



The Beach Beneath the Road

Sustainable coastal development
beyond governance and economics

CHAD STEPHEN BODA

LUND UNIVERSITY CENTRE FOR SUSTAINABILITY STUDIES | LUND UNIVERSITY



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DOCTORAL DISSERTATION

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<p>Abstract:</p> <p>That Florida is in the midst of an ecological crisis is a perspective increasingly shared by academy, government, private industry and civil society. Ideas about the causes of the state's environmental problems and how best to address them, however, are not so well aligned. While some are prone to emphasize the primacy of economic growth over environmental conservation, others argue that, like love and marriage, you cannot have one without the other. More particularly, Florida's many densely populated barrier islands are experiencing increasingly severe critical erosion, threatening people, property and endangered species habitat. In the face of expanding urban development, rising seas and coastal squeeze, the traditional strategies for managing erosion are looking less and less appropriate and the need for a sustainable coastal development strategy is more and more apparent.</p> <p>To this end, this thesis has three main parts. First, I develop a plausible explanation of the origins of Florida's environmental problems, tracing the relationship between changing systems of production and environmental impacts from pre-Columbian to modern times, developing in more concrete detail the case of Flagler County and the City of Flagler Beach. Second, by employing the method of immanent critique I provide a scientific evaluation of competing critical erosion solution options which have been historically considered in the case study area, demonstrating in particular how these competing alternatives can be organized from least to most adequate in terms of their capacity to address the problem under consideration. From this critique I turn to suggest a yet-unconsidered alternative decision making procedure which can reasonably be shown to be an advancement on the "best" idea currently on offer. Finally, I identify a promising pathway to achieving this alternative, arguing in particular that civil society, in contrast to government or the market, must provide the mechanism for realizing the necessary social change.</p> <p>The thesis aspires to make three main types of contribution: 1) practical contributions in the form of a variety of policy and strategy inputs in collaboration with local coastal management practitioners; 2) theoretical contributions via the critical comparison of competing solution alternatives related to coastal management in Florida's coastal communities; and 3) methodological contributions to sustainability studies by demonstrating an approach to scientific research which I argue is more appropriate than other more dominant approaches in terms of its capacity to fulfill the field's interdisciplinary and normative ambitions.</p>		
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The Beach Beneath the Road

Sustainable coastal development
beyond governance and economics

Chad Stephen Boda



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To Dawn, Craig and Kim

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Position and Reference Code:	Date:
1. Flagler Beach Mayor - FBM	Jan. 16, 2014
2. Flagler Beach City Commissioner - FBCC	Jan. 16, 2014
3. Flagler Beach Public Works Director - FBPWD	Mar. 11, 2015
4. Flagler County Planning and Zoning Director - FCPZD	Mar. 12, 2015
5. Flagler County Public Safety Director - FCPSD	Mar. 16, 2015
6. Flagler County TDC Vice President - FCTDCVP	Mar. 16, 2015
7. Flagler County TDC Marketing Director - FCTDCMD	Mar. 16, 2015
8. Flagler County Engineer - FCE	Mar. 18, 2015
9. Flagler Beach resident and SFB founding member - FBR	Sept. 17, 2015
10. FDEP Environmental Specialist - FDEPES	Oct. 04, 2016

Interviews lasted between 20 and 60 minutes. All interviews were recorded and transcribed, with the exception of Flagler Beach resident and FDEP Environmental Specialist which were unrecorded telephone conversations. Interviewees 6 and 7 were interviewed at the same time.

List of abbreviations:

BO –	Biological Opinion
BSPA –	Beach and Shore Preservation Act
CBA –	Cost-benefit analysis
CCCL –	Coastal Construction Control Line
CZMA –	Coastal Zone Management Act
EFI –	Enterprise Florida
ESF –	Emergency Support Functions
FCMP –	Florida Coastal Management Program
FDEP –	Florida Department of Environmental Protection
FDOT –	Florida Department of Transportation
GDP –	Gross Domestic Product
GMA –	Growth Management Act
IPCC –	Intergovernmental Panel on Climate Change
IUCN –	International Union for Conservation of Nature
NED –	National Economic Development
NMFS –	National Marine Fisheries Service
NNP –	Net National Product
NOAA –	National Oceanic and Atmospheric Administration
PLSS –	Public Land Survey System
PPP –	Public-private partnership
RSLR –	Relative sea level rise
SBMP –	Strategic Beach Management Plan
SD –	Sustainable Development
SERT –	State Emergency Response Team
SFB –	Save Flagler's Beach
TDC –	Tourism Development Council
USACE –	United States Army Corps of Engineers
USFWS –	United States Fish and Wildlife Service

For countless ages the world has been a vast battlefield and the struggle for existence a perpetual conflict. Primitive peoples were compelled to fight nature to extort from her the means of livelihood. Since the forces of nature have been conquered and nations have become civilized, the struggle of men is no longer to overcome nature, but with one another for existence.

-Eugene V. Debs, *Capitalism and Socialism*, Campaign Speech at Fergus Falls, Minnesota, August 27, 1912.

PROLOGUE: Of islands, hurricanes, roads, sea turtles, politics and science

Seriously worried but hoping for the best, I woke up early on 7 October 2016 to check the latest update from the National Hurricane Center. The night before, the forecast was that record-breaking Hurricane Matthew would pass directly over our heads, so sleeping was difficult, though I tried. I was conducting field research in Florida at the time and due to a convergence of good and bad luck I happened to be visiting my mother who lives nearby exactly when one of the worst storms to ever hit the area rampaged through. Along its way, Hurricane Matthew killed over 1000 people in the Caribbean (mostly in Haiti) before barreling up the eastern coast of Florida, causing devastating flooding, massive erosion, structural damage, and further loss of life.

Hurricane Matthew never technically made landfall in Florida, though the central eye of the storm came closest to land around Flagler and Volusia counties, causing substantial damage along the coast. While I weathered the storm in Volusia County with my family¹, Flagler County is where I had been working on my doctoral research for over three years. I had been trying to understand the politics and processes of coastal environmental planning at the local level in the small coastal City of Flagler Beach, which had long been struggling with erosion problems that threatened an important coastal road, the recreational beach and the nesting habitat of endangered sea turtles. However, the unusually quiet decade of hurricane activity which preceded Hurricane Matthew meant that, even though Flagler Beach had managed to make precious-little progress in dealing with its coastal erosion problems, the urgency to do so had relaxed somewhat with the passage of time. Many of the city's more recent residents, for example, had never experienced a hurricane before and had limited knowledge of the city's historical struggle with erosion.

After Hurricane Matthew, not only was the issue of erosion management pushed to the top of the agenda, it was practically the only thing residents and elected officials talked about for weeks, if not months, after the storm. One of the most immediate problems was that a popular tourism road, State Road (SR) A1A, which runs along the beach in the city, was badly damaged during the storm, causing disruption to traffic flows and severing access to local businesses. Though SR A1A had long been plagued by sporadic erosion problems, Hurricane Matthew had

¹ To be more precise, I was hunkered down with my mother and step-father and their two Chihuahuas, Officer Chica and Bolt.

clearly exposed on a much larger scale how vulnerable the coastal road (and by extension, the city itself) had become.

Hurricanes have hit Flagler Beach before, and they will certainly hit it again, causing more erosion when they do. But erosion or even hurricanes are not the problem *per se*. After all, hurricanes blow and beaches erode, that's what they do. Instead, the problem is really one of a seemingly incompatible relationship between the City of Flagler Beach and the barrier island it calls home. Barrier islands are landscapes in flux, constantly changing and shifting, and this dynamism is what allows them to persist even when hurricanes blow or sea levels rise. But built in rigidity in society's institutional and physical infrastructure can make communities much less flexible. Making changes to either the physical layout of a city or the political system it is imbedded in is of course no simple task, and the choices available to elected officials and citizens today can be seriously constrained by the decisions made by previous generations. Within this limited opportunity space, the problem in Flagler Beach is not so much to understand why the road and other things are threatened by erosion, but what society can and should do about it.

After Hurricane Matthew, in the town pubs, at public meetings and in the comment sections of local newspapers, many residents expressed concern over the prospects of simply returning to business-as-usual. Some worried about nesting habitat for sea turtles. Others worried about the potential effects on property values or local businesses. Still others worried about public safety and the flow of traffic. There was certainly no shortage of valid concerns. One might expect that, in the wake of such devastation, public officials and private residents would be compelled to review the available options to try and improve management practice to avoid such catastrophe in the future. But this is not exactly what happened. Because SR A1A is a state road, the Florida Department of Transportation (FDOT) is responsible for its maintenance, and the City of Flagler Beach doesn't have a whole lot of say regarding what happens to it. Less than a month after Matthew had passed through, the FDOT had settled on a temporary plan and SR A1A had been reconstructed in its original location, at the cost of over \$3 million, with the expectation that more permanent structures would be built in the not-so-distant future.

The FDOT's position is that SR A1A should stay put, being viewed as essential to the local economy and public safety. With the authority of the Florida governor behind them, and even the support of many residents and elected officials, the FDOT were able to act quickly on their priorities in addressing erosion damage, while many other concerns which were not FDOT priorities, however reasonable, were put on the back burner. The return to business-as-usual, of course, does not mean that the other suggestions for how to solve the problem have disappeared, just that they are significantly less likely to be adopted. After spending years studying these erosion problems, I have my own preference regarding what the city

and FDOT should do. But this thesis is more than a statement of my personal preference. Instead, my ambition is to offer a scientific assessment of the proposed strategies for addressing the erosion problem in Flagler Beach, and if these are found wanting, to offer a potentially better strategy. And because I am approaching this problem through science, the general expectation is that the arguments made will be both reasonable and supported by evidence.

The thesis is organized as a three part study which includes 1) developing an account of the origin of the problem, 2) an evaluation of competing solution options, and 3) the theorization of a potential pathway to required social change.

To begin, I develop a plausible explanation of how the erosion problem in Flagler Beach came about. More specifically, I develop an environmental historical narrative which causally relates past and present changes in biophysical conditions to changes in the dominant form of economic organization in Florida more broadly, paying close attention to how more abstract processes have been translated into concrete outcomes in the case study area. To ground the plausibility of this account, I rely on an authoritative, interdisciplinary selection of scholarly work both general and specific to Florida, as well as my own collection of historical materials obtained during field work through a careful combing of various local public and private archives in the Flagler County area.

Once my account of the origins of the problem is presented, I then move to a scientific evaluation of the existing ideas on how to solve erosion problems in Flagler Beach. This evaluation begins from the recognition that the world is already filled with different arguments and positions about any given issue, and that these are the proper place to start when developing an understanding of possibilities and limitations related to any concrete problem. These ideas and positions are reflective of theories about what the problem is, and are reflected in particular suggestions for how it should be solved. And many of these theories are in tension with each other. In Flagler Beach, for example, some might say that erosion is a problem because of endangered species habitat loss, and the road makes this worse, so moving the road to save the turtles is the right thing to do. Others might say that erosion is a problem because, by undermining the road, it threatens to cut off access to local businesses, so keeping the road is what should be prioritized. Both are valid, but seemingly incompatible, concerns.

The approach I take to judging between these competing ideas is to start by initially accepting a particular idea on its own terms, and to try and understand clearly what the idea is claiming, what assumptions it is based on and what it implies for practical action. By clarifying an idea, or understanding it in its most favorable and charitable light, the limitations of the idea also become clearer. By limitations I mean that, while a given idea and the practical strategy it entails may address some aspects of a problem very well, the same idea may exclude some other reasonable concerns or fail to explain some other important confounding

observations or historical facts. When an idea is found wanting in this way, a new, better idea and strategy becomes necessary to solve the uncovered tensions. A new idea and practical strategy is considered better, from a scientific perspective, if it incorporates the reasonable aspects of the ideas it is surpassing while also accounting for some other relevant concerns which previously considered ideas neglected to address.

I reiterate this procedure of critiquing a particular idea and its related practice, finding its theoretical and practical limits, and developing a fresh idea and practical strategy capable of overcoming these limits until I have reached an understanding of the problem and a solution strategy which represents an improvement on even the best idea currently being suggested by those involved in the issue on the ground. Once this promising alternative has been identified, I point towards some institutional and decision-procedural changes which would need to take place if the alternative were to be achieved in practice, including some important implications regarding the role of civil society (as opposed to government or the market) in achieving the required social change. Following this, a concluding chapter develops some key reflections on the implications this thesis has for how scientific research is best conducted, in particular the action-oriented research conducted under the rubric of Sustainability Science.

A few points of clarification before moving on. First, what draws a researcher to a particular topic is in many ways contingent on life experience (or the agendas of funding agencies), and I have my own personal and professional reasons for focusing on Florida. I have chosen Florida (and Flagler Beach more specifically) for two main reasons related to both its significance as a *place* and a *case*. The first reason is largely biographical, having to do with my family history and personal affection for the state and its breathtaking ecology. Being myself a born-and-raised Floridian, the state is a very special *place* for me. By place I am referring to what the accomplished humanist geographer Yi-Fu Tuan ([1], p. 409) called the “unique signature” of a particular location, the meaningful composite of the land’s “physique” and “the modifications wrought by successive generations of human beings”; the “personality” of space. I have a deep affinity for and fascination with Florida’s “unique signature”, and I care a lot about what happens to it.

The second reason is more academic, having to do with the quality and fecundity of Florida as a research *case*. Florida is the locus of a bewildering variety of intersecting challenges, ranging from water shortages to sea level rise and from growth management to abject poverty, culminating in what two researchers termed a “cascade of natural, biological and human-induced hazards” [2]. One of my colleagues recently called Florida “one of the most unsustainable places on earth”, while other observant critics have started to wonder whether Florida is “just one development away from environmental ruin” [3]. Hyperbole aside, the collision course between Florida’s seemingly insatiable appetite for development and

growth and its dwindling natural areas and functioning ecosystems, when viewed as a microcosm, offers in a single region unique insight into the magnitude and complexity of the interconnected challenges faced by societies throughout the globe.

