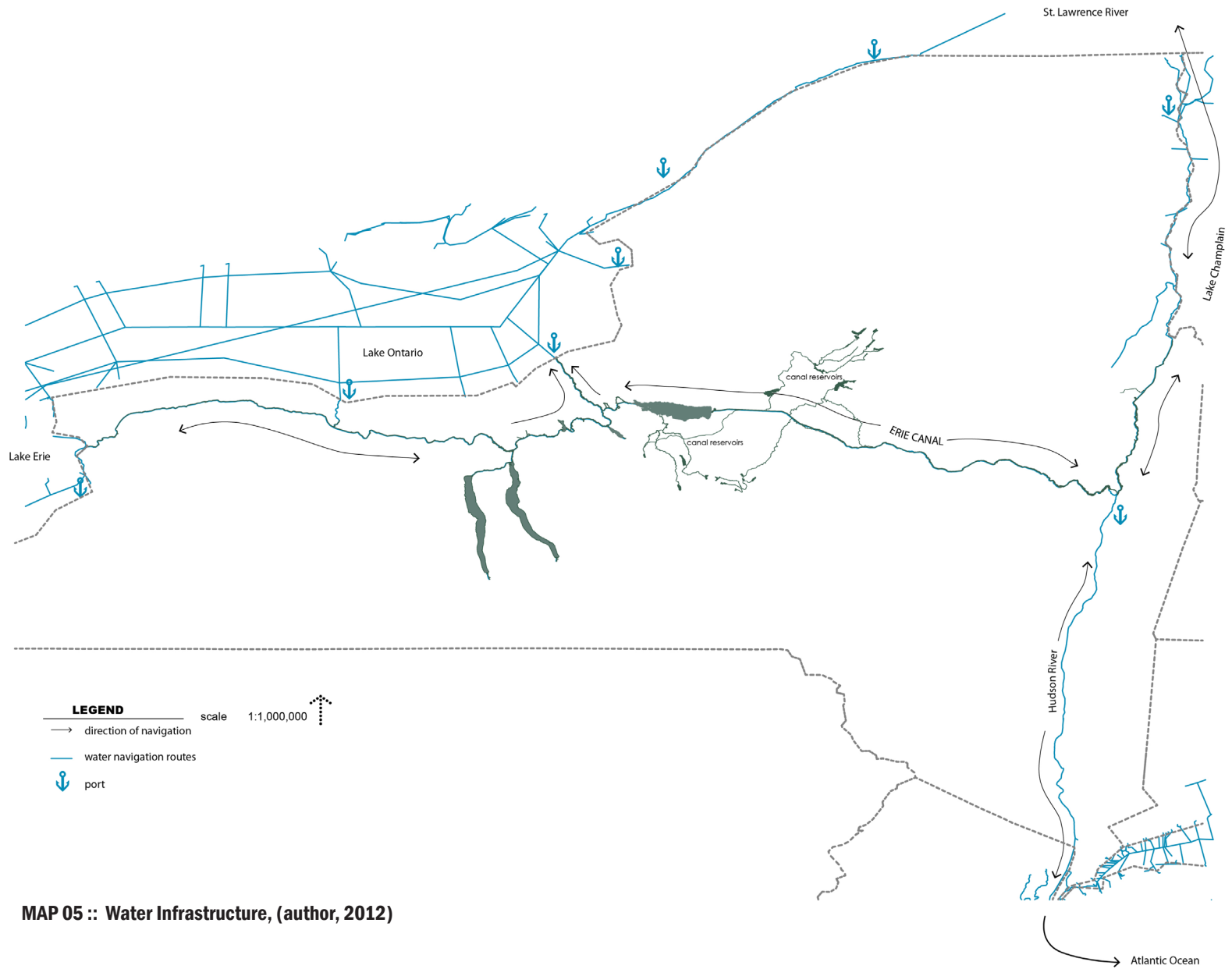
The Canal has three locks that are producing hydropower and one that could potentially



Image 4 :: An example of a Terminal Wall is shown on the right side of the photograph, (Talisman, 2011)

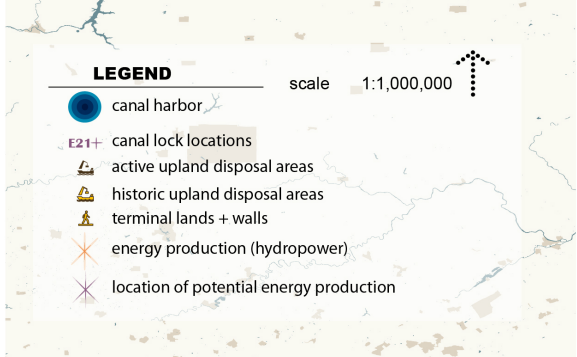
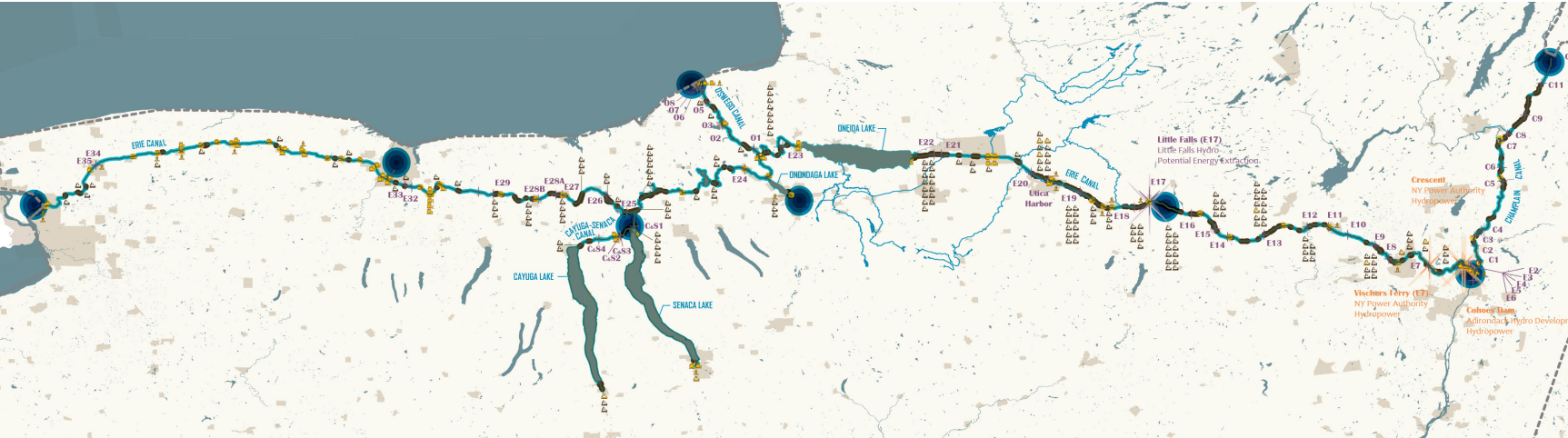


Image 5 :: An example of an Upland Disposal Site, (Canal Corp, 2012)



MAP 05 :: Water Infrastructure, (author, 2012)

MAP 06 :: Canal Infrastructure, (author, 2012)



do the same in the most eastern part of the water body. Canal terminal properties are the “facilities that have been constructed or acquired under the authority of the (state) legislature, in connection with the canal system for loading, unloading, and/or temporarily storing commodities transported upon the canals and shall include docks, dock walls, bulkheads, wharves, piers, slips, basins, harbors, grain elevators, buildings, equipment, tracks and roadways together with the lands now owned or as may hereafter be acquired by the state for the proper maintenance and operation of the canal terminals” (Canal Law, Deluca 2012). Upland Disposal Sites allow dredge material to be deposited from the Canal. Dredging allows the water to remain deep enough for boating and navigation, however the dredge material is usually contaminated with various pollutants and deposits. The less urbanized locations tend to have more Upland Disposal Sites between Erie Lock 22 and Erie Lock 7.