Finally, a brief comment on the title. “The beach beneath the road” is an adaptation of the slogan *Beneath the pavement, the beach!* (Fr. *Sous les pavés, la plage!*), originally a piece of anonymous graffiti which became a prominent symbol of the meaning behind the social unrest which swept Paris in May of 1968. An invocation of the need for change, the slogan represented many things: “a subaltern vitality, the control of something unruly, the dominance of nature, and a possible return of the repressed. The expression also speaks to a new kind of social imagination, a right to view the city as a space for democratic possibilities, a social geography of freedom” ([4], p. 3). The slogan, suggested to me by a colleague, resonates with this work in two ways. First, in an immediate sense the people involved in the erosion problem in Flagler Beach are struggling with the question of what to do about a beach which is increasingly trapped, literally, beneath a road. Beyond the specific case, the more general ambition of this work, in particular the approach to research I advance throughout this study and return to in the concluding chapter, is to contribute to a wider strategy for advancing social change for sustainability which employs science to demonstrate not only the possibility, but the necessity, of another, better way of living together.



Figure 1:

Only hours before Hurricane Matthew devastated the city, with the ocean slowly rising, a resident takes a walk beside what is left of the critically eroded dunes in Flagler Beach on Thursday October 6, 2016.

PART ONE:

Evolution of the Problem

Chapter 1

Historical Transformations in Florida's Economy and Environment (Pre-Columbian - 20th Century)

Have yow not hard of Floryda,
A coontre far be west?
Wher savage pepell planted are
By nature and by best,
Who in the mold fynd glysterynge gold,
And yt for tryfels sell,
With hy!
Ye, all alonge the water syde
Wher yt doth eb and flowe
Are turkeyse found, and wher also
Do perles in oysteres growe;
And on the land do cedars stand
Whose bewty do excell.
With hy! Wunnot a wallet do well?

-Anonymous, 1586²

² Poem quoted in ([5], p. 29).

1.1 European Contact and Ecological Change in the Florida Peninsula (pre-Columbian – 1860s)

There is a growing recognition among private industry, academia, government and civil society that Florida is facing a general crisis of environmental degradation which could have significant implications for both its famous ecology and its massive economy if it continues unabated.³ A group of Florida environmental historians, for example, frame the problem this way in the introduction to their admirable collection on the topic ([5], p. 19-20):

Today, after five centuries of European and American initiative and innovation, the result lies before us—a thriving, vital set of human communities resting on a not-so-vital base of land and water inhabited by endangered species and threatened by all manner of pollutants. The time of reckoning, if not already here, is fast approaching, and modern Floridians can ill afford to ignore the fragile foundations of the civilization that they and their ancestors have wrought.

While compelling, such a seemingly straight forward description should not be taken too seriously, as on closer inspection it tends to hide more than it reveals. It neglects to capture, for example, the substantial impacts indigenous peoples had on Florida ecology prior to European contact. It also neglects to differentiate between different colonial periods in the post-Columbian era of human settlement in Florida. Each of these periods had their own political and economic systems leaving their own unique social and environmental footprints, as each change in the political-economic system came with changes in social and social-ecological relations.⁴ And these changes did not evolve naturally and inevitably from trial-and-error or progressive improvement, as the above statement seems to suggest, but constitute a series of systems which were actively imposed, often with the use of state and military power, on previous systems which functioned under differing and often incompatible social-institutional and economic arrangements.

One important reason why it is necessary to take the time to clarify the roots of current environmental problems is to dispel with any assumptions that environmental catastrophes are simply the whim of “mother nature” or, as Ted Steinberg [8] has put it, “acts of god”; rather, problems of environmental

³ For example, the widely read tourism magazine *Travel Weekly* recently ran a piece entitled *In Florida, fears grow that environmental damage will hurt tourism* [6].

⁴ “The relations of production in their totality constitute what is called the social relations, society, and, moreover, a society at a definite stage of historical development, a society with peculiar, distinctive characteristics. Ancient society, feudal society, bourgeois (or capitalist) society, are such totalities of relations of production, each of which denotes a particular stage of development in the history of mankind” ([7], p. 29).

degradation and risk are fundamentally *human* problems. Just as important, it is necessary to avoid mystifying such problems as inevitable outcomes of some unalterable human nature. Instead, I am in the camp that believes environmental impacts are best understood as reflecting the specific political-economic conditions under which they were produced.⁵ This means that, while previous periods of human habitation in the Florida peninsula had their own concrete impacts on the bio-physical environment, some of which have persisted far into the future, the particular qualities that characterize the environmental degradation we see today can only be fully understood in relation to the way the contemporary economy functions. The basic institutional and behavioral requirements of modern capitalist political-economy provide the “framework”, so to speak, within which practical collective and individual action in the landscape takes place. The unique qualities of Florida’s natural environment and the contingencies of history play an important role in causing concrete outcomes, but this uniqueness has a deeper significance, I would argue, only in relation to more universal tendencies in dominant political-economic practices.

Society and environment in pre-Columbian Florida

So, how did we get here? By which I mean the edge of ecological catastrophe. After all, people have been living in Florida far longer than the 500 years invoked by our environmental historians above, while reference to some sort of a generalized environmental crisis, relatively speaking, is a very recent phenomenon.

The answer cannot simply be “human activity”, because humans are nothing new on the scene. The most recent archeological evidence found in a sink hole in the Aucilla River near Tallahassee showed that humans were already in Florida munching down on mammoths some 14,500 years ago [10], suggesting the earliest history of human habitation in the Florida peninsula straddles the Pleistocene-Holocene interface. The pre-Columbian history of Florida can be broadly characterized by scalar leaps in technology, population, and environmental impact, particularly on animal populations, which Stiner et al. [11] suggest were archetypal of Paleo-Indian development around the world. When the first inhabitants entered Florida, its land area was roughly twice the size it is today due to lower sea levels, and many of the large mammals characteristic of the late Pleistocene were still present; this was the time of 10ft-tall ground sloths (*megalonyx*) and giant armadillos (*glyptodonts*) the size of a small car. The extinction of these late Pleistocene species is part of the larger quaternary extinction event of “mega-

⁵ Here I mean to invoke Marx’s materialist conception of history (or historical materialism), which involves an attempt to “unravel the causes of long-run societal change in the process of historical evolution through the deployment of the concept of mode of production” (see [9], p. 42).

fauna” around the world which coincided with changes in global climate, an increased frequency of major geologic events, and the rapid dissemination of human cultures into previously human-free locales [12].

Ever since humans set foot in the peninsula, the mutual influence between social groups and the bio-physical environment has been central in the developmental history of Florida’s landscape. Drier conditions and the related dispersal of available natural resources heavily influenced the hunter-gatherer subsistence practices of early Paleo-Indians. For example, tribes tended to center their hunting and gathering activities on available fresh water resources; of the many remnants of Paleo-Indian sites that have been found in Florida to date, almost all have been near or at a site characterized by limestone strata which made potable water available from underground aquifers [13, 14]. The human remnants from this time, like those recently found in the Aucilla River, are what you might expect, such as stone tools and animal bones. And while we know relatively little about the earliest inhabitants of Florida, it seems clear that many groups were at least seasonally nomadic, moving back and forth between coast and interior as the seasons changed and opportunities for food and water changed with them [13].

Around roughly 9,000 B.C., in tandem with rising temperatures and sea-levels, Florida’s climate became wetter and its land-mass began to significantly shrink [13]. The combination of the increase in water availability, larger human populations and reduced land area may have influenced the later Paleo-Indians to adopt less nomadic lifestyles; the existing archeological sites corresponding to this time provide evidence of longer periods of habitation at temporary camp sites [14]. With this decrease in nomadic lifestyle and increase in propensity for settlement comes the end of the Paleo-Indian period, marked by the first suggestions of villages or semi-permanent settlements around roughly 5,000 B.C. (see [15], Chapter 1). After millennia of cultural adaptation, around 500 B.C. pottery design, settlement patterns, and subsistence techniques became more like those encountered by the first European explores, typified by the Saint John’s period cultures of northeast Florida which spanned from roughly 500 B.C. to the arrival of Europeans around the turn of the 16th century [13].

A cluster of indigenous tribes speaking variations of the Timucuan language group, commonly called Timucua, inhabited northeast Florida during this period and were responsible for introducing cultural practices such as agriculture, ceremonial mound burial, and more complex forms of political organization [14]. Some of the best evidence archeologists have of what people were up to back then come from what basically amount to ancient trash piles, known as “middens”, comprised mostly of discarded oyster and clam shells, broken pottery and other refuse. These middens are found throughout Florida and in many other places in North America, but the grandest of all is Turtle Mound in Florida’s Canaveral National Seashore. This midden, which towers nearly 25 meters over the

surrounding flat landscape, is a testament to the size and longevity of the Timucua civilization that created it (Figure 2).



Figure 2:

Left: Looking North from the viewing platform atop Turtle Mound midden in Canaveral National Seashore. Rising far above the surrounding landscape, Turtle Mound has been used as a navigation landmark for centuries. **Right:** Middens like Turtle Mound are made up of a variety of types of refuse deposited by generations of indigenous inhabitants, most prominently of which are shells from local varieties of mollusk.

Elaborate details of Timucuan political and social life before European contact are lacking because there are very few firsthand accounts and the Timucua themselves produced no written records of any kind describing their pre-Columbian daily activities or systems of social organization, leading archeologists to heavily rely on excavated evidence. Excavations of Timucuan village sites and middens, for example the village of Nocoroco in what is today Tomoka State Park in Volusia County, have turned up remains of locally sourced shellfish and wild game, a variety of ceramics and other tools, and indications that previous occupants were likely engaged in agriculture [16]. The first-hand descriptions of Timucuan social life that do exist come from after initial European contact, an interaction itself which was accompanied by significant changes in indigenous social organization [17]. Historian Jerald Milanich ([17], p. 151), among the foremost archeologists in Florida, offers the most authoritative description of Timucuan society prior to European contact:

The Timucuan never organized as a single political unit. The various groups which spoke Timucua were organized around individual villages, each with its own chief and other village leaders. Over time, perhaps hundreds of years, existing villages had budded off new villages as the population of the parent villages increased to levels that made such a fission economically feasible. Because of this process, groups of contiguous villages shared common histories, populations which retained kin ties, and other characteristics which drew them together and gave them a sense of identity. Within such ethnic Timucuan groups the parent villages and their chiefs

may have had greater importance and respect, status derived from the historical events of the past.

One imagines that it was this general social condition that those first Europeans to set foot on the Florida peninsula found the Timucuan cultures they encountered. When thinking about the *non*-human world the first European's encountered, however, it is important to avoid what Devenan [18] called the "Pristine Myth"; that is, the idea that the pre-Columbian Americas were "a world of barely perceptible human disturbance." There is plenty of evidence to support the idea that the indigenous mode of production involved substantial manipulation of the bio-physical environment. This includes for example measurable impacts on the size and distribution of a variety of coastal resources resulting from persistent human harvesting [19] or regional biogeographical impacts resulting from pre-Columbian settlement patterns [20]. Some scholars go as far as to argue that pre-Columbian societies maintained large areas of land as "culturally managed ecosystems" (e.g. [21], p. 19) which they argue emerged through complex interactions between subsistence practices, such as intentional burning, and natural complex-adaptive tendencies in ecological systems.

First European contact

Most histories of modern Florida⁶ begin with the Spanish conquistador Juan Ponce de León's "discovery" of the peninsula in 1513, naming it "the Land of Flowers" (La Florida) in honor of the approaching Easter holiday. It is difficult to over-state the extent of the changes that flowed from first European contact. The resultant dramatic shifts in demographics, land use and tenure systems, and administrative authority would end up changing the face of Florida's physical and social landscape forever. However, as we will see, the dramatic changes to come did not appear all at once, but rather were manifest in qualitatively different periods characterized by particular forms of administrative rule and productive activity, each leaving their own unique imprint on history. Even early demographic and other changes to indigenous societies resulting from initial European contact differed within specific periods, for example the substantial regional variation in rates of population decline and acculturation (see [23], particularly p. 159-161).

In 1894, writer Charles Richards Dodge, while reflecting on his travels in subtropical Florida, wrote that the state's history is "a story of sanguinary conquest" ([24], p. 10). Dodge was no doubt referring to the long and often bloody

⁶ If you are interested in a more detailed account of Florida's dramatic history, I recommend *The New History of Florida*, edited by Michal Gannon [22], the most authoritative and detailed account produced thus far by among the most productive and widely respected Florida historians.

history of colonization which characterized much of Florida's history after Columbus (or, perhaps more accurately for Florida, after Juan Ponce de León). In the wake of the European discovery of La Florida, legends of an exotic and rich land full of gold and natural resources spread far and wide.⁷ The Spanish were the first Europeans to successfully lay claim to the Florida peninsula, at first seeking riches and fountains of youth (so the myth goes), later focusing their efforts on proselytizing the indigenous and constructing military outposts to help protect the precious cargo, such as gold and silver, being extracted and shipped from other Spanish colonies in the Americas back to the European mainland ([15], Chapter 2). The city of Saint Augustine, located in northeastern Florida, is the archetypical example of this early Spanish period. The city, founded in 1565, is the oldest continually inhabited city of European origin in the United States and was the administrative hub of Spanish colonial La Florida for some 200 years. It was also the site of construction of the most well-known early Spanish period landmark in Florida, the Castillo de San Marcos, a star-shaped masonry fortress which is today designated as a National Monument (Figure 3).



Figure 3:
The southwest corner of Castillo de San Marcos, Saint Augustine, Florida. Initially constructed in the early 1600s, the fort was occupied by different military forces until the end of the Second World War. Source: Author's photo, 2014.

Beyond the masonry forts found in places like Saint Augustine or Matanzas Inlet, the Spanish were also responsible for initiating some noteworthy biological

⁷ The poem at the beginning of this chapter is the first English language poem to mention Florida, produced by an anonymous poet in England in 1586. The poet asks the question “Have you not heard of Florida, a land far to the West?”, before enumerating the fabled riches of the newly discovered lands, including gold, turkeys and pearls, which were certain to make one rich (the last line reads “With her! [Florida]. Would not a wallet do well?”). Referenced in ([5], p. 29). Full poem retrieved from: http://archive.org/stream/cu31924030921724/cu31924030921724_djvu.txt

changes in the Florida peninsula. Some impacts were direct, for example the deliberate introduction of livestock such as cattle and agricultural crops such as oranges, both of which are closely identified with the state today. These are good examples of what Charles C. Mann [25] has discussed under the rubric of the “Columbian exchange”, the human-induced destruction of bio-geographical barriers which occurred as global travel and trade expanded in the age of exploration. But perhaps, above all, the depopulation of indigenous peoples through disease and war (see [26]) characterizes the enduring legacy of early Spanish Florida. This legacy must also include the indirect but major ecological impacts that resulted from the collapse of indigenous populations in Florida similar to those which occurred elsewhere in North America, for example the regeneration of forests on landscapes which had previously been kept open by fire or agriculture (e.g. [18, 27]).

The impacts on the environment left by indigenous peoples were reflective of their hunter-gatherer and subsistence agricultural economies. Similar subsistence activities, on a much smaller scale, continued under Spanish rule, though indigenous demographic collapse meant that there were far fewer people engaged in such activities, allowing many natural areas to develop into a non-anthropogenic state [18]. A major qualitative change in economic activity came with the first systems of commodity agriculture implemented by the British Empire when they took control of the La Florida territory in the 1760s. Since its discovery by Europeans, the British had become increasingly interested in the Florida territory for much the same reasons as the earlier Spanish conquerors, namely to reap the harvest of its fabled riches.

From Spanish Priests to British Plantations

While La Florida remained a Spanish territory for over two centuries, very little in terms of established settlements and productive activity had been accomplished (or pursued) by the colonial crown. To be sure, numerous military campaigns were undertaken in the earliest days of European conquest which sought to subdue the indigenous population and take control of whatever riches the new territory had to offer.⁸ However, extensive cultivation or harvesting of natural resources, while of course undertaken to some degree, was never a top priority for the Spanish crown,

⁸ Between Juan Ponce’s settlement attempt in 1521 and the first successful permanent settlement at Saint Augustine in 1565, numerous unsuccessful, and some downright calamitous, attempts to either settle or exploit the fabled riches of the Florida peninsula were made, perhaps most infamously by Hernando de Soto in 1539, which left in their wake indigenous communities that were “overstressed and humiliated” and expanded the infection of natives with Old World pathogens, leading to the annihilation of many southeastern tribal cultures (see [28] and [29]).

which instead tended to view the peninsula primarily as a missionary and military outpost (see [22], Chapter 4 and 5). Evidence suggests that the extent of direct pre-Columbian human influence on the natural environment was likely much greater than that of early European colonialists [18]. However, with changes in colonial administration came changes in prioritization, and with changes in prioritization came changes in the scale and intensity of productive activity. The British colonial government was the successor to Spain, and with this transition in administration came more concerted efforts to settle the Florida territory and expand production. This was pursued primarily through a system of generally slave-labor supported plantation agriculture which was already common in other British colonies further north.

The shift away from primarily subsistence activities towards the production of agricultural commodities signified a dramatic change in the qualities of the primary mode of production in the peninsula, ushering in a system which would remain dominant until after the American Civil War. However, while the British were the first to take steps towards implementing a system of land tenure conducive to commodity agricultural production, its actual implementation was far from universal, with settler lands being largely confined to designated coastal areas and allocated in a generally ad hoc way.⁹ As a result, environmental impacts resulting from plantation agriculture and resource extraction were likewise confined in extent and intensity. Not until the acquisition of the Florida territory by the still young but growing United States in the early 19th century was a more systematic scheme of land organization and allocation implemented. This new system and the private land market it helped produce were crucial in creating conditions conducive to rapid urbanization (and the environmental impacts that came with it) which characterized 20th century Florida.

Since the European discovery of the Florida peninsula, claims to what most believed was a strategically located and natural resource rich virgin territory were heavily contested by various colonial administrations, including Spanish, French, British and eventually American. While the French were never successful in their early and numerous attempts to lay claim to Spanish La Florida [31], the British colonial administration finally achieved what the French never could when they obtained the La Florida territory through the signing of the Treaty of Paris in 1763, a treaty which ushered in significant changes not only in Florida, but throughout colonial North America. As Tebeau ([15], p. 72) explains:

In the Treaty of Paris England took over Canada from the French, and Spain received France's trans-Mississippi lands (Louisiana). Spain also exchanged Florida,

⁹ British land claims were secured (and constrained) by a land treaty between native tribes and British authorities in 1765 in which the area south of the St. Marys River and east of the St. Johns River, together with the entire Atlantic coast, was opened to colonization ([30], p. xv).

which now extended westward to the Mississippi River, for Havana, which had been captured by the English. England had emerged victorious over France in the New World, and the stage was set for what was to prove a brief rule in Florida.

After gaining control over the Florida territories, the British colonial administration subdivided the Florida colony into East Florida and West Florida along the Apalachicola River to ease the burden of administering such a large area. The colonial administration then moved to incentivize settlement of the newly acquired territory by issuing land grants. In a very short period of time, surveys of the territory were issued and carried out and metes-and-bounds¹⁰ were laid to mark out tracts of land for distribution. For example, the East Florida Society of London, an interest group known as a “privy council” with the power to allocate colonial lands, granted over 2,800,000 acres of land in East Florida between 1764 and 1770, a total which surpasses the combined land grants in all other British colonies in this time period [32]. As a result, settlements began to spring up along Florida’s northeastern Atlantic coast and inland rivers (Figure 4). Cash crops such as indigo, sugar cane and cotton were grown extensively, while other specialty products (e.g. naval stores) were produced from the available natural resources. The naturalist William Bartram, who had been commissioned by British authorities to explore the Florida territories and document any useful plant or animal species, commented often on this growth in productive activity in his famous *Travels* [33]. For example, while sailing down the Saint John’s River, south of Saint Augustine, Bartram, in his characteristically elegant and descriptive prose, recalled the coastal plantations he observed:

Having a lively leading breeze, I kept as near the East shore as possible, often surprised by the plunging alligators, and greatly delighted with the pleasing prospect of cultivation, and the increase of human industry, which frequently struck my view from the elevated, distant shores ([33], p. 85)

Britain would hold the Florida territories for a mere 20 years (the Spanish occupied the peninsula for nearly 200) before transferring the territory back to Spain in the wake of the American Revolutionary War [34]. However, the intensity and breadth of productive activity under British rule (and the new social structures which supported it) amounted to a sizeable legacy.

¹⁰ Metes-and-bounds is a system of land demarcation which uses physical natural or man-made markers, pace lengths and cardinal directions to designated boundaries of individual land parcels; see <https://www.britannica.com/topic/metes-and-bounds>.

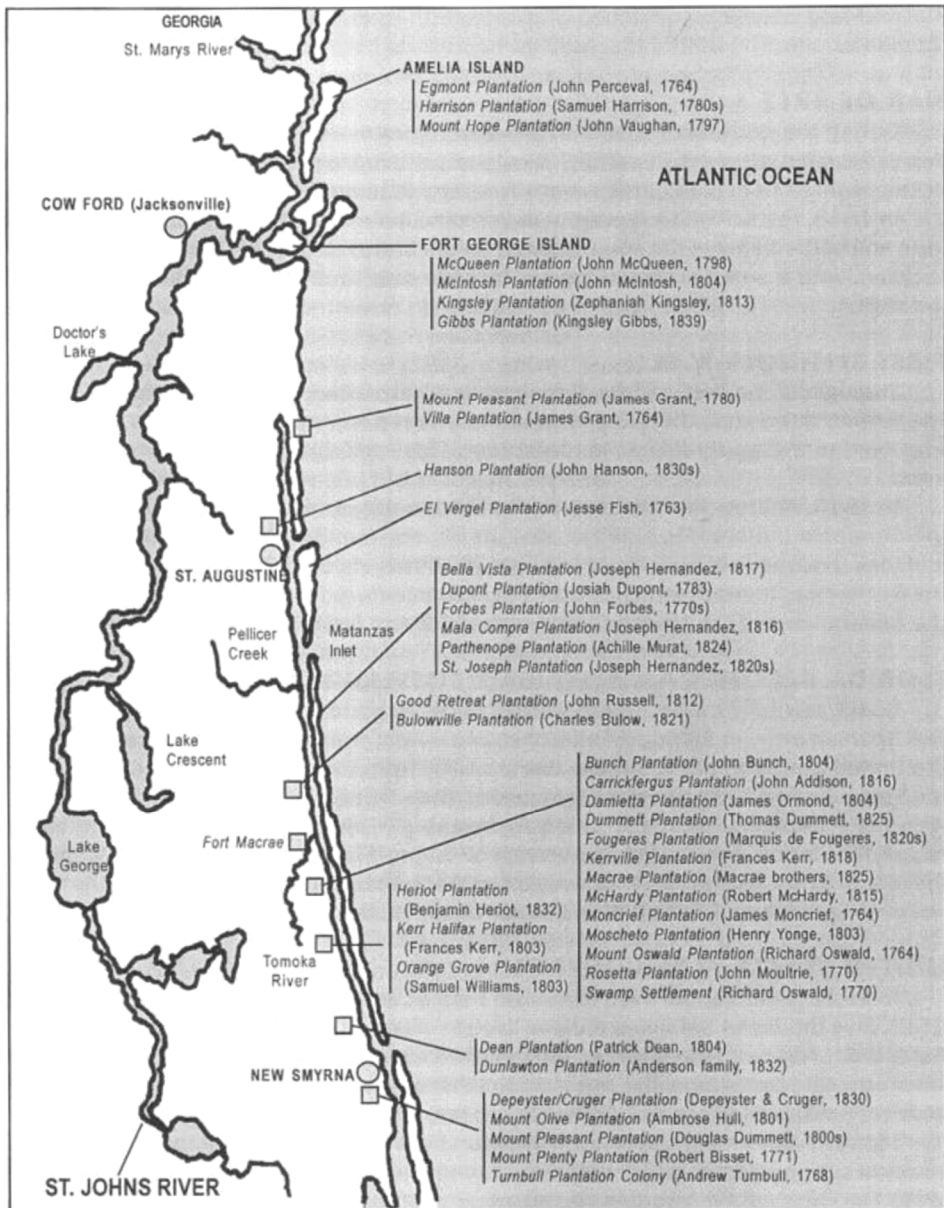


Figure 4: Colonial plantations along Florida's northeast coast. Note that many of these plantations originate from the British period (1763-1783), some of which continued to be under production for many decades after the British transferred East and West Florida to Spain. Other plantations were established during the Second Spanish (1783-1817) and American Territorial (1817-1845) periods. All plantations were clustered along the Atlantic Coast. Source: Map courtesy of the Flagler County Historical Society.

A notable example is Dr. Andrew Turnbull's New Smyrna colony settled in 1768, which at the time was among the largest single settlement attempts in North America, involving over 1000 initial colonists. Turnbull's colony roughly established the site which hosts the contemporary town of the same name (New Smyrna Beach) and, through the legacy of his Mediterranean work force, has had major influence on the cultural heritage and demographics of Saint Augustine to this day [35]. But the New Smyrna colony is perhaps most famous for the cruel tactics employed by Turnbull to settle and work the plantation. The influential surveyor and naturalist Bernard Romans recalled the New Smyrna situation this way while drafting his *A Concise Natural History of East and West Florida* in 1775 ([36], p. 268):

About 1500 people, men, women and children were deluded away from their native country, where they lived at home in the plentiful cornfields and vineyards of Greece and Italy, to this place, where instead of plenty they found want in its last degree; instead of promised fields, a dreary wilderness; instead of a grateful fertile soil, a barren arid sand; and in addition to their misery, were obliged to indent themselves, their wives, and children for many years, to a man who had the most sanguine expectations of transplanting Beshawship¹¹ from the Levant.

Even with such blunders and disappointments, the British managed to make large strides in surveying, dividing and allocating (particularly coastal) colonial lands, bringing them into production, as well as constructing over-land transportation networks, such as the Kings Road [37], which collectively laid the foundation for further development in the future. Many of the lands granted during the British period would continue to be occupied and cultivated by successive generations under different colonial rulers. However, brewing tension in the English colonies to the north which would eventually lead to the American Revolutionary War sounded the death rattle of the short lived British occupation of Florida, and the British colonial government, "in the interest of peace", returned the Florida territory to Spain via the Treaty of Paris of 1783 ([34], p. 148).

During the second Spanish administration in Florida, much of the same production and subsistence activities continued, including plantation agriculture and harvesting wood and other natural resources. The granting of unoccupied lands also continued, though in a largely disorganized fashion which made future attempts at land surveying more cumbersome [38]. This time around, however, Spanish control of the Florida territory was, as Tebeau has put it, only "nominally Spanish" ([15], Chapter 7). A lack of financial support from the Spanish homeland

¹¹ An Iranian comrade helped me understand that *Beshaw* is the Arabized form of *Pasha*, which was an Ottoman title for a high-ranking bureaucrat, similar to the title "Lord". Bernard Romans' use of the word here is meant to be derogatory, in that Turnbull had hoped to implement what was generally viewed by Westerners as a barbaric form of governing to his new Florida settlement.

combined with frequent intrusions by the new and increasingly powerful United States to the north made governing the territory practically impossible. At the same time, American appropriation of Florida seemed increasingly likely as southern plantation owners, angered by the slaves and indigenous tribes that fled northern captivity and oppression in droves, seeking refuge in Spanish Florida, demanded the U.S. government do something to “solve the problem” [39]. Ultimately, the Adams-Onís treaty of 1819, also known as the “Florida Purchase”, was signed which established the terms by which Spain ceded Florida to the United States in exchange for debt relief and the settling of boundary disputes in the North American West [40].

In the final analysis, the two decades of British rule and the “nominal” return of Spanish authority to the Florida peninsula introduced important, if not extensive, changes in human-environment relations. Land cover changes certainly occurred where land was cleared for agricultural production, including local-scale clearing of coastal forests for cotton and indigo production and the manipulation of coastal marshes for sugar cane cultivation. However, the foundations for a universal system of land allocation were soon to be laid in the newly acquired American territory which facilitated settlement and production on a scale that would far surpass the relatively limited impacts of the Spanish and British colonial periods.

This Land is Your Land? This Land is MY Land! Or, clearing and gridding a new American territory

After its acquisition of the Florida territories from Spain, the United States government made substantial efforts to provide incentives for and conditions conducive to the settlement of the still sparsely populated peninsula through a combination of systematic land surveying and systematic removal of the indigenous population. This two-pronged approach would ultimately clear the way for the establishment of a capitalist land market and the state’s rapid urbanization nearly a century later, and it represents, as we will see in the following section, the most deliberate and complete attempt by a government to transform all of the Florida territory into a site for capital accumulation.