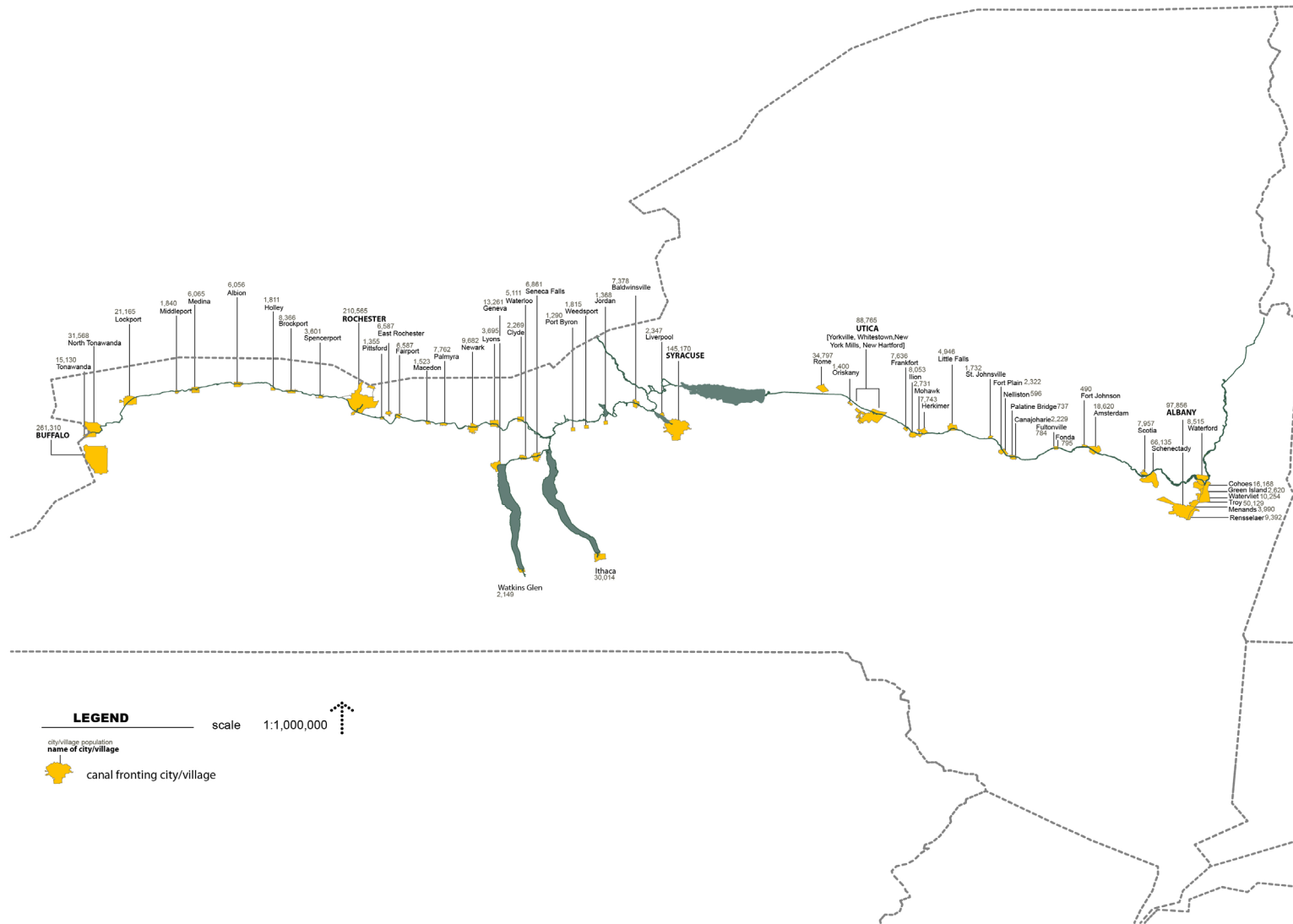
The Canal has 36 operating locks that raise the water elevation from sea level in the Hudson River to nearly 570 feet in Lake Erie. Since the state recreational mission of the 1995 Recreationway plan, several harbors have been constructed in canal fronting towns to connect water-bound users to the adjoining community. Terminal Lands, the historic location where cargo was loaded and unloaded onto land, are still under the jurisdiction of the Canal Corporation. These lands are located directly contiguous to the canal and have been valued

as open air flea market staging areas in the past. Today, their location might offer a great leverage for strategic potential development.

Many of the challenges surrounding the canal prevent its expansion as a greater economic generator for the health and well-being of the region. Cumbersome legal frameworks set over the canal lands in a way that provides a disincentive for private developers to invest in the projects in the canal jurisdiction. A large majority of the canal lands are configured in such ways they are regarded as poor quality. Some canal property exists in very skinny but long strips (maybe 20’ wide by 150’ long) and significantly reduces the potential uses that can ever be developed. The canal is only open during the warm seasons and closes for winter from November to May. Additionally, it is configured of very small dimensions for modern shipping vessels, and many entrepreneurs are hesitant to utilize the canal for commercial or industrial shipping because they perceive that the water level is too shallow or the overhead passes are too low. Commercial and Industrial uses would be challenging anyway since there are no transit hubs that connect the canal to other modes of transportation and shipping infrastructure. Although the Canal Corporation has begun to diversify the uses of the Erie Canal, it still has difficulty connecting the Canal with the communities along the water body.

[MAP 07] THE CITIES AND VILLAGES ALONG CANAL

This map represents the sixty-two cities and



MAP 07 :: The Cities and Villages Along the Canal, (author, 2012)

villages that exist along the Canal and their respective populations.

A dense cluster of communities lay on the banks of the Hudson River between Lock 01 at Waterford and the Port of Albany. Watkins Glen and Ithaca are included in this map because they lie at the base of the two Finger Lakes that feed into the Erie Canal through the Cayuga-Seneca Canal, where Geneva, Waterloo, and Seneca Falls are located. This map reflects the nodal communities, ranging from large cities of over 260,000 inhabitants (Buffalo) to small villages of 490 residents (Fort Johnson).

[MAP 08] EFFECTS OF URBANISM ON THE CANAL

This map was produced with data from the U.S. Environmental Protection Agency (EPA), reporting the pollution in the communities along the Canal. I displayed the environmental pollution in and along the Erie Canal using the reported land, toxin, and water contamination sites¹ within 2 miles on either side of the canal. Most striking is that the most contaminated

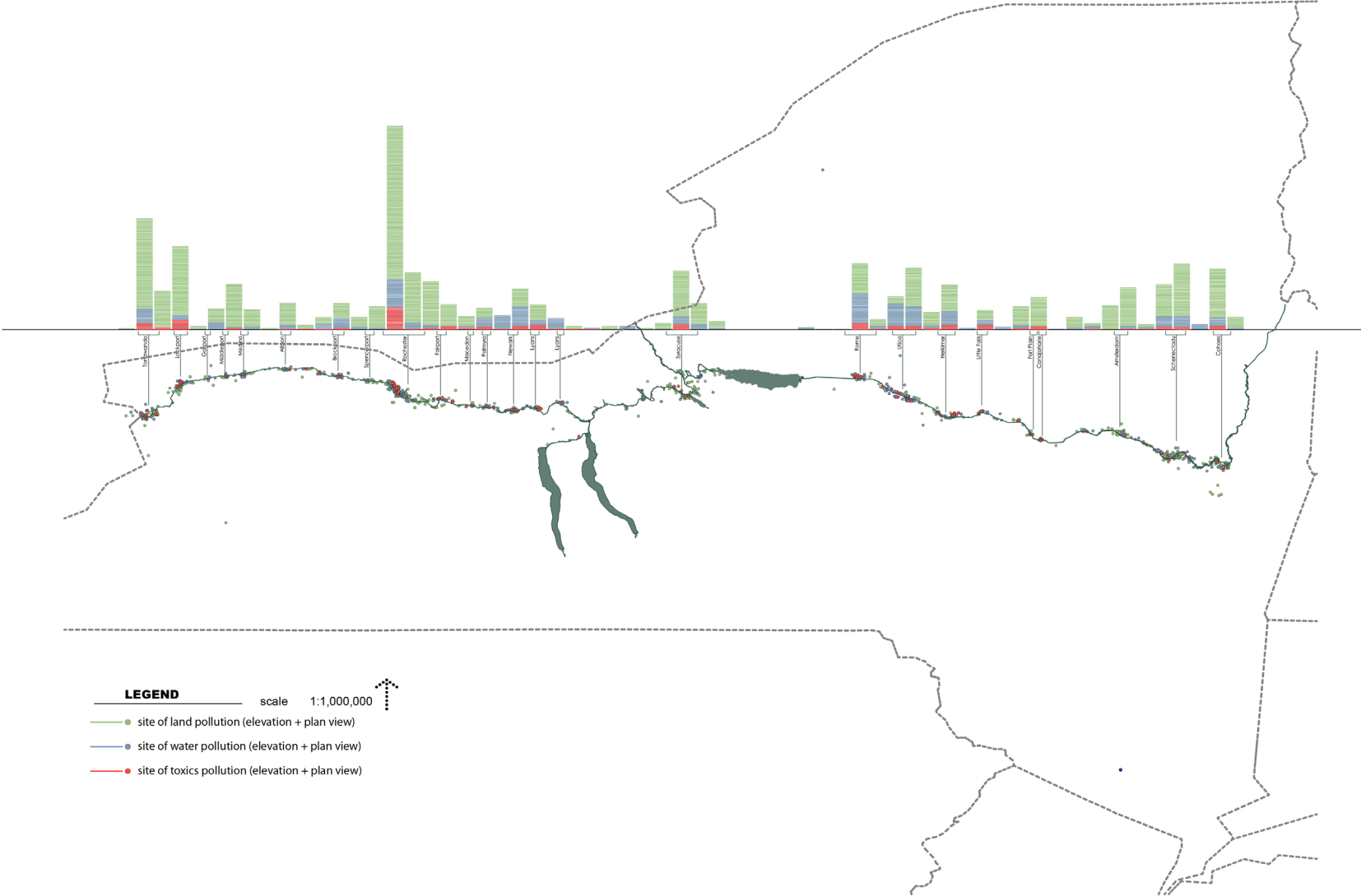
¹ The Reported Contamination Sites Data Sets for Land, Toxics, and Water is generated from the following national environmental programs: Assessment, Cleanup and Redevelopment Exchange System (ACRES); Aerometric Information Retrieval System (AIRS)/AIRS Facility Subsystem (AFS); Biennial Reporting (BR); Superfund from the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS); Permit Compliance System (PCS); Radiation Information Database (RADInfo); Resource Conservation and Recovery Act Information (RCRAInfo); and Toxics Release Inventory (TRI)

location along the Canal has consistently been on the west side of Rochester. The next most contaminated sites are in Tonawanda, NY and Schenectady, NY. The green denotes land sites with reported accidents, spills, leaks, and improper disposal of HAZMAT materials. The blue denotes similarly reported violations to water discharge regulations, safe drinking water systems, and the presence of irregular microbial activity in water sites. The red dots measure sites with reported toxic violations. Rochester is the most polluted city along the Canal. Patterns of contamination closely mirror patterns of urbanization

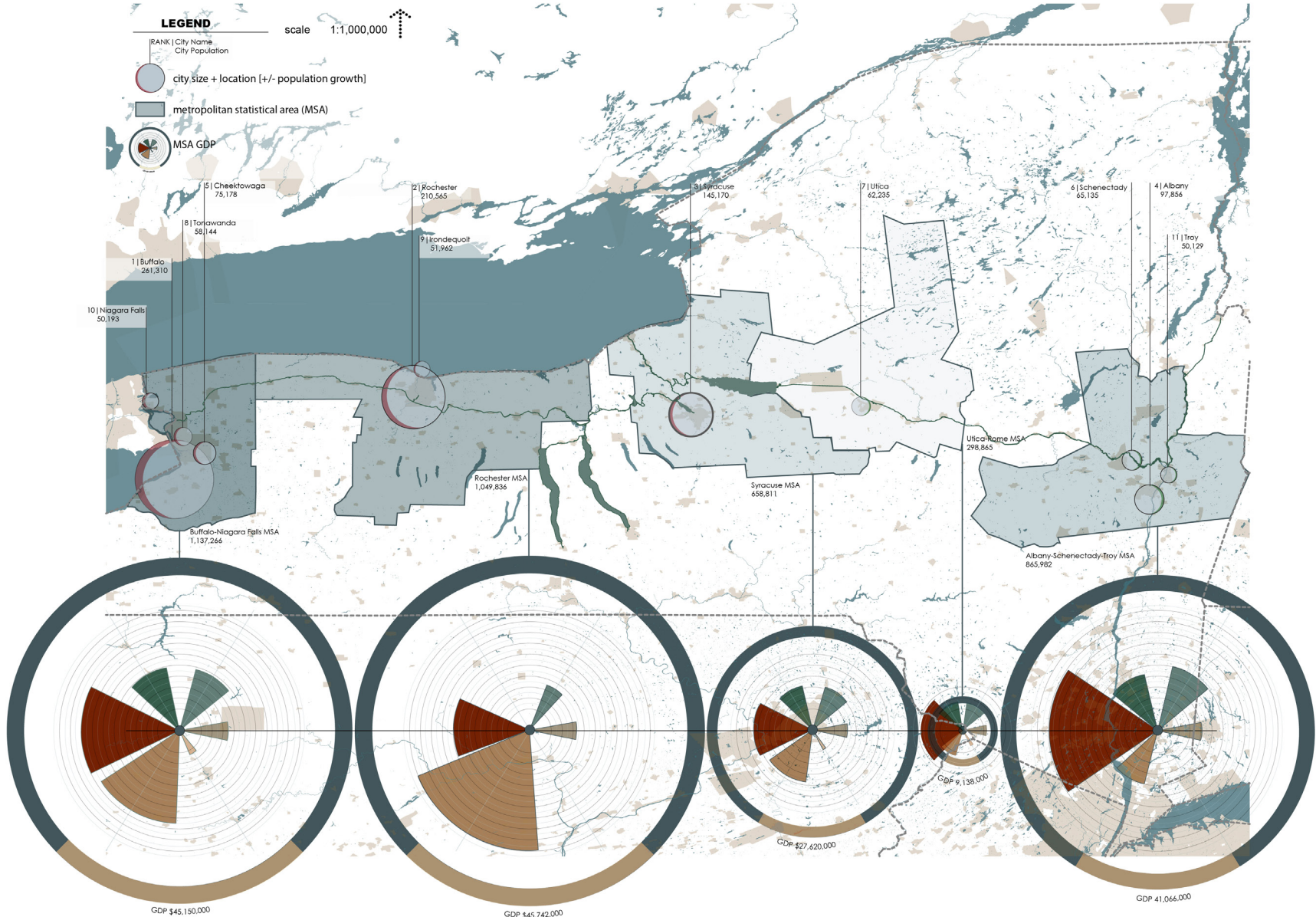
[MAP 09] POPULATION & ECONOMIC PRODUCT OF THE SITE

This map shows the eleven largest cities in the region. They are identified and represented by circles that are scaled to their proportionate populations. The red and green swatches on the inside rim of the bubbles indicate if, and how much, each city is growing or shrinking in population.

Taking a regional view, the five MSAs have been mapped according to their population. The MSAs are defined by the Bureau of Economics and are drawn along county boundaries. The jurisdiction of each city's MSA is outlined and shaded. The heavier shading indicates the more populated MSA. The Buffalo-Niagara Falls MSAs have the largest population, with Rochester falling in second place; both of these MSAs have over one million people. In comparison, the Utica MSA has a much smaller population



MAP 08 :: Effects of Urbanism on the Canal, (author, 2012)



of approximately three hundred thousand. Economically, the Buffalo-Niagara Falls MSA and the Rochester MSA also have the largest GDPs.