Almost immediately, the U.S. federal government undertook the systematic surveying and subdivision of the newly acquired Florida lands. This was accomplished through the Public Lands Survey System (PLSS), a rectangular cadastral mapping strategy which utilizes systematic, nested geometric measurements oriented along a system of baselines and meridians to organize land into parcels “suitable for disposal by the government”.¹² In 1824, surveyor-general

¹² See https://nationalmap.gov/small_scale/a_plss.html

Colonel Robert Butler, tasked with initiating the gridding of Florida lands, established the starting point of the Tallahassee meridian which literally laid the ground work for the systematic surveying of all Florida lands under the PLSS ([41], p. 82). Implementation of the PLSS enhanced what political scientist James Scott termed the “legibility” of space by organizing it within a geometrically rational system which facilitated the coordinated and efficient allocation of property to private individuals, as well as the collection of taxes from a distant, centralized state ([42], Chapter 1, see in particular p. 44-45). Such a system also helps to clearly define which private or public entity has monopoly control of a certain portion of absolute space.¹³ The PLSS remains the foundation for land transfers and property lines in much of the United States today (Figure 5).

Along with the implementation of the PLSS, the United States government ramped up its efforts to remove indigenous peoples from the territory, viewing their presence as hostile and a barrier to expanding settlement, a perspective also shared by most white frontiersmen [40]. Though practically all of the Timucuan and other first inhabitants had been whipped out during the first two hundred years of Spanish colonialism, the Florida peninsula had seen a marked increase in indigenous inhabitants in the late 18th and early 19th centuries. In particular, during the second Spanish administration (1783-1819) many indigenous groups sought new places to live in the Florida peninsula after being dispossessed and systematically oppressed in the British turned American colonies to the north. Many escaped black slaves also fled to Florida, over time intermingling with the various indigenous tribes to form a group which would eventually coalesce as the Seminole Nation [44]. The nearly half century of war between the United States military and the Seminole Nation was formally initiated when the well-known hater of indigenous and United States president-to-be General Andrew Jackson invaded Spanish Florida in 1818, which also provided the impetus for the signing of the previously mentioned Adams-Onís treaty of 1819 with which the United States acquired Florida from Spain [45].

The Seminole Wars (roughly 1816-1858), as the decades of drawn out military campaigns and sporadic battles are jointly known, were collectively among the longest sustained military campaigns in U.S. history, a campaign which eventually led to the forced expulsion of most of the Seminole Nation to treaty lands in Oklahoma or deep in the swamps of southern Florida [46].¹⁴ The destruction of

¹³ “The exclusivity of control over absolute space is not confined to private persons but extends to states, administrative divisions and any other kinds of juridical individual. Private property in land, in practice usually recorded through cadastral survey and mapping, clearly establishes the portion of the earth's surface over which private individuals have exclusive monopoly powers” ([43], p. 339).

¹⁴ But this “victory” (in fact, it was the United States military that eventually backed out of the campaign) was only accomplished after thousands of lives were lost, millions of dollars spent and deceitful tactics were employed, such as the infamous and cowardly arrest and imprisonment of the

infrastructure and property that resulted from the fighting, such as the burning of bridges and plantations like that found at Bulow State Park (Figure 5), thwarted the possibility for more extensive investment in the Florida peninsula until after the American Civil War [47].

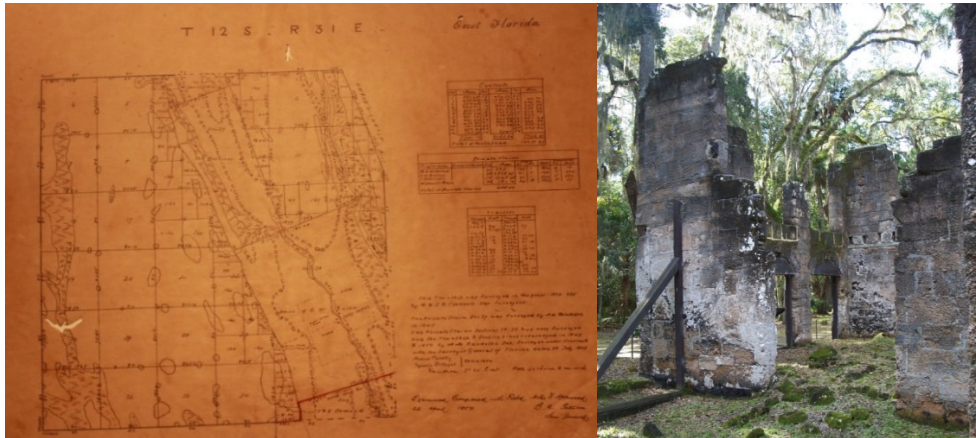


Figure 5:

Left: This section from an 1850 PLSS survey shows the systematic parceling of lands within Township 12 South, Ranger 31 East, in modern day Flagler County. This section also offers a clear example of the contrast between previous, non-systematic land grant strategies organized by metes-and-bounds and the systematic coordinate system of the PLSS. The central, non-conforming parcels in the image correspond to the Bulowville Plantation lands which are representative of the British and Spanish colonial administration land grant schemes, while the other geometrically structured parcels were established by the American territorial administration. Source: Map section courtesy of the Flagler County Historical Society. **Right:** Occupied between roughly 1821 and 1836, the Old Sugar Mill at Bulowville Plantation was once among the largest producers of sugarcane in northeast Florida. John Joachim Bulow, who inherited the plantation land from his father Charles Wilhelm Bulow after his death in 1823, owned 159 slaves who labored in the surrounding forests and swamps. The plantation was set on fire and destroyed by Seminole warriors during the Second Seminole War in 1836. Author's photo: 2015.

After the fiercest fighting had ceased and the majority of the Seminole Nation had been forcibly removed, the Florida territory was annexed as the 27th state of the United States in 1845. The combination of a persistently small population and the effects of the Seminole Wars, however, left huge tracks of land unoccupied and uncultivated throughout Florida. To remedy the problem, between statehood and the American Civil War, the United States government passed several important legislative acts aimed at prepping the ground for further settlement and “improvement” of newly acquired public lands throughout North America, including the Florida peninsula and large territories in the West. The Swamp Lands Act of 1850, for example, brought more than 20,300,000 acres of unoccupied federal lands in Florida under state control to expedite drainage, improvement and settlement; most of these lands are in private hands today ([48], p. 43). The

Seminole Nation’s influential leader Osceola under a flag of truce in Saint Augustine on 21 October 1837 (see [47], Chapter XIV).

improvement and settlement of these new state lands, however, was to be postponed as Florida joined the Confederacy as one of its founding members in 1861 at the beginning of the American Civil War. Because it had the smallest population of any confederate state, Florida played only a minor role in the bloody battles further north. The state's major role was instead to supply food, timber, fuel and other resources to the confederate army, which made it the target of various land and maritime blockades [49]. We all know how that story ends.

After the Civil War ended and reconstruction began, large numbers of prospective settlers, some of which had relocated to the peninsula during the war, saw Florida as offering the most promising path to the future [50]. To incentivize and facilitate the private settlement of newly acquired public lands, the signing of the Homestead Act of 1862 by President Abraham Lincoln, which only came into effect in Florida after the Civil War had ended, allowed for the transfer of 160 acres of public land to any eligible settler willing to reside on and improve unoccupied public land by, for example, farming or building a house [51]. However, more ambitious government land-giveaways were increasingly becoming a part of both the federal and state level strategy for settling frontier lands, with transport companies being among the largest beneficiaries.

By the time the Civil War ended, the United States and Florida governments had collectively managed to effectively eradicate the indigenous population, systematically survey nearly all public lands, transfer federal land to state control, and implement land-grant schemes to prospective settlers and infrastructure investors. But as the 19th century came to a close, Florida remained a sparsely populated and wild backwater. The largest Florida city in 1890 was Key West, the small fishing village at the far end of a chain of coral keys (closer to Havana, Cuba than the Florida mainland), which was significant mainly in terms of its sponge harvesting and cigar rolling industries [52]. The now great city of Miami wouldn't break ground for nearly another decade.

The state economy before and for some time after the Civil War was dominated by what economic historian William Stronge ([53], p. 20, Chart 1-10) calls the "frontier industries", meaning timber, cattle, naval gum stores, and some forms of agriculture, which collectively made up around 55% of the total value of production of Florida's economic base in 1899. The clearing or harvesting of forest resources in particular had long been a common practice under Spanish, British and American administration. For example, the massive stands of long-leaf pine (*Pinus palustris*) that once covered much of the southeastern United States were widely razed after European colonization [54]. Whole forests were destroyed when harvested for construction materials, to clear agricultural or grazing lands, and because of interruptions to natural fire regimes, reducing the total extent of the long-leaf pine by more than one-half of its original range by 1900, with harvesting continuing well into the early 20th century ([55], p. 6). *Pinus palustris* is currently

on the IUCN's Red List of Threatened Species¹⁵, though it has no formal federal protection status in the United States (Figure 6). Similarly, the southern live oak (*Quercus virginiana*) was widely felled and turned into the ribs and planks of sailing ships, most famously by the aptly named “Live Oakers” [56]. While *Quercus virginiana* is not endangered, most of the largest and oldest trees were turned into lumber and are now lost to history, but a few celebrated specimens remain (Figure 6).



Figure 6:

Left: A stand of long-leaf pines shortly after a controlled burn in Black River State Park, Santa Rosa County, Florida. **Right:** The great Fairchild Oak in Bulow State Park, Flagler County, Florida. A nearby Florida Park Service information sign reads: This live oak has withstood hurricane winds, fires, droughts, wars and the follies of mankind for centuries. Please help us to protect this magnificent tree by not climbing on its ancient limbs. Thank you. Source: Author's photos, Top, 2017, Bottom, 2015.

While select environmental impacts certainly preceded the 20th century, they had little to do with extensive development undertaken by a large human population. Indeed, there is substantial evidence to suggest that human presence in the landscape was less visible centuries after European contact compared to pre-Columbian times [18]. In Florida, the total state population in 1900 was barely over half a million, and it wouldn't surpass one million for another two decades. At the end of the 19th century the vast majority of people in Florida resided in the north of the peninsula, particularly in the panhandle area; southern Florida remained, as Mohl and Mormino's ([22], p. 418) put it, “remote, forbidding, inaccessible and unsettled”. In this way, perhaps the most significant impacts wrought by British, Spanish and early American rule were not directly environmental, but political.

However, a structural transformation in Florida's economy was on its way, namely a major shift away from the frontier industries to the predominantly urban industries characteristic of modern Florida, in particular real estate and tourism. Much of the path for post-Civil War demographic and economic changes in Florida

¹⁵ See <http://www.iucnredlist.org/details/39068/0>

had already been cleared by centuries of colonial rule under which several significant, compound events had transpired; the indigenous population of the peninsula had been effectively wiped out, twice, meaning there was virtually no resistance to settlement efforts after the Civil War; newly acquired public lands had been surveyed and largely transferred from federal to state control, meaning a centralized system of land banking and allocation had been implemented; programs had been put in place which would transfer state lands through land-grants and other incentives to private hands, meaning the mechanisms for the establishment of a market in private land were put in place. This latter development in particular, the transfer of public lands to private hands, was significant for instigating the social and economic transformations which would characterized 20th century Florida, as it turned a “large supply of underutilized – cheap land” ([53], p. 21) into a foundation for private capital investment and economic development.

1.2 Laying the Tracks for American Capital (ca. 1870 – ca. 1920)

To assume that the transfer of public lands to private investors was the outcome of some natural process of institutional evolution would be at odds with history. In fact, as we have seen, the establishment of a private land market was the product of a concerted effort by state and federal governments with a definite end in mind. As historian Colburn ([57], p. 345) has noted, post-Civil War political leaders:

recognized the critical importance of a development program if Florida was to prosper, but the state lacked the capital to spur development and population growth. The only resource political leaders had to barter was land, and they did just that by granting large sections of land indiscriminately in order to encourage ambitious and wealthy men to develop the state and to make it accessible to others.

The transformation of land, like labor-power, into capital involves a process which Marx ([58], p. 873) discussed under the rubric of “so called primitive accumulation”, meaning “an accumulation which is not the result of the capitalist mode of production but *its point of departure*” (emphasis added). This initial accumulation is not a *passive* development; rather, it is an essentially *intentional* activity that must be purposively and actively pursued by some entity, regardless of the “natural” designation private property and capitalistic values are assigned by

some (political) economists.¹⁶ The above described centrality of war in the history of establishing capitalist relations in Florida is a particularly clear case in point.

Force is required because the initial process of accumulation involves not only the establishment of private ownership and capitalist market institutions where they didn't previously exist, but also the dismantling of preexisting social and economic institutional structures in the process of their establishment, a process predicated on both social and physical violence. The "making available of spaces to capital", as geographer Tom Mels ([59], p. 2) phrased it, is never "ontologically given", but must be "conceptually and materially produced". In Florida, the various colonial and, eventually, federal and state governments contributed to this process in ways which were temporally separated and qualitatively different but *compound*, meaning many previous changes in social and economic structures (for example, the decimation of indigenous populations) were "inherited"¹⁷ by future generations, so to speak, and provided the starting conditions for further developments. While, as we will see, the establishment of a private land market was a necessary step to advancing capital accumulation in Florida, its achievement was mediated by the contingent outcomes of actual history.

State supported systematic surveying and mapping in particular has played an essential role in the conceptual and concrete production of a capitalist land market in Florida. Systematic organization of public lands facilitated what Cosgrove ([62], p. 55) has called "a way of seeing, a composition and structuring of the world... according to the certainties of geometry". Such techniques facilitate the separation of land from its concrete biophysical and historical context and allow for its efficient and rational allocation from a distance. This "production of abstract space", to invoke Henri Lefebvre's terminology and theory ([63], p. 285-291), encapsulates the attempt to transform what are in reality heterogeneous, concrete, bio-physically distinct spaces into a "homogenous", qualitatively equivalent mass of capital, i.e. pure "land" in the abstract.¹⁸ This facilitates the treatment of land as

¹⁶ "In actual history, it is a notorious fact that conquest, enslavement, robbery, murder, in short, force, play the greatest part [in primitive accumulation]. In the tender annals of political economy, the idyllic reigns from time immemorial... As a matter of fact, the methods of primitive accumulation are anything but idyllic" ([58], p. 874).