The MSAs corresponding gross domestic production (GDP) is visually represented along the timeline below each region. The size of the ring denotes the size of the GDP. Within the ring, blue represents the service-based industries, while the beige denotes the goods-producing economy. Both the Buffalo-Niagara Falls MSA and the Rochester MSA have a ratio of 3:1 between service and goods-producing, while the other three have a 5:1 ratio. Within the ring, the six sectors of the economic market are graphed, read clock-wise: government (red), healthcare (green), finance and insurance (teal), retail (grey), transportation warehousing (tan), and manufacturing (brown). Note that Rochester’s GDP is mostly contributed by manufacturing (20%), while the Capitol District and the Utica-Rome MSA is primarily based on government work.

The ten largest employers in the region were studied. While mapping this information revealed little pertinent information, the classification of industry was far more telling. Two of the ten employment organizations were city hospitals; other organizations were university owned hospitals and two educational organizations. Delphi Thermal Systems in Lockport, NY is the only industrial employment center that made the list (U.S. Department of Labor, Employment and Training Administration, 2012). This statistic primarily demonstrates just how diminished industrial processes are in the

Mohawk Valley Region.

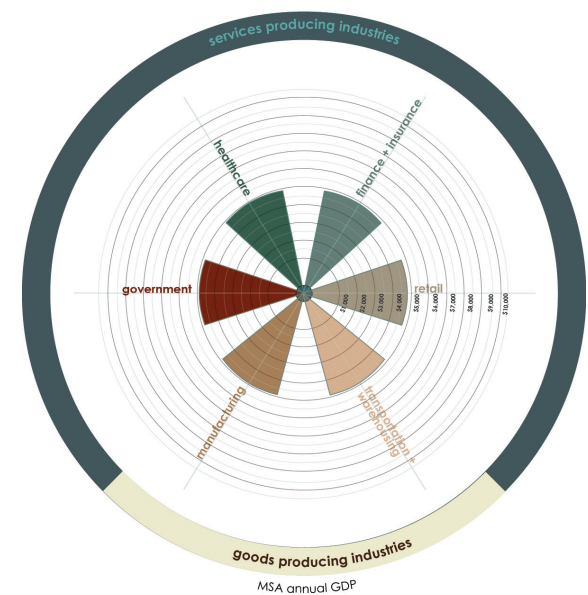
[MAP 10] TRANSPORTATION AND INSTITUTIONAL INFRASTRUCTURE

This map represents the transportation and institutional infrastructure of the region. It shows the region’s transportation infrastructure: Highways (magenta lines), intermodal hubs (magenta dots), major airports (magenta airports), and ports (magenta anchors). It also shows its institutional infrastructure: hospitals (orange dots); higher education, which includes private, state, and military colleges and universities, but not community colleges (purple dots).

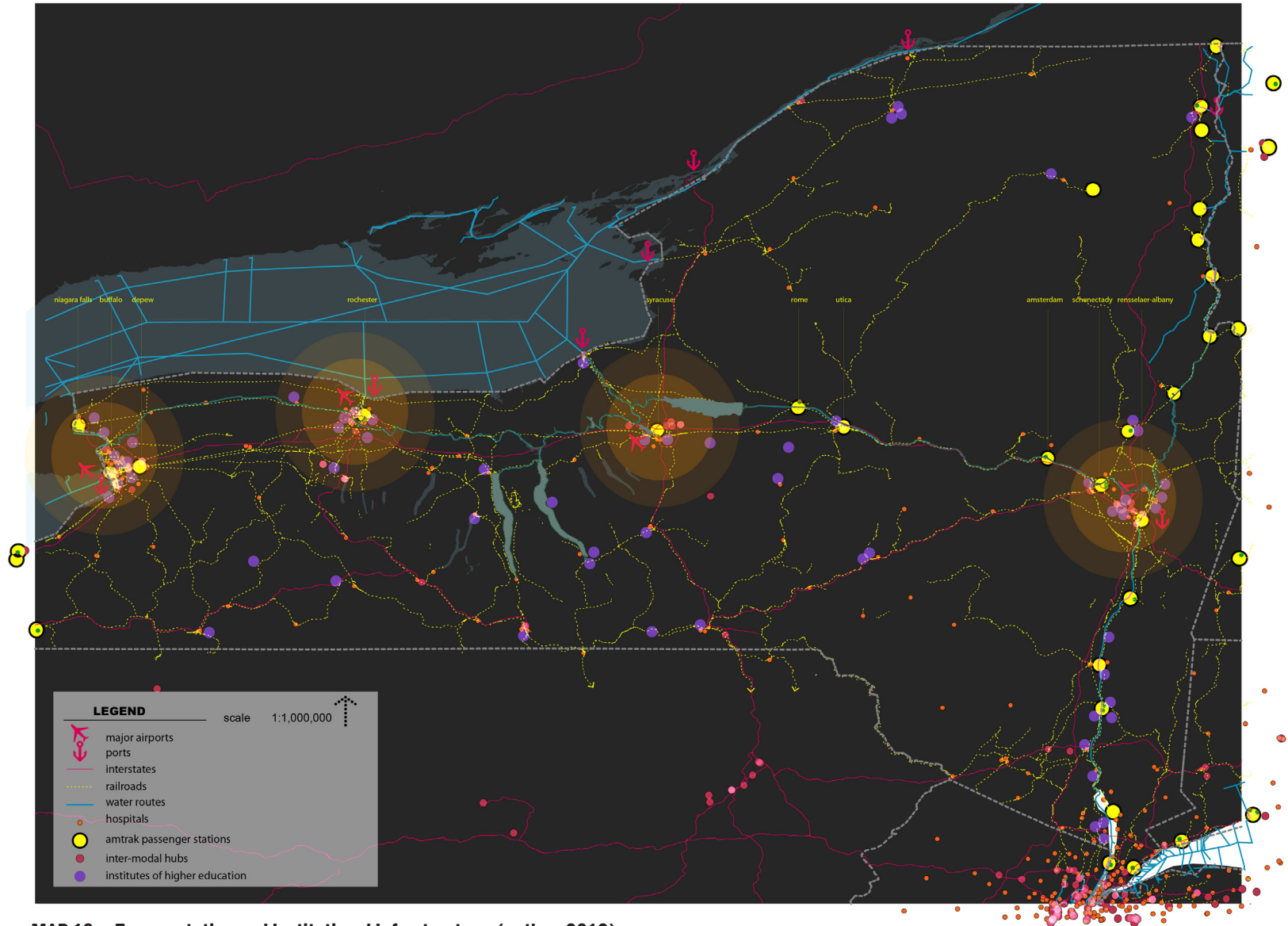
The outer rings around the cities denote the approximation of a half hour drive outward. It is evident from the map that there is existing confluence of structural forces at central nodes, which are quite compact, while the institutional infrastructure exists, quite dispersed, outside of these nodes.

II. Data Analysis

I analyzed the data by displaying it in a consistent spatial format on the maps such that multiple topics of information could be analyzed simultaneously to one another. Several strategic plans and economic impact assessments have been developed for the Canal in the past. However, the unique value of this approach is that it couples data from



A diagram showing how to read the GDP graphics in Map 09. Six sectors were selected and cross-compared between each MSA, (author, 2012)



MAP 10 :: Transportation and Institutional Infrastructure, (author, 2012)

several disciplines and places a weighted value on each metric according to its influence and importance in the region, not the political values of the agency performing the assessment. The data was analyzed using the values identified in the hypothesis. I have decided to conduct and break down my analysis based upon the two lenses that I have refined in this research. The first lens is a physical one that speaks to the elements of the landscape. The second lens is a programmatic one that looks at the economic and ecological flows of the Canal region. Following my analysis, I seek to combine the physical and programmatic lens in order to allow a holistic means of proposing recommendations and considering overall planning implications for them.

Physical Lens:

- **Hydrology: Flooding + Reservoirs:** The locations of the reservoirs are concentrated around the central part of the Canal between Oneida Lake and Utica. The reservoirs are located on a higher elevation than that of the Canal, as they are located in the Adirondack Mountains and in the foothills of the Southern Tier. As indicated, major flood events occur in the lower part of the Mohawk River between Utica and Waterford. This poses a problem because it indicates that the reservoirs are not aligning with where flooding is actually occurring. So while the existing reservoirs were historically constructed to keep the water in the canal high

enough for shipping purposes, currently there is a need to retain water outside of the canal to prevent its flooding. Therefore, additional water storage retention is needed in this segment of the canal.

- **Canal Town Proximity to Higher Education:** Schools exist in major metropolitan areas, but are also dispersed around Upstate New York. There are cities with above average populations, in comparison to other villages, along the canal, however these cities are located in major cities of the region. The communities who are not within a close proximity of a major city and still maintain an above average population are those that largely host an institution of higher education. Though it is not entirely certain that these communities have a higher population because they host higher educational institutions, they are still benefitting from these higher populations. This is telling because it indicates that there is an established population along the canal in these spaces. We can insinuate from some of the economic reports that there are multiplier effects in these college communities in addition to various spin-off industries many times catered to the college-aged demographics such as goods and services that support the existence of these institutions.

- **Terminal Lands:** Terminal lands are not as significant as they were once assumed to have been; they exist in very fragmented and small parcels that may not necessarily link up to a larger network. At the systems level, they are only important in terms of knowing their location. However, when the analysis zooms in and looks at design solutions for a site, the terminal sites, if in the area of the selected site, become substantially more valuable. They are human-scaled spaces, many are not larger than ½ an acre, and are usually co-located with a terminal wall or canal lock.
- **Dredged Spoils Area:** Much more capacity for environmental remediation exists in the eastern half of the Erie Canal where it synchronizes with the natural drainage watershed of the Mohawk River. There is a much higher concentration of Dredged Spoils Areas (DSAs) in the eastern half of the Canal as well. Most lie in large congruous parcels along the Canal and tend to occupy the linear space between the locks and docks – presumably to avoid direct contact with publicly accessible areas. Right now these DSAs are highly valued spaces because the environmental laws no longer allow for dredges spoils to be treated in this manner. However, the DSAs have been grandfathered in, and the Canal Corporation can avoid

the otherwise expensive mandated treatment process that involves taking the dredge material to an off-site facility to be cleaned.

- **Polluted Locations-Rochester:** Sustainability is equally built upon ecological revitalization as it is upon economic. In mapping, I found that there are various cities along the Canal that contribute to very high pollution of the Canal, such as Rochester, which has significantly larger quantities of reported polluted sites. Any sort of capital investment along such locations along the canal should take the construction opportunity to remediate the environmental state of the landscape, while they are in pursuit of their economic potential.

Programmatic Lens:

- **Canal Identity:** There is a strong identity that is aligned with the western half of the Canal. These places have historically proven to support investment and significant attention to the Canal whether it be through political or financial support. Assuming that any infrastructure investment will be placed in the Canal, it would be best utilized in the western half because of their strong identity to and excitement about the presence of the infrastructure.

- Population:** While the eastern half of the Canal is more heavily weighted with natural capital, the western half is more abundant in social capital. Buffalo, Lockport, Brockport, Spencerport, Rochester, and Fairport are communities that strongly identify with the Erie Canal and at the same time are all located in the far western part of the State. Between the Buffalo-Niagara MSA and the Rochester MSA, this area contains the largest population and largest GDP in the Erie Canal Region. Where the Erie Canal merges with the natural Mohawk River in the east, it is entirely channelized by the time it enters the western area. While this fixed channel creates less of a capacity to achieve ecological co-benefits or ecosystem services, it creates more reliability in the behavior and scale of the water, allowing for the community to program it more actively.

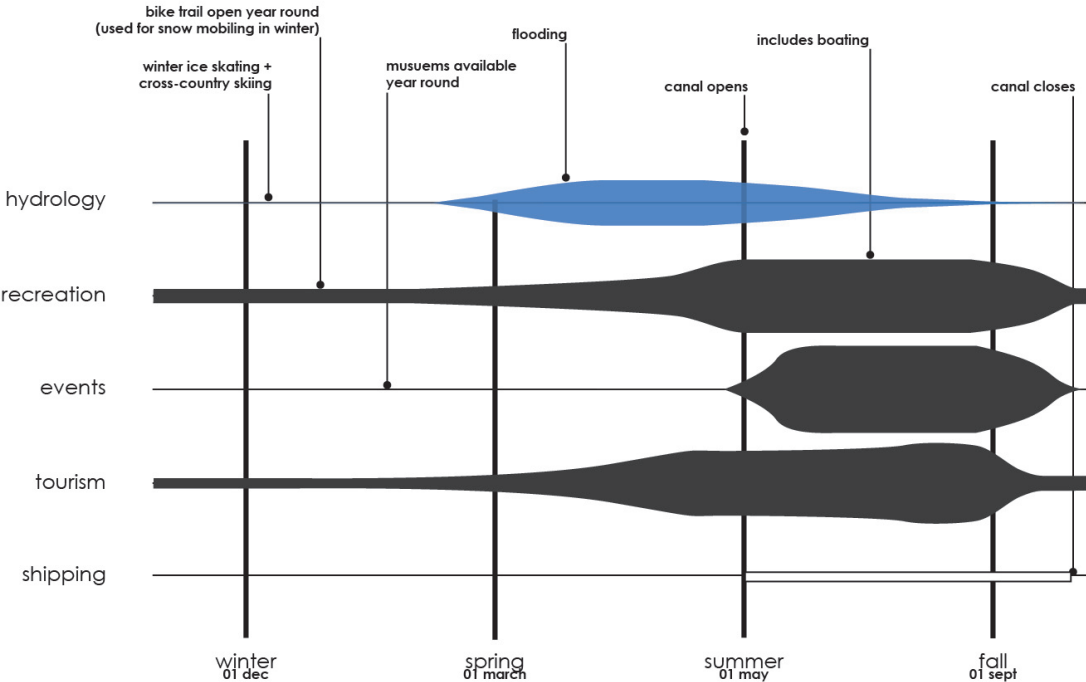


Figure 3 :: Data Analysis of the Economic and Ecologic Flows that Impact the Canal, (author, 2012).

- Regional Flows:** The Erie Canal Region experiences much more activity and outdoor engagement during the non-winter months. Pandering to these natural swell periods in the flows of people in the region, could create higher yields. Most of New York State’s tourism is generated from New York City and Long Island. However the majority of tourists who come to the Erie Canal Region are native to New York and the Northeast. This is suggestive that the majority of tourists will be interested in