¹⁷ Pierce Lewis formulated the idea of "inheriting" history in the way I am implying here in his seven axioms for reading the landscape (see [60]). I originally came across this idea, however, by way of the landscape geographer Don Mitchell who, in anticipation of developing it further, formulated Lewis's idea this way: "History matters to the structure and look of a landscape. We inherit a landscape which forms the basis for any changes or developments we subsequently make. Change itself is uneven ("lumpy"). Both technological and cultural change comes in great leaps forward, perhaps more so than as gradual evolution." ([61], p. 30).

¹⁸ The homogenization of space I discuss here is universal in the sense of the abstract logic of capital; however, in practice the historical specifics of development in an economic system and the presence of varying interests add concreteness and complexity to the outcomes of particular instances of enforcement of a capitalist land market. Specific transitions to capitalist relations result

“a pure financial asset, a form of fictitious capital”, a condition which, as Harvey ([64], p. 21-22) put it, “dictates the pure form of landed property under capitalism”. However, this begs the question of what it is about land that would lead a government to be so adamant about, and go to such lengths to achieve, the rationalization and dissemination of landed property. How is this related to the implementation of capitalist economic relations?

Land as the basis of production

At the most basic level, land is essential for all forms of production and human activity, regardless of whether we are considering a hunter-gatherer society or an advanced industrial capitalist society.¹⁹ However, in what specific ways land is considered useful for political-economic activities depends entirely on the society in question, specifically regarding the dominant mode of production. Under capitalism, for example, land can “function as an element, means, or condition of production, or simply be a reservoir of other use-values (such as mineral resources)” ([64], p. 17). Beyond constituting the *physical* conditions for productive activity, under capitalism private ownership of land plays a specific and indispensable role in reproducing the *social* conditions of capitalist production. The preservation, and even the enhancement of private property in land “performs an ideological and legitimizing function for all forms of private property” from which “capital derives its own legal standing and legitimacy” ([43], p. 360). Private landed property also creates the potential for ground-rent, understood generally as “simply a payment made to landlords for the right to use land and its appurtenances (the resources embedded within it, the buildings placed upon it and so on)” ([43], p. 330). Land, broadly conceived in this way, has both use-value and exchange-value, the latter being tied to the level of rent a particular portion of land yields (ibid).²⁰

in unique hybrid matrices of land relations (e.g. mixes of public and private land), rather than accomplishing homogenized, purely capitalist relations on all land parcels. Harvey ([64], p. 18) put it this way: “It is not hard to see how a powerful alliance of classes - comprising landowners, industrial bourgeoisie, money lenders, backed by the state - can form and block any full transition to capitalist social relations on the land”. However, as Harvey ([64], p. 22) also points out, the absence of “feudal residuals” in the United States has led to the more universal adoption of capitalist land relations, where land tends to be viewed as a “purely financial asset”.

¹⁹ “... land serves not only as a means of production but also as a 'foundation, as a place and space providing a basis of operations' - space is required as an element of all production and human activity” (quoted in [43], p. 337).

²⁰ This raises an important question- “How does it come about that commodities which contain no labour possess exchange-value, or in other words how does the exchange-value of purely natural forces arise?”- the answer, as Rosdolsky ([65], p. 35-38) points out, is that “the value of land is nothing but the price which is paid for capitalized ground-rent”. Land, or any natural endowment,

Rent, which is derived from the monopoly power of private ownership²¹, provides the basis from which a private land market can form. Under such conditions the land is treated as a form of “fictitious capital”, a “pure financial asset which is bought and sold according to the rent it yields” ([43], p. 347). Such abstraction from the use-value of land indicates that the primary relationship between different land commodities under capitalism is a *quantitative* relationship of exchange-value (i.e. level of ground-rent) which is detached from the qualities that make a particular plot of land useful.²² However, differences in the level of ground-rent provided by a particular plot of land demonstrates, as Rosdolsky ([65], p. 87) points out, “the significance of use-value as an economic category” because ground-rent “derives ultimately 'from the relation of exchange-value to use-value' of land”. In other words, land on the market takes the form of exchange-value, but this of course does not erase its material content, i.e. its use-value, which it possesses by its nature as a commodity²³ and, furthermore, influences the level of ground rent that can be extracted from a particular plot of land.

The extraction of monopoly rent is predicated on the condition that “social actors control some *special quality* resource, commodity or location which, in relation to a certain kind of activity, enables them to extract monopoly rents from those desiring to use it” ([66], p. 395). These special qualities can be the result of natural endowment (e.g. fertility, location, etc.) or of human improvements (e.g. drainage, access, etc.). And as we will (see Section 5.2), the propensity of much economic theorizing to abstract away the qualities, i.e. use-values, from land (or any other form of capital) leads to serious theoretical and practical contradictions. Still, land as capital has exchange-value derived from the rent it commands (even if it also has use-value), which in turn means it has a price on the market and is subject to

cannot technically speaking create value itself, as only labor can create value. Rather, land acquires exchange-value through its appropriation, which it then enters into the cost of production as exchange-value. “This value can only be explained by the Theory of Rent – and modern ground-rent represents a particular creation of capital, the only creation of capital ‘as value distinct from itself, from its own production’”.

²¹ “All rent is based on the monopoly power of private owners of certain portions of the globe.

Monopoly rent arises because social actors can realize an enhanced income-stream over an extended time by virtue of their exclusive control over some directly or indirectly tradeable item which is in some crucial respects unique and non-replicable” ([66], p. 395).

²² Harvey ([64], p. 18) clarifies that “The actual history of this process is strewn with complexities generated out of the cross-currents of class struggle and the diversity of initial conditions of land tenure and ownership.”

²³ “Commodities come into the world in the shape of use values or material goods, such as iron, linen, corn, etc. This is their plain, homely, natural form. However, they are only commodities because they have a dual nature, because they are at the same time objects of utility and bearers of value. Therefore they only appear as commodities, or have the form of commodities, in so far as they possess a double form, i.e. natural form and value form... Not an atom of matter enters into the objectivity of commodities as values; in this it is the direct opposite of the coarsely sensuous objectivity of commodities as physical objects.” ([58], p. 138).

the market mechanism. This has significant implications for the guiding logic of development and its physical patterning in space. As Harvey ([43], p. 369) points out, the land market:

shapes the allocation of capital to land and thereby shapes the geographical structure of production, exchange and consumption, the technical division of labour in space, the socioeconomic spaces of reproduction, and so forth. Land prices form signals to which the various economic agents can respond. The land market is a powerful force making for the rationalization of geographical structures in relation to competition.

To summarize, by facilitating the creation of a private land market, the systematic parceling of Florida's public lands and their distribution to private hands both contributed to the *insertion* of capitalist economic relations in the Florida territory as well as providing the foundation for their *reproduction* and *extension*.²⁴ However, changes to institutions and legal structures which control land ownership and distribution are still in need of being made concrete *in practice* if they are to be put to productive advantage.²⁵ Said differently, the transformation of land into *capital*, like other material use-values²⁶, requires not only its *acquisition*, but furthermore its *employment as capital*. And employing land as capital means employing it as a means of production for exchange; in other words, employing it with the intention to satisfy not personal needs, but use-values of others, social use-values ([58], p. 131).

Land, transportation and capital accumulation

The use of land for transportation in particular is crucial for productive activity, as its construction facilitates both physical access to spaces of production and the physical foundation for further production, exchange and consumption.

²⁴ "The monopoly of private property in land is both an "historical premise" and a "continuing basis" for the capitalist mode of production" (quoted in [64], p. 19).

²⁵ By highlighting this difference I mean to invoke the distinction stressed by Swedish geographer Torsten Hägerstrand ([67], p. 36) between "two different but closely related phenomena: 1), Social transactions and institutions, and 2) physical actions in the landscape". The first of these remains in the realm of ideas and is thus only constrained by the imagination; the latter is the realm of material reality, and is the point at which physical transformation of the environment occurs. The initial transformation of the first into the second is a matter of physical production, accomplished by combining means of production (i.e. land, machinery, etc.) with the necessary labor-power (i.e. workers) to construct basic physical infrastructure.

²⁶ "The appropriation of 'natural agencies. . . such as water, land (this notably), mines, etc.' is in principle no different from the appropriation of other material uses values and their transformation into fixed capital by putting them into use as such. The improvement of land - be it for agriculture or industry - means that the land itself 'must ultimately function as fixed capital . . . in some local process of production'" (quoted in [43], p. 235).

Hägerstrand and Clark ([68], p. 19) offer a lucid description of the reciprocal relationship between transportation development and land use change.²⁷

With every change in the use of a site, in terms of intensity of use or type of use, there is a corresponding change in the flow of people and material to and from the site. Likewise, with every change in flows of people, vehicles and materials along routes adjacent to a site, there is a corresponding change in accessibility to and attractiveness of the site for its present use, or for some other potential use. Furthermore, a considerable share of urban land, and indeed an increasing share, is occupied for transportation use. Transportation not only relates to land uses: it is itself a land use.

The importance of investing in transportation for capitalist production is associated with two closely related concepts. First, it is significant in terms of the *circulation* of capital.²⁸ The circulation of capital (see [69], Chapter 4), which in its most abstract form can be denoted as M-C-M' can and often does involve the physical movement of commodities from one place to another in order to bring together the necessary means of production and labor-power for engaging in productive activity, in which transport is obviously crucial. However, to be clear, physical movement is not strictly necessary for capital circulation to take place.²⁹

The role of transport in circulation is twofold, first in terms of production, the second in terms of consumption (and by extension of both, in terms of exchange). First, it can enter as a *means* of production (i.e. as capital input to the production process) or as an *end* of the productive process itself (i.e. as the valorized commodity produced).³⁰

²⁷ Harvey has a different, but I would argue complimentary, take regarding the relationship between transport development and land use: "... transport investment stands to enhance land values in areas proximate to it. Landowners stand to gain (or lose) accordingly. They have a strong vested interest in the where and when of transportation investment. They may even be willing to promote it at a loss (preferably using other people's money or through the agency of the state) in order to benefit from enhanced ground-rents" ([43], p. 369-370).

²⁸ "Continuity in the circulation of capital can be assured only through the creation of an efficient, spatially integrated transport system, organized around some hierarchy of urban centres... The speed of movement is also vital. 'Spatial distance' then reduces itself to time because 'the important thing is not the market's distance in space but the speed with which it can be reached'" (quoted in [43], p. 377).

²⁹ "Within the circulation of capital and the commodity metamorphoses that form a section of it, the metabolism of social labor takes place. This metabolism may require a motion of the products in space, their real movement from one location to another. But circulation of commodities can also take place without their physical movement, as can the transport of products without commodity circulation, even without direct exchange of products. A house that is sold by A to B circulates as a commodity, but it does not get up and walk. Moveable commodity values, such as cotton and pig-iron, can remain in the same warehouse while they undergo dozens of circulation processes, and are bought and resold by speculators" ([70], p. 226)

³⁰ This means that, if we consider the circulation of money capital in its expanded form, namely M-C...P...C'-M' then transport can either enter the process as a component of P (i.e. as a component

The transport industry forms on the one hand an independent branch of production, and hence a particular sphere for the investment of productive capital. On the other hand it is distinguished by its appearance as the continuation of a production process *within* the circulation process and *for* the circulation process ([70], p. 229)

Secondly, transport is significant for capitalist production in terms of *consumption*, both in terms of a means of production being “consumed” as productive capital (i.e. productive consumption), as previously mentioned, as well as the realization of use-values in the general (i.e. non-productive) consumption of commodities, as “the use-value of things is realized only in their consumption, and their consumption may make a change of location necessary, and thus also the additional production process of the transport industry“ ([70], p. 226). Improved transportation reduces the cost of capital circulation by expediting exchange and thus lowering transaction costs, increasing the prospects for profit.

The initial production of a large-scale transportation network requires massive capital investment that very often can only be supplied by government or a mass of centralized capital. In the late 18th century, the British colonial administration invested in the construction of some of Florida’s first major transportation networks, most prominently the previously mentioned King’s Road which connected Saint Augustine to Dr. Turnbull’s New Smyrna settlement, some sections of which continue to be traveled today [37]. However, most transportation pathways before the Civil War were small scale and supplied through private initiative (Figure 7). Florida’s pre-Civil War transport system remained miniscule and mobility was extremely limited. The few existing railroad links were short and disconnected. Furthermore, some of the state’s already sparse critical transport infrastructure was damaged during the Seminole Wars through, for example, the burning of bridges along major transport routes, including the King’s Road.

After the Civil War, government and private investment in Florida’s transportation network grew in an effort to facilitate economic development. For example, in the early 1880s, the U.S. Army Corps of Engineers (USACE) dredged portions of the now 3,000 mile (4,800 km) long Intracoastal Waterway in eastern Florida, easing access and transport of building and other materials along the state’s notoriously treacherous Atlantic coast. Around the turn of the 20th century, particularly in tandem with the invention and proliferation of the private automobile, the interest in infrastructure development exploded and public investment in building new and maintaining existing roads became (and remains) a central issue of state concern ([71], p. 243-253). The state road department, today the FDOT, was established in 1915.

of the production process), or exit the process as the valorized commodity C' , the surplus value of which is realized in money form through exchange, namely M' (i.e. profit or rent).



Figure 7:

“Old Beach Road” in Bulow State Park, Flagler County. A nearby informational sign reads: In the early 1800’s this road was known as the “Old Beach Road”. It went from “Old Kings Road” to the Atlantic Ocean, crossing Bulow Creek and the Intracoastal Waterway. This was also the original entrance road to Bulow’s Plantation. Today it looks very similar as it did when Bulow’s Plantation was in operation. Author’s photo, 2016.

But the ability of the state to afford the kind of capital investment needed to take full advantage of the its unoccupied (and often waterlogged) lands after the Civil War was seriously limited, so the needed infusion of capital for the improvement and development of new lands would have to come from somewhere else. As Historian Samuel Proctor ([72], p. 268) explains:

Throughout the South, there was a growing need for transportation, and in a state as large as Florida the need for a railroad was critical. If Florida was to become prosperous and productive it would have to develop its economic resources, but the impoverished state did not have the necessary capital. Encouraging northern investment was an important objective.