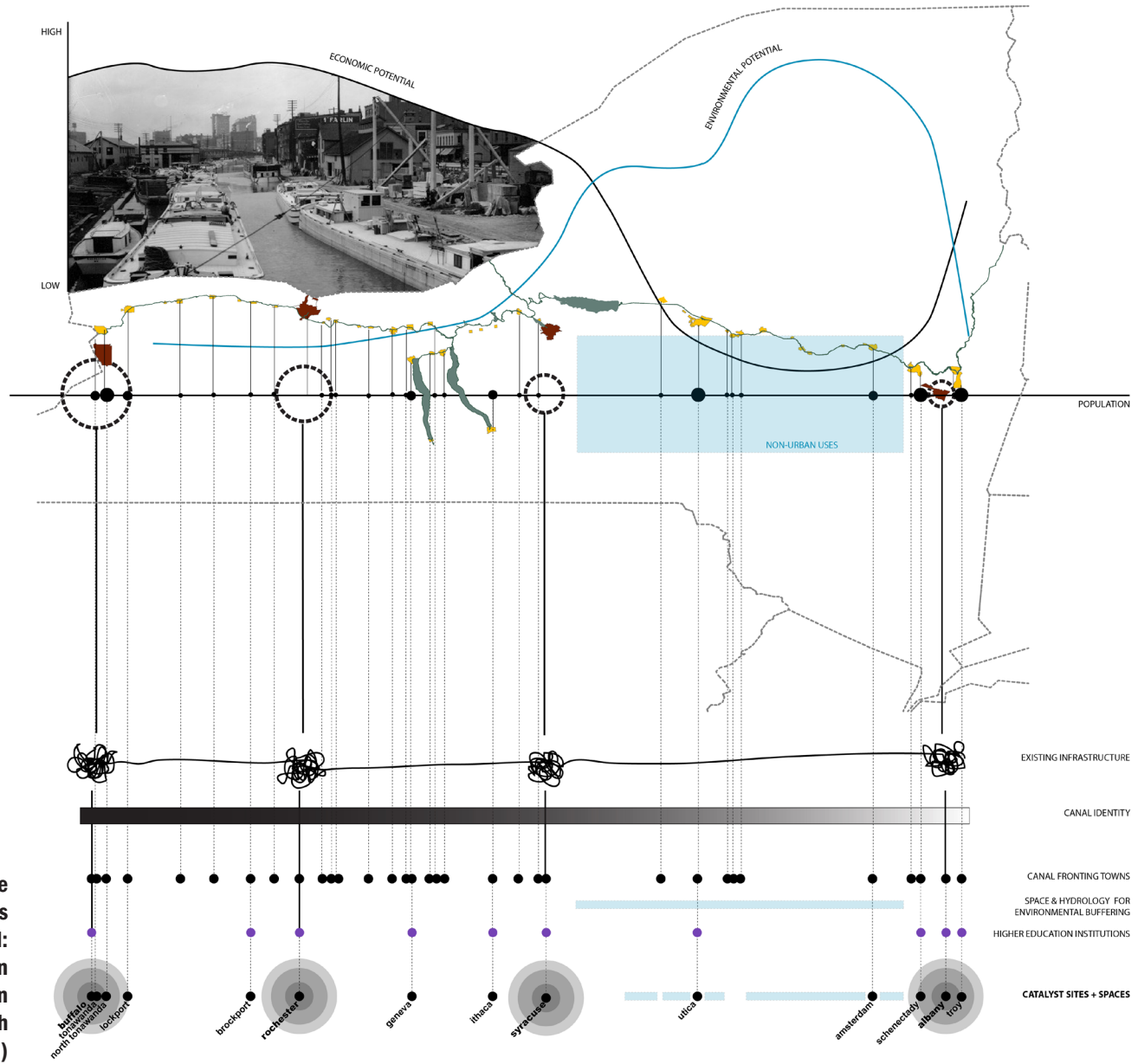


Figure 4 :: Data Analysis of the Physical Landscape. Catalyst Sites and Catalyst Spaces are selected: Type I in the radiating dots, Type II in the small black dots, and Type III in the blue segments at the base of the diagram, (author, 2012)

bucolic, weekend recreation activities more than spectacle entertainment.

III. Recommendations: System Design Proposal

The proposed address is to identify locations in the canal landscape that present the greatest potential for positive change that, when initiated together, are hypothesized to catalyze the entire region into greater economic and quality-of-life prosperity. The catalyst sites were identified by the clusters of leftovers; leftover canal architecture that sits in an underutilized state because its designed purpose is obsolete in the 21st century. The highest latent potential lied in the clusters where the terminal lands, water reservoirs, harbors, and potential intermodal transit hub areas existed in close proximity to a dense and accessible population of people.

The canal is a very linear force. It provides fluid traffic for both bicycles and boats that pass through the landscape without necessitating specific stops. The design objective of this research is to provide perpendicular connectors that cut through the streaming velocity of the Canal corridor and pull that through-traffic into the landscape. These catalyst locations perform as these perpendicular connectors.

According to the mapping assessment, I have identified specific leverage points along the canal. In order for greater economic utilization of the canal, four sites are sites

with *existing infrastructure* that are located at a confluence of major intermodal hubs and existing infrastructure networks. In pursuit of developing greater urban activity, fifteen sites, including the previous four, were identified as sites of *contiguous clusters of population*. These are canal-fronting communities, meaning that these cities and villages physically touch the canal or the canal system. In pursuit of enhanced ecological capacity, several spaces have been identified as *spaces for environmental buffering*. This means non-urban spaces that have the correct hydrology, topography and program to host green infrastructure that can foster more non-urban environmental services. These spaces have a greater capacity to store water and precipitation, enhance the biodiversity of flora and fauna and generally a better ability to host ecological functions. All of these catalyst sites regardless of criteria, are located on rail tracks, so while they don't all have passenger stations, they have the capacity and potential to carry passenger rail traffic.

Category 1: Sites with Existing Infrastructure

The existing infrastructure referred to are loading and unloading and storing cargo from commercial barges. The four sites with existing infrastructure are Buffalo, Rochester, Syracuse, and Albany. There may be the need for some small investments in all four sites, however, I have identified Rochester and Syracuse as the two sites that most severely lack commercial shipping infrastructure at the canal side location. While the port of Albany

and the port of Buffalo are already fairly developed, the point of contact between the city of Syracuse and the city of Rochester has minimal infrastructure for commercial loading and unloading. Plans for development of the Syracuse harbor is underway, so it is clear that the Canal Corporation is advancing. In this manner, there may be an opportunity to leverage investment in the canal infrastructure.

Category 2: Sites of Contiguous Clusters of Population

I have identified 62 cities and villages that exist along the Canal that fit within this category. Of these, I have identified which have a critical mass of people because it is necessary to have a sizable population with which you can work with initially to further develop an economy. I developed criteria in identifying which of these cities and villages can serve as catalyst sites. The community must have at least 8,000 inhabitants, they must have rail infrastructure in and around it even if it is not serviced by passenger rails at this time, and must be hosting or in proximity to an institution of higher education. The 15 sites that fit this category are Buffalo, Tonawanda, North Tonawanda, Lockport, Brockport, Rochester, Geneva, Ithaca, Syracuse, Utica, Amsterdam, Schenectady, Albany, and Troy.

Category 3: Spaces for Environmental Buffering

The region between Oneida Lake and Schenectady is largely rural with a low urban

population. The region is the location of the Canal's confluence with the Mohawk River, which means that it runs along hydrological watersheds. This is also expectedly the location where the most flooding occurs. Ironically, the segment of the Canal with the most space to address its flooding is at the location where the most flooding actually occurs.

Site design at each of these catalyst sites will probably be public event spaces, landmarks, public seating, better connections that give access to waterfront, public promenades, or a reception facility like a visitor's center. Site designs need to be developed both to receive tourists that need a welcome reception in addition to locals that need public performance and event space. Some place that has many uses that can range from performance space, to gathering facilities, to flea markets, and will serve as a gateway to and from the Canal.

Seeing as every site location will offer different environs, this address proposes that a custom design per native conditions be prescribed according to some basic programming objectives. The program design will involve environmental remediation, tailored to potential latent canal economies, and build a narrative that enforces the heritage of the Canal and the region.

IV. Three Directions Moving Forward

I have identified three alternative trajectories that can be pursued to establish and understand the final outcome of this assessment given the

interests of the stakeholders. The first one is to construct infrastructure for a latent economic market, the second is to remove infrastructure to establish the canal as a natural recreation way, and the third is to optimize the canal components and either build infrastructure or deinfrastructure segments of the canal to achieve its greatest economic and ecological potential.

Establish the Market

If the direction and trajectory is to build infrastructure for latent economic markets, the following section addresses the types of activities that need to occur in order to support this infrastructure. Though I conducted an extensive mapping assessment there are processes, social interactions, and dynamics that cannot necessarily be represented on a map. There is a need to conduct further economic analysis in order to make a conclusive suggestion based upon building infrastructure for latent economic markets. An intense on the ground analysis will discover what the real possibilities are for these markets.