And as we have seen, settlement of unoccupied lands and the attraction of potential capital investment were incentivized through state sanctioned land grants. Throughout the United States, railroads in particular were the recipients of huge swaths of gratis state property in exchange for private investment in transport

infrastructure which proponents hoped would facilitate further settlement along the newly established mobility corridors [73]. The famed forester and conservationist Gifford Pinchot, who knew better than most the situation on the ground regarding the management and distribution of public lands in the late 19th and early 20th century, described with contempt both the scale of the land giveaway and the degree of fraudulent activity that was being undertaken by private individuals and firms alike³¹ as means to gain private ownership over as much public land and resources as possible ([74], p. 79-84). After recalling a comical example of fraud, where a land grant claimant reported having toured their supposedly “flooded” land by boat (when the boat turned out to not be floating but being towed on a horse-drawn wagon), Pinchot reminds us of the reality and severity of the situation:

Funny? Yes, but mighty tragic too. For the vast common heritage of land fit for and intended for American homes was falling, in huge quantities, into the crooked, mercenary, and speculative hands of companies, corporations and monopolies. Enormous areas of the Public Domain... were presented “in aid” to railroad and wagonroad companies. So huge were these free grants that by 1909 twice as much land has been given away in land grants as had been taken up under the Homestead Act. Thus, the natural resources, with whose conservation and wise distribution and use the whole future of the Nation was bound up, were passing under the control of men who developed and destroyed them with one and only one object in mind – their own personal profit. And to all intents and purposes the Government of all the people did nothing about it. ([74], p. 82)

The condition was no different in Florida, where the “generosity” of the state-led land giveaway was indeed successful in attracting investments of northern capital. Already in 1870 northern capital was increasingly being invested in economic activities in Florida, such as the many steamboat tours that were ferrying tourist up and down the Saint John’s River [75]. But perhaps the most well-known legacy is that of development magnate Henry Flagler.³²

As a partner of John D. Rockefeller, Henry Flagler had made a fortune in Standard Oil and, following what proved to be an influential visit to Florida with his first wife in the late 1870s, he would end up spending the last thirty years of his life using his wealth to develop a multi-million dollar railroad, shipping, hotel and land development empire along the state’s Atlantic coast ([72], p. 269). He constructed lavish hotels in places like Saint Augustine, and his famed East Coast

³¹ “If money is social power and land some form of financial asset, then the trading and renting of land plots and the consolidation of land ownership and control, becomes a critical feature to the creation of new power relations. Individuals and groups may try to take advantage of such possibilities to better their position in society. This is as true for pioneer settlers as it is for the working class homeowner, for squatter settlers and traditional peasants” ([64], p. 24).

³² A similar story, which I have not the space to develop here, transpired on Florida’s west coast, with massive investments in similar activities made by Henry Plant, particularly in Tampa (see [76]).

Railway, at its peak, stretched as far south as south could go in the United States (Key West)³³, offering unprecedented access to virgin property and exotic destinations formerly beyond the reach of most. Henry Flagler's investments, particularly in his development of railway transport, provided access to previously inaccessible lands and connected fragmented settlements, initiating massive increases in property values and encouraging widespread speculation. The development boom that followed in the tracks of Henry Flagler's railroad would signal the beginning of a transformation in Florida's population structure and economic activity from predominantly rural to predominantly urban. Many agree with historian S. Bramson's ([77] 10) suggestion that "much, if not most, of the east coast of Florida owes its birth and growth to [Henry Flagler] and his corporate enterprise".

1.3 Like Beads on a String: the "Nature" of Urbanization and the Making of Modern Florida (ca. 1920 – Present)

Even the casual observer of Florida history is bound to notice that the kind of development which characterizes 20th century Florida is substantially different than any previous historical period, both in terms of its qualities and sheer magnitude. The establishment of a private land market through the methods of primitive accumulation, and the subsequent development of transportation infrastructure networks were critical steps in producing conditions conducive to urbanization, incentivizing investment³⁴ and instigating rapid population growth. And given the central role land prices and transportation networks play in directing and

³³ Not long after its construction, the Key West leg of the Florida East Coast Railroad was badly damaged in a hurricane and never re-opened.

³⁴ Professor of Social Theory and Political Economy Andrew Sayer ([78], p. 34-36) suggests that "investment" is "arguably the most dangerously ambiguous word in our economic vocabulary" because it "camouflages" what amounts to two very different definitions (and implications) of the term. Sayer distinguishes between: 1. Object (use-value)-focused definitions which "focus on what people or organizations invest in (e.g. infrastructure, equipment, people) and its usefulness and benefit in the future... [which] enable the production of new goods, services and skills- things with useful qualities, or use-values in the language of political economy... what might be called real or objective investment." 2. 'Investor' (exchange-value)-focused definitions which "focus on the financial gains to the 'investor' from any kind of spending, lending, saving purchase or financial assets or speculation- regardless of whether they contribute to any objective investment, or provide anything socially useful. In other words, instead of focusing on the benefits of the investment in terms of use-values, the focus is on how much money it yields to the investor." While these two divergent meanings of the term are often conflated, they have quite different implications.

structuring physical investment in the landscape³⁵, these same forces have predominantly determined the geographic location and qualities of environmental impacts in the state.³⁶ As population and economic activity rapidly grew, the incentives to drain wetlands, flatten sand dunes and clear forests also grew, in particular in the coastal zone where the expansion of urban areas was most heavily concentrated.

After the East Coast Railroad was complete, celebrated Florida journalist, author and activist Mary Stoneman Douglas ([80], p. 296) noted how “new towns clustered on it like beads on a string”. This upsurge in population and productive activity is what underpinned the second of what Florida historian Gary Mormino ([71], Chapter 2) calls the “three land booms” in Florida history. The first of these land booms refers to the previously discussed British colonial period in northeastern Florida, a time when large (but still geographically limited) land grants were offered to prospective settlers e.g. for the establishment of agricultural operations. The second land boom, instigated by the transport investments of Henry Flagler (and increasingly the state), combined with a huge supply of cheap land and low tax burden³⁷, started in the early 20th century but peaked in the mid-1920s. This is the time when well-known cities like Miami and West Palm Beach came into their own, as previously uninhabited barrier islands and coastal swamp lands were rapidly settled and developed into seaside real estate, tourism amenities and other forms of commercial enterprise. At this time, historian William W. Rogers explains ([81], p. 291-292), “real estate promoters and developers swarmed into Florida, and an estimated 300,000 people settled there between 1923 and 1925”, while the new access and amenities attracted 2.5 million tourists to the state in 1925 alone.

While physical increases in population and built environment were notable (the state’s population grew by over 50% between 1920 and 1930), the treatment of

³⁵ “By perpetually striving to put the land under its “highest and best use,” [landlords] create a sorting device which sifts land uses and forces allocations of capital and labor that might not otherwise occur. They also inject a fluidity and dynamism into the use of land which would otherwise be hard to generate and so adjust the use of land to social requirements. They thereby shape the geographical structure of production, exchange and consumption, the technical and social division of labor in space, the socioeconomic spaces of reproduction, and invariably exert a powerful influence over investment in physical infrastructures (particularly transportation). They typically compete for that particular pattern of development, that particular bundle of investments and activities, which has the best prospect for enhancing future rents” ([64], p. 21-22).

³⁶ In making my arguments in this section, I owe much to Neil Smith’s *Uneven development: Nature, capital, and the production of space* [79], from which I learned a lot and draw liberally.

³⁷ The state legislature at this time offered “a very unique way of encouraging capitalists and investors to bring their money to [Florida]” by amending the state constitution to prohibit income taxes and inheritance taxes ([81], p. 291).

land as a purely financial asset also invited wide-spread speculation.³⁸ For example, Rogers ([81], p. 293) tells of the emergence of a “large freelance sales force” which sought profits purely through speculative trading; these so-called “Binder Boys” were:

fast talking hucksters in golf knickers and two-toned shoes, [whom] purchased lots for 10 percent down (a binder that held a property for thirty days), then sold the binder for a profit to other speculators. A binder could be sold and resold many times before payment became due... At one time Miami had 25,000 such street brokers, many of them men who had quit jobs in the North as butchers, taxi drivers or railroad conductors, to take advantage of the Florida bonanza.

Through such speculation, paper profits reached “dizzying heights”, while actual land prices skyrocketed; for example, average assessed property values in several southeastern Florida counties more than doubled between 1924 and 1926 ([53], p. 100). However, problems associated with inflated land prices also had perverse spill-over effects in others parts of the state economy, such as transportation, construction and banking which, when combined with labor strikes in 1925, invited increased backlash from northern critics intent on “telling the truth about Florida” speculation. To make matters worse, the impacts of several major hurricanes which hit southern Florida between 1925 and 1929 sent the entire Florida peninsula into an economic slump which only minimally recovered before the onset of the Great Depression swept the state into further financial hardship ([81], especially p. 294-297).³⁹

The rapid spread of urban development in Florida mirrored a shift in the geographic structure of the state’s population (Figure 8). Over the course of the 20th century, Florida’s population grew from roughly half a million to over 15 million residents (almost entirely the product of in-migration⁴⁰) while transitioning from 80% rural to 90% urban. The state’s growing urban centers, which were quickly increasing both in population and industry at the turn of the 20th century, “pulled” both rural residents and immigrants in to cities e.g. to seek wage labor or as entrepreneurs, while the difficult, laborious existence in frontier-esque rural settlements “pushed” many rural residents towards the city lights to similar ends ([53], Chapter 6). The *rate* of urban-rural transition changed overtime, accelerating during Florida’s second land boom in the 1920s, slowing throughout the Great

³⁸ “Changing anticipations of future rents, tied to both future capital flows and future labour, likewise affect land and property prices. For this reason even unused land can acquire a price. The speculative element is always present in land trading” ([43], p. 367).

³⁹ For an authoritative account of this period of Florida history, see ([22], Chapters 16 and 17).

⁴⁰ “Florida’s exploding growth in the twentieth century stems almost entirely from new waves of migrants, not from a high birth rate” ([82], p. 422).

Depression, and then accelerating again through the post-war period before leveling off in the 1990s as the rate of over-all population growth also declined.

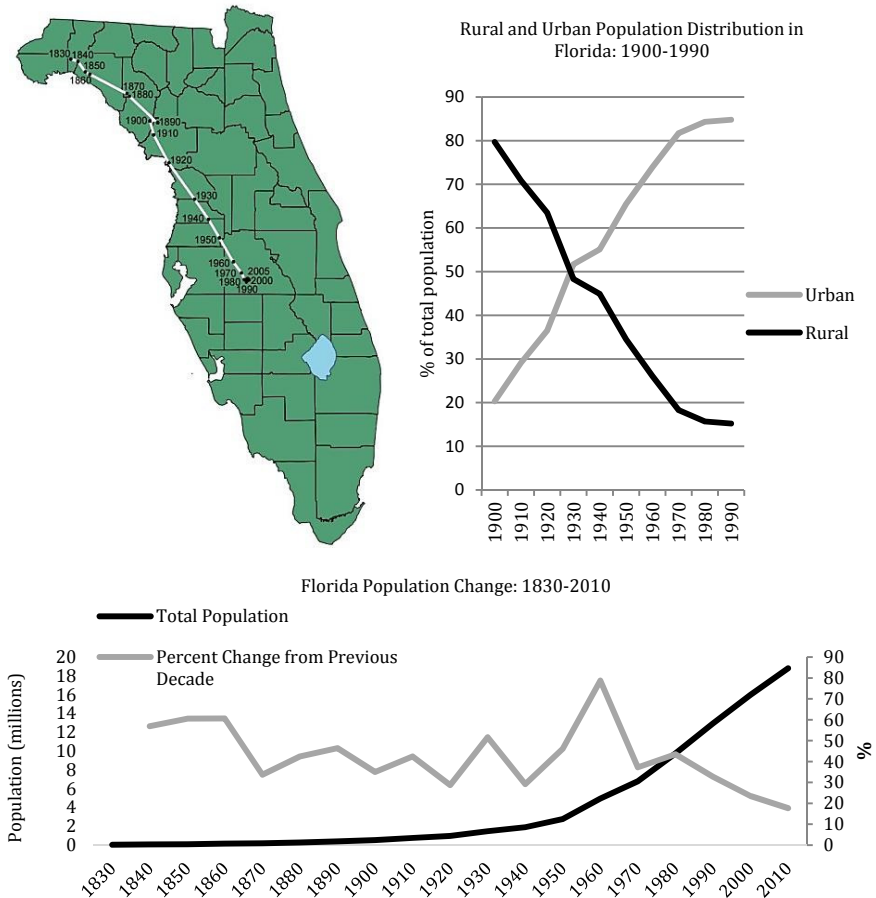


Figure 8:

Top Left: After 1900, Florida's population center begins to rapidly migrate towards the south and east, following the extensive developments in cities along the southeastern coast. Source: [83]. **Top Right:** The distribution of Florida residents living in Rural and Urban areas inverted in the 20th century. Source: [84]. **Bottom:** Changes in Florida's population in total and by decadal percentage change. Source: demographia.com and U.S. Census Bureau.⁴¹

The growth in industry and (particularly urban) population, combined with the increasing prevalence of the private automobile, dramatically increased the demand for transportation infrastructure, which, with the level of capital investment and

⁴¹ See <http://www.demographia.com/db-state1900.htm> and <https://www.census.gov/dmd/www/resapport/states/florida.pdf>

public revenues on the rise, the state increasingly obliged. For example, between 1920 and 1930, the number of road miles developed and maintained by the state road department nearly quadrupled (from less than 1000 miles to 3800 miles) ([81], p. 293). By 2016, this total had climbed to over 122,700 miles.⁴²

After WWII, Florida experienced what Mormino ([71], Chapter 2) called the third “land boom”, which refers to the post-war influx of new Florida residents in the 1950s and 1960s. A variety of determinates drove this next intense period of economic and social change:

The third Florida boom resulted from complex interrelated forces and factors. Breathtaking shifts in technology, rising levels of affluence, the emergence of large numbers of senior citizens and retirees, new freedoms and old customs, political and leisure revolutions, a Great Society, a Cold War, cul-de-sacs and coast-to-coast expressways all shaped the development of modern Florida. ([71], p. 45)

This is the time when Florida saw its largest percentage increase in population, growing nearly 80% in the decade between 1950 and 1960. Cities like Tampa saw huge increases in population (Tampa more than doubled its population from around 125,000 to 275,000 in this decade), while inland cities like Orlando, today well recognized for its “marriage” to Mickey Mouse [85], have their modern origins in this period of development. The “new optimism” of post-WWII America and increasing expendable household incomes allowed many Americans to participate in vacation tourism in a way which had not previously been possible for most low and middle income citizens. Many of these new-found tourists made their way to Florida, contributing substantially to the rapid economic growth in the state’s urban areas ([57], see also [15], Chapter 26). This is likewise when Florida’s economy began to outperform the national average, eventually growing to be one of the country’s largest economic actors in terms of total GDP as well as one of its most populous states (Figure 9). In 2017, Florida is the 4th largest state economy with the 3rd largest population in the country.

These incredible 20th century shifts in the location and size of population centers underpinned a wider structural shift in the state’s economic base away from the hitherto dominant frontier industries (based largely on natural resource harvesting) towards what Stronge ([53], p. 16) calls the “sunshine” industries, which grew from around 10% of the state’s economic base in 1900 to about 75% in 2000 (Figure 9). By “sunshine” Stronge is referring to those particular industries which are coupled to Florida’s climate and physical geography, including semitropical and early season agriculture and, of course, tourism and retirement, the latter which grew substantially as a portion of the state’s economic base throughout the 20th century. Tourism specifically continued to account for a larger and larger portion

⁴² See <http://www.fdot.gov/planning/statistics/mileage-rpts/Public16.pdf>

of the state economy⁴³, shifting from 52% of the “sunshine” sector in 1899 to nearly 90% by 1980 ([53], p. 17, 205). By the year 2000, the tourism-retirement industries would amount to nearly 70% of the total production of the state’s entire economic base ([53], p. 267). And, as we will see in Section 5.2 below, the industry has only continued to grow in importance.

While aggregate figures of population growth and economic sectoral change are helpful in understanding in broad strokes the major changes to state demographics and political economy in the 20th century, it is important to point out that development in the state has always been temporally and geographically *uneven* development. The sites of investment and productive activity have shifted over time, and have tended to be concentrated in particular geographic locations, such as along the coastline, following previous investments in transportation, land improvement, etc. For example, while counties like Miami-Dade in southeastern Florida saw massive investment and growth in the early 20th century, other counties such as Flagler County in northeastern Florida saw their share of investment and growth towards the end of the 20th century, with impressive growth rates expected to continue into the foreseeable future. Other counties, such as Dixie County in northwestern Florida, have never experienced the rates of growth and investment witnessed in Miami-Dade or Flagler counties and remains predominantly rural and relatively poor today (Figure 9).

Uneven geographical urban development under capitalism can be thought of in terms of two broad tendencies inherent to the logic of capital accumulation, namely the tendency towards *concentration* of capital and the tendency towards *centralization* of capital. Concentration and centralization can be considered in both social and spatial terms, though they are related. The social concentration of capital denotes the process by which capital accumulation grows exponentially by “reinvesting increasing quantities of surplus value as capital” ([79], p. 161), meaning that the surplus value realized in the production process is at least partially reinvested in further productive activity, rather than being consumed away. This reinvestment sets in motion the expansion of productive capacity overtime, this capacity being a factor of the total stock of capital available as input to the production process (see Section 5.1 below).

⁴³ Beginning after WWI when the personal vehicle became more affordable and thus widely available, and recreational sightseeing grew in popularity, thousands flocked to Florida to partake in a sort of camper-style tourism known endearingly as “tin-can” tourism which remained the most popular style of tourism for average American’s until the proliferation of roadside motels after WWII; see https://www.floridamemory.com/photographiccollection/photo_exhibits/tincans/tincans2.php

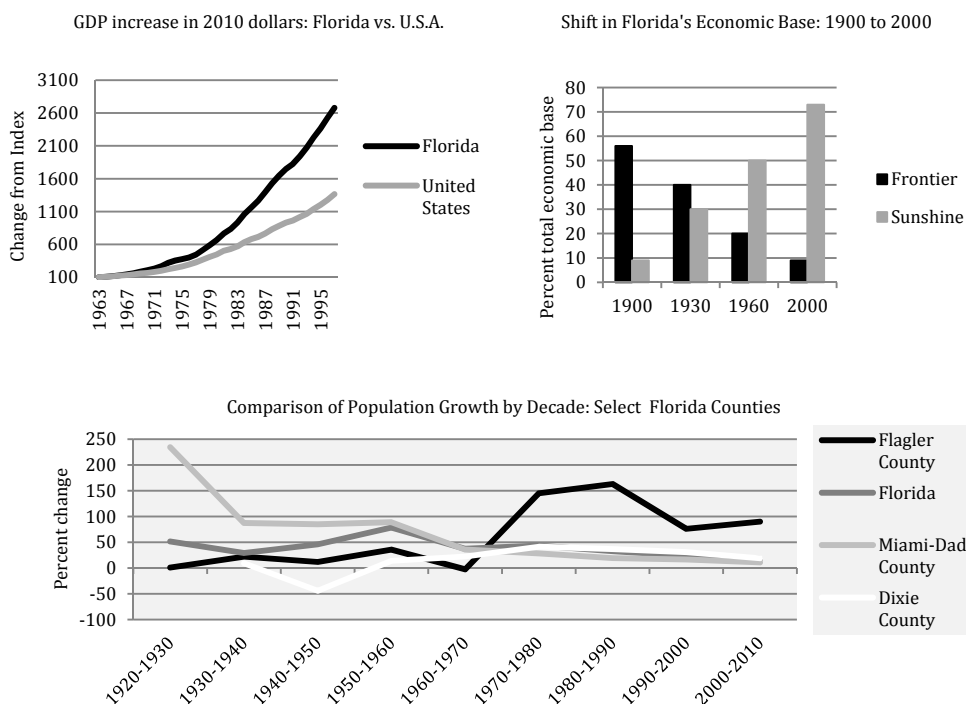


Figure 9:

Top Left: Starting in the early 1970s, Florida's rate of economic growth far outpaced the U.S. national average. Source: [86]. **Top Right:** Florida's economy underwent major structural transformation throughout the 20th century. In this graphic, I have excluded the "maritime" industries (fishing, shipping, etc.) the percentage contribution of which remained relatively stable, before falling off in the later 20th century. Source ([53], p. 264, Chart 15-1). **Bottom:** A comparison of changes in population for select counties from 1920 to 2010 demonstrate the unevenness of development across space and through time. Note, Dixie County was established in 1921, and its first recorded population (6,419) was in 1930 Source: [87, 88].

The social concentration of capital logically implies that production proceeds on an ever extending scale (i.e. the scale of production increases with each reinvestment of surplus-value as productive capital), which likewise requires more means of production and more cooperative labor to feed the continuously expanding process. This ever expanding need to incorporate more means of production and more labor is also what underpins the *spatial* concentration of capital. Achieving economies of scale through the construction of larger production facilities and the design of more advanced cooperative labor processes often requires that the expanded means of production and labor-power are physically proximate for an extended scale of production to actually take place.

The tendency towards the social and spatial *centralization* of capital is also of real significance, and it is differentiated from concentration of capital in that centralization "does not depend in any way on a positive growth in the magnitude

of social capital” ([58], p. 779).⁴⁴ This is because centralization, rather than relying on growth, has to do with the combining of scattered individual capitals into a single capital, the “simple alteration in the quantitative grouping of the component parts of social capital” (ibid). Thus, the *social* centralization of capital amounts to the accumulation of exchange-value in fewer and fewer hands, most commonly through the merger or absorption of one capitalist’s capital assets by another. This can facilitate investment on a much larger scale than is possible through the development of individual capitals.⁴⁵ This was the case, for example, with Henry Flagler’s development of the East Coast Railway which involved the purchasing of numerous existing railway lines and companies from which Henry Flagler expanded his railway empire [77]. However, the *spatial* centralization of capital, rather than a clustering of exchange-value, refers instead to the *physical* clustering of capitals in established places of production ([79], p. 166), perhaps the clearest example being the production of dense networks of urban built environment.

The “physical concentration of use-values” ([79], p. 164) that constitute urban development also means that environmental impacts resulting from urbanization are likewise spatially clustered, or, perhaps more accurately, are geographically unevenly manifest. This means that, rather than being the contingent outcome of individual actions, environmental degradation today is reflective of the *structural* economic requirements which stem from the logic of capital investment and accumulation. And like urban development itself, conversion of habitat and other forms of environmental impact have been most intensely concentrated along the state’s coastline which has historically received the bulk of capital investment and remains a significant space for economic activity, particularly regarding the tourism and real estate industries. This historic spatial concentration and centralization of capital investment along the coast is reflected in the geography of the state’s urban areas, population centers and transportation networks (Figure 10). It is likewise reflected in the qualities of environmental damage, for example the near complete loss of functional barrier island maritime forest habitat⁴⁶ or the rapid

⁴⁴ It is important to differentiate between Marx’s use of the term “social capital”, which denotes the aggregate level of capital in a society, and the use of the term by those such as Robert Putnam ([89]), who intend the concept as an indicator of the level of social solidarity or social ties among a group of people.

⁴⁵ “The world would still be without railways if it had had to wait until accumulation had got a few individual capitals far enough to be adequate for the construction of a railway. Centralization, however, accomplished this in the twinkling of an eye” ([58], p. 780).

⁴⁶ In a 1995 USFWS Biological Report, ecologist Vincent Bellis ([90], p. 62) made this depressing personal observation which, over 20 years later, seems to have come to fruition: “The increased human habitation of barrier islands has caused demand for cultural infrastructure, including roads, electrical transmission lines, and water and waste-water systems, to grow exponentially. All along the coast, maritime forests are being dissected into rectangular blocks to provide access and service corridors. Further development means that the remaining forest canopy will be reduced as lots are cleared for construction, parking, and septic systems; to provide an unobstructed view; to reduce

decline of coastal wetlands as urban development expanded (see Section 2.1 below). The major exception to the primacy of coastal development in the state today is the urban band stretching between Daytona Beach, Orlando and Tampa which developed during Florida's previously mentioned third "land boom" in the mid-20th century; even so, more than 75% of the state's current population live in a coastal county [91].

In the extended process of establishing modern capitalist political economy, the U.S. campaigns of forced removal of indigenous inhabitants, the systematic surveying of public lands and the establishment of mechanisms for their private distribution, demonstrate the active role of the state in the more concrete process of primitive accumulation in Florida. The production of a private land market, combined with capital investments in transportation infrastructure and other improvements to land (e.g. reclamation), created conditions conducive to rapid urbanization in the Florida peninsula, a process which itself reflected significant transitions in the structure of the state's demographics and economic base. Under these new conditions, the production of the built environment proceeded according to the logic of capital investment. Because urban land-use changes presuppose biophysical transformations, the same generic forces which direct urban development under capitalism also determine the geographical location and particular qualities of environmental degradation in modern Florida, in particular those problems associated with the degradation of the coastal environment.

habitat for snakes and biting insects; or simply to provide space for a grass lawn. Ultimately, maritime forest could be converted to a rolling sea of mobile homes beneath a canopy of TV antennas or tiered cliffs containing the 'summer nests of migratory sunbirds'. At present rates of development, most currently unprotected maritime forests will probably be functionally destroyed or physically obliterated by the year 2000".

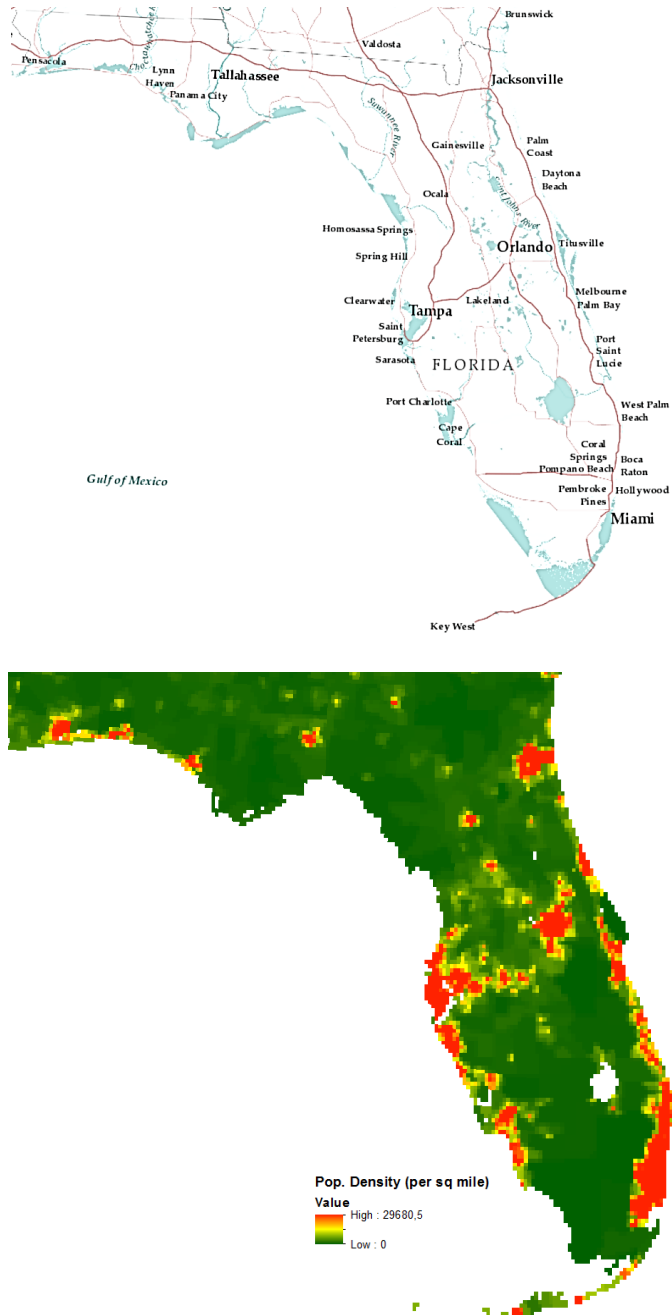


Figure 10: Florida's major cities and interstate highways (**Top**) and population density (**Bottom**) are predominantly concentrated along the coastline. Author's maps, 2016, made with ArcMap.