I previously identified five projected waves of economic potential: tourism from New York City, retaining recent college graduates, retiring baby boomers, high tech manufacturing employment, increased shipping activity from rising oil prices. To determine this information, we need to conduct primary-source analysis and research and interview the key stakeholders in each of the identified potential economies. Interviews will probe economic viability from

site to site, but analysis seeks to identify which markets have the greatest potential to engender economic activity across the region.²

These interviews seek to harvest specific information:

- What economic markets might expand there
- If infrastructure is holding back this expansion
- What the design requirements are that these economic sectors require in terms of transportation, facility design, and physical space
- How capital intensive this market is in regards to creating jobs

The catalyst sites were chosen because they met a certain number of criteria; this in turn makes them more conducive to attracting multiple industries and demographics. The reason why is, as described above, certain investments such as a designated public spaces can spur private investment. We have here public investment that is intending to incite private

²While catalyst sites are a localized means of examining what markets they can nurture, further research can contribute to the understanding of what exists regionally along the canal. Rather than placing limitations upon each of the catalyst sites, these potential markets, though localized, contribute to the change and growth of the entire region. Therefore, the identified potential markets can be utilized in an efficient way for future actions.

investment in the buildings around the public space. For example, a real estate developer might elect to build lodging in response to a revitalized downtown boardwalk location that is inviting to tourists. This not only taps the tourism potential market, but serves to tap other markets as well. The kind of private development that is going to spring around these public spaces is likely to encourage and succumb to the natural patterns of density that evolve around catalyst sites such as lodging, residential, and commercial buildings; thus taking on a village or city form rather than low-density and sprawl. That kind of urban form is conducive to the type of urban design that best suits young professional college students and an older population that need accessible housing closer to amenities who still have a high level of mobility and much of their financial capacity.

Remove the Subsidy

This particular trajectory identifies the sustainability of the Canal being almost entirely dependent on subsidies. In response to this, it seeks to take away infrastructure in order to naturalize the water system. This perspective adheres to the understanding that oil prices are speculative and the continuous use of this canal for barge shipping is optimistic. The sustained use and operation of the Canal depends on a 90% subsidy of Canal costs.

The two most successful facets of this Canal are its legacy and its bike path. However, without the Thruway Authority's subsidy, the

canal would not exist in the form it is today. This approach anticipates what the outcome would be if the subsidy were to be taken away. As a result, this direction proposes to deinfrastructuralize the canal and capitalize on the ecology by naturalizing the water system. By removing infrastructure and naturalizing the waterway, we can repurpose the Canal as an ecological boon and recreational amenity, amplifying the two facets of the Canal that are most successful. It can continue functioning as a linear ecological corridor that preserves the ruins of the Canal in a heritage type narrative but in a way that does not disrupt the natural riparian process.

The Authority can then redirect the close to \$80 million for other purposes. The Canal would serve as an ecological and recreational amenity for the region while the funding would be redirected to support cleaning polluted water, economic development activities in the canal fronting communities, or water reclamation efforts. The Canal Corporation could then potentially partner with the EPA in the effort to amend or reclaim the quality of these headwater systems that feed into national river systems. The Authority can be redirected towards water quality concerns considering the degree of pollution at the urban nodes along the Canal.

Diversifying Current Uses

This particular trajectory seeks to amplify the multi-use diversity of the existing infrastructure. Doing so presents a hybrid approach between


the two prior trajectories. It prioritizes capital investments assuming that the subsidy will continue. Considering the longevity of the subsidy, what other capital investments could and should be made? Each of the prior two approaches was vying for the application of either infrastructure design for economic development or deinfrastructuralization for ecological remediation. This third approach seeks to optimize the reprogram and the redesign of the Canal system by applying the first strategy in the regions that can most capitalize on economic development, and applying the second strategy in the segments that can most capitalize on ecological buffering. It will engender greater productivity by diversifying and compounding the multi-faceted uses of the canal.

Purchasing power is stronger in the western half of the Canal. This area has a stronger identity with the Canal, more individuals reside in this part of the region, and the two metropolitan areas, Buffalo and Rochester, sport larger GDPs with fewer subsidies. These characteristics are all described to say that this western half of the canal has a greater capacity to place people into the Erie Canal system than the eastern half. The most influential catalyst sites to foster economic development are the four sites of existing infrastructure and the fifteen sites of contiguous clusters of population. In order to increase the storage capacity and amplify the area's buffer against volatile undulations of ecological flows, we would leverage the catalysts spaces between Oneida Lake and Schenectady to design natural systems that can absorb peak

flows. The DSAs could be designed to support the existing reservoir system such that the Erie Canal properties are able to take on runoff from neighboring agencies. If a fee were applied, the Canal Corporation could rely on the runoff charges to provide a steady stream of revenue. While the economic capital generated in the west can subsidize the east, the environmental services are largely generated in the east to subsidize the west.

The ultimate objective in this trajectory is to diversify the uses of the canal. However, the Canal needs to realistically diversify in phases. For example, if we want to promote greater commercial shipping, we must first publicize that the Canal is still an active infrastructure amenity. This may be done through marketing or events. The priority of the catalyst sites will depend on what the objective at the time is. So currently, the Canal Corporation is correctly investing in recreational and live event activities involving the Canal. This has to occur before the public spaces in the Category 2 catalyst sites and the economic infrastructure in the Category 1 catalyst sites are built. The Canal seems to suffer the most from stagnation. Its primary problem is that currently many, in some accounts most, native New Yorkers do not know that it is still functional. It has been preserved in living memory as something that existed in the past and is no longer a part of the productive urban landscape.

The design strategy for the Erie Canal Region should not focus on the primary or secondary industries. Instead, the focus should be on



CONCLUSION | CHAPTER FIVE

The Erie Canal may never churn an economic profit from shipping cargo as it did in the past, but repurposing its utilization in the contemporary era, in conjunction with other economic movements, can generate higher profit than what it is currently producing. Using a systems design approach, I conducted a series of mapping assessments in conjunction with secondary source economic reports and interviews from the region that allowed me to identify several catalyst sites and spaces along the Canal system.

I then looked at three trajectories with which I could approach repurposing and redesigning this historical piece of landscape infrastructure, the Erie Canal. The first direction advocated for building infrastructure for an emerging market. This would be done by continuing the research to discover what potential lies in the identified latent economic markets. Once the population, infrastructure, and spatial requirements of these markets are discovered, the program and development of the catalyst sites will be better informed. Ultimately this trajectory aims to leverage latent markets, if they are latent, so that the Canal can sequester co-benefits from one another. The Canal can harness economic vitality from the emerging markets, and these same markets can utilize the multiple benefits that the Canal can deliver to them. Therefore, the canal can benefit from being updated for servicing the needs of these contemporary markets, but these economic flows can also benefit from the physical links that connect them to each other. Regardless of the economic sectors that materialize along the region, the Canal provides

a physical cohesion that brings multiple ecological and economic benefits into each node it touches.

The second direction argues that the most sustainable use for the future of the Canal is in the deinfrastructuralization and naturalization of its waterway. Because the Canal receives over 90% subsidy to operate, rendering it ultimately unsustainable, the financial hurdle may be impossible to overcome as has been witnessed in the last 150 years. As a result, this trajectory argues that the most successful traits of the Canal have to be identified and amplified, which has been its historic legacy and recreational use as a biking trail. In turn, the Thruway Authority can redirect the 80 million dollars in subsidy finances towards different types of catalyst investments that may have a higher probability of generating economic or ecological development for the region. These could include community investments in small towns along the Canal region or remediating headwater tributaries of national rivers.

These two trajectories vary in their approach. The first is highly embedded in practicality in order to establish martial evidence before implementing substantial redesign of infrastructure. The second approach is highly innovative and is intended to incite drastically different ideas for the future of the Canal.

The last direction argues that a more realistic approach may be to conduct a hybrid between the two previous approaches. In doing so, this direction can be well justified in economic

proof, yet still innovative. This approach takes full advantage of the catalyst sites that were identified along the Canal system applying infrastructure for latent economic markets in some nodes and placing environmental buffers in others.

The Erie Canal was chosen as a case study because it is highly representative of post-industrial regional landscapes of the United States. In examining this one case study, it rises hope that redesigning or reprogramming old infrastructure can contribute to the release of latent economic activities. By repurposing old infrastructure for current economic needs, we see that in cases such as the Erie Canal, it may be possible to avoid the abandonment, subsidization, and commodification of the infrastructure. Therefore, the ultimate goal is to culture many purposes for these old infrastructure system, such that they can withstand changes in economic and ecological flows because they have been designed for multiple purposes.

It is clear that the upkeep and maintenance of older infrastructure systems is very expensive. To make an authentic or genuine shift in the trajectory of the future of these systems, it is necessary to influence how communities who inhabit the regions of these infrastructures take ownership over them. This can be done by diversifying programmatic and physical components of these infrastructure systems to allow for a greater accumulation of value for them.

Harvey argued against governments creat-

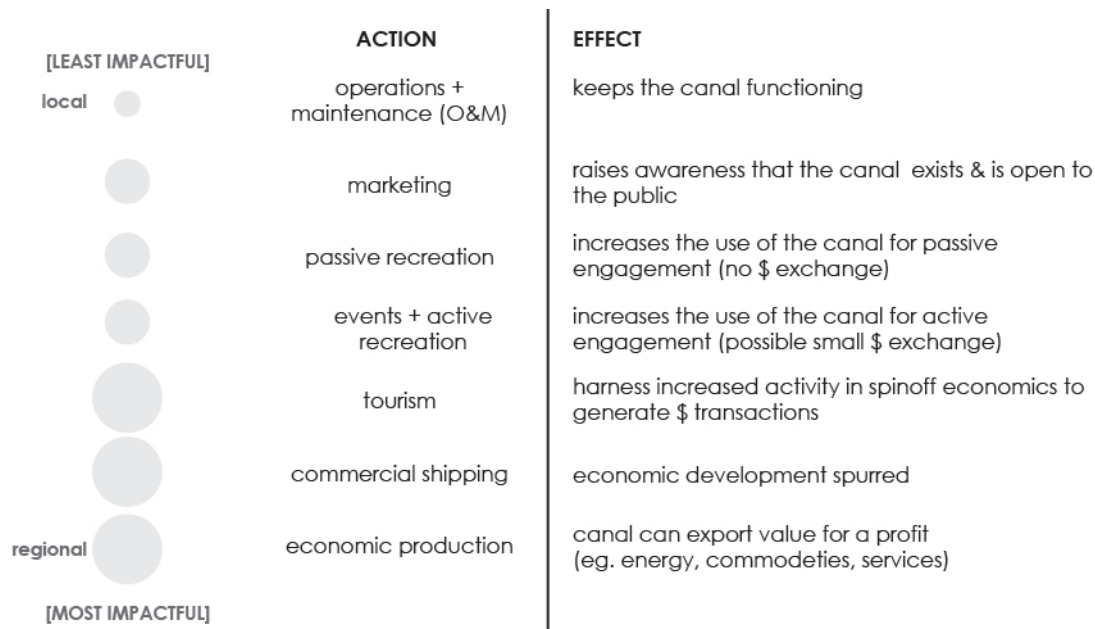


Figure 5 :: A gradient of actions exists where the latter few actions (bottom of the list) build off of the compounded success of the initial few actions (top of list). A general transition occurs from “heavily reprogramming” actions at the top to “heavily redesigning” actions at the bottom, (author, 2012).

ing spectacle projects to garner capital investment in their region. These older infrastructure systems were constructed for very functional reasons, but because those reasons are largely antiquated, these systems remain as largely ruined, expensive, and sometimes abandoned massive projects. However, these systems, in their own right, play the unintentional role of the spectacle, this spectacle being an element of natural capital. The difference between these rustbelt spectacle infrastructures and the spectacle projects Harvey speaks about, is that the former was not contrived as a strategy to gain fast attention. These spectacles exist and have existence value of its own, and are genuine, and as a result they serve as facets of natural capital in that region. If we can recognize these infrastructures for its multiple values and its existing spectacle values, this amplifies the worth of these systems. Therefore, if we can design for all the layers of values that these systems embody, then it will not only preserve their legacy, but they will be able to contribute to sustainable economic and ecological activity in the landscape.

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Additional Data Resources

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Erie Canal GIS Data, New York State Canal Corporation (2012)

NYS Department of Environmental Conservation, NYS Watersheds (2012), <http://www.dec.ny.gov/lands/60135.html>

EPA EnviroMapper (2012), <http://www.epa.gov/emefdata/em4ef.html?ve=9,40.71455001831055,-74.00711822509766&pText=New%20York,%20NY>

Bureau of Economic Analysis (2012), <http://www.bea.gov/regional/>

U.S. Census Bureau (2010), Fact Finder, <http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t>

Methodology

The research for this thesis was conducted around the concept that repurposing a pre-existing landscape can open latent potentials and contribute to the economic development of the contemporary society. This is a concept that needs to be defined and investigated since it is a hypothetical theory and has no material application yet. This study was conducted to further investigate the possible applications of systems design and whether this strategy of design could contribute to the improvement of economic vitality in a region.

Case Study

I examined a single case study to test my hypothesis. The unit of analysis was the region so the case had to involve a regional element. I elected to research a case example in the United States out of familiarity for this terrain and because a greater quantity of resources would be available for review. The history of the American industrial revolution, and the urban landscapes that resulted, provided an exemplar scenario that incorporated regional economies and coincided with the perceived problems my hypothesis was designed to address. I selected the Erie Canal in the Mohawk Valley Region of Upstate New York as the case study. This is a landscape that portrayed typical traits of American post-industrial regions.

While I picked this single location to study, it is generalizable to other locations. Since this paper does such in depth research on this one



case, its contents were known well enough to not need to make false claims. This study uncovered sufficient information such that it can generalize the findings.

I elected to use a case study to test my hypothesis, as opposed to a quantitative study, because this method most appropriately suited the type of research I could do – a quantitative study would not have helped. I wanted to test a design as a check to my hypothesis, and to look at multiple metrics at the same time to draw conclusions. My study necessitated a spatial accuracy that could exhibit the properties of location and geography for a mapping exercise.

Data Collection

I collected the data for this research project using a combination of literature reviews, interviews, articles, government statistics, and mappings. The literature reviews primarily supported the development of my hypothesis and gave the historic background for the American context and Canal case study. They hypothesis is an original statement, but based on the prior work of researchers and practitioners. The literature review provided the context for this topic and allowed the hypothesis to emerge from the identified gap in the theory. The bibliography for the literature was collected from the syllabi of academic classes covering the topics of urban political theory, urban economics, urban ecology, and landscape + urbanism. The history literature review primarily served to give an accurate account of the

significant past events that lead to the current condition of the case analysis. These references were discovered through basic library searches and from the bibliographies of scholarly works.

I conducted research on the background, development, current conditions, and environmental state of the case study region through interviews, articles, and government statistics. I collected contemporary data about the state of the economy from articles cited from local regional newspapers. The research utilized data taken from primarily from the US Census, US Department of Commerce, the New York Regional Economic Council, and the New York Canal Corporation. Informational interviews were conducted with five experts in the field of regional planning in Upstate New York. Four of the five individuals had a connection to the Canal Corporation. They either currently worked at the Coproation or had in the recent past. The individuals that were interviewed for this study: the Executive Director of the Capital District Regional Planning Commission; the Deputy Director of the Canal Corporation from 2005-2010; the current Deputy Director of the Canal Corporation; a Canal Corporation Project Manager in charge of the operations and maintenance budgets; and a regional planner who worked on the waterfront to Main Street connections on the Hudson River. These were informational interviews where ancillary data, which was not available in written documented form, surfaced and budgetary documents were recovered.

The purpose in recovering such background data and information on the current economic,

social, and environmental state of the region was to establish the opportunities and challenges in the region. The later design that emerged out of this research is tailored to leverage the opportunities and address the challenges by posing physical or programmatic installations to hurdle the impasses. While the extents of the challenges in the region and within the canal are extensive, the physical design solution is understood to be one component of a full planning address. This paper recognizes that the solutions presented in this study will not exhaustively address the data unearthed in this section.

They research deploys a systems design strategy to test the hypothesis. This strategy is not a conventional approach to analysis or design, but is specifically tailored to assess very large regions. Mapping data spatially in its accurate geographical location is a central component to this approach. The objective of mapping analysis is to surface multiple elements of the region simultaneously such that cross-comparative observations can be drawn. The data that was inputted into the maps was sourced from the government statistics and informational interviews described above.

Additional to the relationship observations, testing this hypothesis in a location will lend insight to methods of application. Is it better to approach a region through adaptively repurposing landscapes to influence regional economies or should one identify emerging economies as an opportunity for regional design interventions that will contribute positively to the landscape