**At this point, following the account provided above, it is perhaps time to look back on the statement by the Florida environmental historians quoted at the beginning of this chapter. We are now better equipped to fill what was at first a sweeping and largely empty statement with concrete historical specificity regarding the processes and mechanisms of social and environmental change which have led to the state's current predicament. And with this concrete content in mind, the truth of their statement is brought into focus. In the 500 years since Juan Ponce de León "discovered" Florida, environmental impacts *have* become more generalized, more wide spread and increasingly difficult to over-look. And the majority of these impacts have overwhelmingly come in the last century in connection to the state's transition to a capitalist, predominantly urban economy. A growing recognition of the extent and severity of environmental degradation both in Florida and throughout the United States led to calls for curbing destructive behavior and protecting the environment from what many increasingly saw as the depredations (rather than benefits) of unconstrained industrial production and urbanization. Answers to these calls came in the form of legislation⁴⁷ and incentive programs which collectively constitute the elaborate scaffolding of federal, state and local level environmental public policy.

⁴⁷ "Legislation", Hägerstrand ([67], p. 43) reminds us, "is the fundamental instrument of governing".

Chapter 2

Historical Development of Environmental Public Policy (ca. 1890 – Present)

I think there are as good reasons for regarding the case
against capitalism as closed, with a verdict of 'guilty',
as for believing that the sun will rise tomorrow,
and that I am not a tree frog.
-Andrew Collier ([92], p. vi)

2.1 Thinking like Mountains: Normative Foundations of “American” Environmental Policy (1890s – 1960s)

Early investments in transportation and land development in Florida took place in an institutional context which was virtually devoid of any meaningful environmental (or any other kind of) regulation. Rather than protecting the environment, the leading public and professional opinion in post-Civil War America regarding the use of natural resources and the settlement of wildernesses like those in Florida was that they were wasted potential in need of “improvement” if they were to be put to productive use for the benefit of the nation ([93], Chapter 4). It is important to realize that, at the turn of the 20th century, much of Florida was characterized by rampant poverty. Historian Colburn ([22], p. 350-351) has noted how many Florida politicians and residents at the time:

believed that a cheap land policy and private development, even in areas as environmentally sensitive as the Everglades, were essential to the state’s emergence from poverty. As this stage in Florida’s development, environmental concerns took a distant second place to concerns about economic growth and expansion of the population.

In the early 1900s, the term *conservation*, which was widely touted by American business and government officials alike, had a quite different connotation than it does today, implying the rational, productive use of natural resources rather than the prevention of use, embodied perhaps most generously in the long-term forestry management strategies promoted by Gifford Pinchot (see e.g. [74], more on this below). Pinchot, as we will see, certainly advocated wise use of natural resources, but he also despised wanton waste and fraud, both of which were common throughout the United States in the late 19th century. When reflecting on the earliest days of the effort to establish effective conservation policy in the United States, Pinchot expressed his frustration this way:

The best way to discredit a good system or a good law, or to perpetuate a bad one, is not to enforce it. And certainly the public-land laws, good or bad, were not enforced. Fraud enveloped them like a blanket... It is not easy now to realize the atmosphere toward the end of the [19th] century. While millions of acres [of public land] did go to bona fide homemakers, irrigators, miners, and others, frauds on a gigantic scale were being perpetuated in the regular course of business, and few men thought the worse of another because he was stealing from the Government. The condition of respectability was that you must not be caught and convicted. And convictions were mighty hard to get. ([74], p. 81-83)

In Florida as elsewhere in the country, the general idea at the time seemed to be that the only good tree was a felled tree and the only good swamp was a drained swamp. And due to its isolation and relative backwardness at the turn of the 20th century, Florida was in many ways a southern version of the proverbial “Wild West”. The lack of regulation and monitoring encouraged an often extra-legal approach to getting things done, which some would argue persists to some degree today. For example, Mormino ([71], 44) has put the matter this way:

Florida has always straddled the line between respectability and scandal, between honest toil and an easy buck, between strict adherence to the Protestant work ethic and games of luck and chance... [but] the rules were different here... Whether it concerned taxes, building codes, or environmental regulations, Floridians take a brazen delight in flouting the law, or at least show a well-worn indifference in ignoring it.

It is in this context of few regulations, combined with huge capital investments in transportation and real estate development, that contemporary environmental problems in the state became more widespread, generalized and systematic. This is because the tendencies towards concentration and centralization inherent in capital accumulation not only direct the attention and activity of capitalists (i.e. where they invest their capital), but also translate into the physical clustering of material transformations which take place in the production process⁴⁸, for example the construction of drainage canals, dredging and infilling of wetlands or the razing of vegetation and topographic surface features such as sand dunes (see Section 1.3).

Because transportation infrastructure, population growth and urbanization have overwhelmingly been concentrated along the coast, this is where much of the most intense changes to the natural environment have historically occurred. Wetlands, for example, are by their nature commonly located in coastal areas, and as such have been significantly affected by the increase in urban and other land uses in Florida. In a comprehensive report to congress on changes in wetland coverage and quality in the United States between 1780 and 1980, the authors found that around 53% of the wetlands in the contiguous United States had been drained or otherwise destroyed in these two centuries ([94], p. 6). Generally speaking, drainage, transport construction and other development activities have played the biggest part in wetland destruction and have collectively “greatly reduced the wildlife values of some wetlands, particularly along the coasts” ([48], p. 7-9). Florida makes up the largest percentage of the total wetland stock in the contiguous United States, and loss of wetlands in Florida has been the most extensive of any state in terms of

⁴⁸ “much of the commodity capital built into the landscape tends to cluster around complexes of productive capital. This is the case with urban development under capitalism where a host of services and ancillary activities are attracted by the centralized investment of fixed capital” ([79], p. 165).

acreage, with over 9 million acres (46%) having been lost since 1780 ([94], p. 5; see Figure 11).

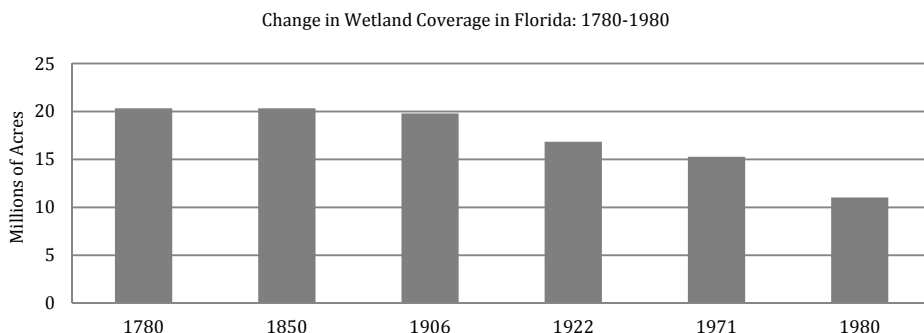


Figure 11:
Chart data collected and combined from ([48], p. 7) and ([94], p. 6)

Wetland loss in Florida accelerated in particular after the turn of the 20th century, a direct result of the expansion of both urban infrastructure and drainage for agricultural land which accompanied population growth and the shift from an economy based on frontier industries to one based on sunshine industries. While what Odum [95] called the “tyranny of small decisions”⁴⁹ was certainly an important factor, the dictatorship of large decisions played just as important a role in the loss of Florida’s wetlands. The most well-known example of large-scale conversion of Florida wetlands is surely the massive, systematic efforts invested in the draining and reclaiming of the great Florida Everglades, what Mary Stoneman Douglas famously called the “River of Grass” ([80], see especially Chapter 13). Taken together, both small and large scale wetland conversion contributed to the sharp decline in Florida’s wetlands throughout the 20th century as urban development expanded in a context of limited to non-existent regulation.

In addition to the extensive drainage of wetlands, fragmentation of habitat and unregulated commercial hunting in the late 19th and early 20th century heavily contributed to the decimation of many wildlife populations. Predators in particular were affected both by habitat loss and systematic extermination. The Florida panther [97], southeastern red wolf [98] and both the American crocodile [99] and American alligator [100] were driven nearly to extinction. While some of these species (particularly the alligator) have recovered from the brink, most remain

⁴⁹ The concept of the “tyranny of small decisions”, originating with the economic work of Alfred Kahn [96], refers to “decisions that were never consciously made, but simply resulted from a series of small decisions” ([95], p. 728).

precariously perched on the edge and only continue to exist because of formal protections and the persistent and concerted efforts to safeguard individuals and their critical habitat. Populations of wading birds were likewise annihilated both by loss of habitat, such as was the case for the decline in wood stork population [101], and from over-hunting, as was the case with a variety of plume birds, the killing of which had reached “scandalous proportions” ([80], p. 310) at the turn of the 20th century. As Michael Grunwald explains, the “killing fields” of southern Florida rookeries amounted to mass extermination: “In 1886, the American Ornithological Union estimated the annual nationwide carnage at five million birds... Birds were big business, and competition was fierce” ([102], p. 120-121). In the absence of meaningful intervention, the loss of Florida’s famed wildlife seemed imminent.

However, in the face of such environmental decline, state and federal government began taking legislative action to address the mounting problem. And progress was made. For example, after 1980, the rate of wetland loss in Florida reduced significantly (by over 80% compared to the rate from 1970-1980) as a result of a variety of actions taken at the federal, state and local levels. This included in particular “legislation, ordinances and initiatives that protected wetland habitats, the application and enforcement of wetland protection measures, elimination of some incentives for wetland drainage, public education and outreach about the value and functions of wetlands, private land initiatives, coastal monitoring and protection programs, and programs and policies that promoted wetland restoration and creation” ([103], p. 8).⁵⁰ The increasingly active role assumed by government in controlling environmental degradation, for example in regulating wetland conversion, was a primary outcome of increasing social pressure resulting from what might be called the “ecological awakening” of the American public which became more widespread in the 1960s, though its roots lay farther back in time.

America’s ecological awakening

In the first half of the 20th century, increasing environmental damage, both in Florida and around the United States, gradually led to calls by a broader swath of the American public for slowing down the “juggernaut improvement”⁵¹, mainly by curbing the destructive behavior of individuals and firms. This social reaction against the side-effects of unregulated economic and industrial development led to the passing of targeted regulations and social and environmental protections to hold

⁵⁰ However, even with such safeguards, wetland loss still averaged 5000 acres a year in the 1990s as the state continued to develop and grow.

⁵¹ See ([104], Chapter 3).

back the destructive tendencies of the “self-regulating” market economy. Karl Polanyi captured this idea under the rubric of the “double movement”, a concept which invokes the social countermovement “checking the expansion [of the market] in definite directions” ([104], p. 136). Around the turn of the 20th century, with the help of maturing ecological sciences, social reaction to the ills resulting from unfettered economic and industrial expansion in the United States split into two competing positions regarding what should be done to address the problem.

Generally speaking, early critics of rampant environmental degradation tended to agree on the need to curb environmentally destructive behavior. These same critics strongly disagreed, however, on the most appropriate strategy for doing so. The dispute over how best to curb environmental degradation is perhaps most famously captured in the preservation-conservation debates which spanned the late 19th and early 20th century in America. As historian of American environmental thought Roderick Nash ([105], p. 129) explains:

At first, and superficially, the problem [of environmental degradation] seemed simple: “exploiters” of natural resources had to be checked by those determined to “protect” them. Initially, anxiety over the rapid depletion of raw materials, particularly forests, was broad enough to embrace many points of view. A common enemy united early [environmentalists]. But they soon realized that as wide differences existed within their own house as between it and the exploiters. Men who though they were colleagues found themselves opponents. The schism ran between those who defined conservation as the wise use or planned development of resources and those who have been called preservationists, with their rejection of utilitarianism and advocacy of nature unaltered by man.

These competing perspectives on how to deal with environmental damages attacked the problem from diametrically opposed positions, with preservationists emphasizing the intrinsic value of nature which deserved protection in its own right while conservationists emphasized the productive value of nature which prioritized the rational, efficient use of natural resources for the greatest human benefit.

Among the most well-known advocates of preservationism is of course John Muir. Through his prodigious writings and political advocacy, John Muir inspired an entire generation of environmentalists to pursue the preservation of wildernesses and other natural areas as places intrinsically valuable in themselves and as essential for the continued vitality of the human spirit, which was seen as being increasingly alienated in modern, industrial life. As J. Meyer ([106], p. 276) notes, Muir’s argument that nature is important as a source of inspiration and renewal (i.e. *re-creation*) for the increasingly alienated modern human is “reflected in his persistent encouragement to urban dwellers to experience nature in at least some form”. Muir believed that if the civilized man would only seek wild places, he

could “purge himself of the ‘sediments of society’ and become a ‘new creature’”, ([105], p. 125).⁵²

Underpinning Muir’s assertion that nature should be preserved is not only his insistence on its spiritual benefits to modern society, but that nature is intrinsically valuable in itself. Muir put it this way:

No dogma taught by the present civilization seems to form so insuperable an obstacle in the way of a right understanding of the relations which culture sustains to wildness as that which declares that the world was made especially for the uses of man ([107], p. 235-36).

And, again:

Like most other things not apparently useful to man, [poison ivy] has few friends, and the blind question “Why was it made?” goes on and on with never a guess that first of all it might have been made for itself ([108], p. 14).

This “eco-centric” perspective on nature likely comes from Muir having been heavily influenced by the romantic writings of (even personal friendships with) e.g. Thoreau and Emerson ([106], p. 276, also see [105], Chapter 8), and has led some (e.g. [109]) to identify Muir’s thought with the contemporary “deep ecology” movement popularized by Norwegian philosopher Arne Naess (see e.g. [110]). While these eco-centric sentiments do not perfectly capture Muir’s outlook on nature, which was admittedly less black and white than some are prone to imply [106], they do point to the crux of Muir’s strategy for curbing environmental degradation, namely an ethical argument for individual appreciation and public protection of wilderness areas. Following from this, Muir fiercely advocated for government intervention in development projects, for public land acquisition and for the creation of protected areas, perhaps most famously represented by his intense (and ultimately unsuccessful) engagement with the controversial Hetch Hetchy Valley Dam project along the border of Yosemite National Park in California ([111], p. 72). Through his writings and political activism, Muir ultimately played a significant role in the early establishment of the United States National Park System and was a founder of the still active and influential environmental organization the Sierra Club.

John Muir is often presented as the archetype for the preservationist movement. On the other side of the environmentalist coin, as previously mentioned, the conservationist movement is perhaps most typically embodied by the management philosophy and policies of Gifford Pinchot. If Muir was the “romantic”, then

⁵² For example, Muir ([107], p. 22) appealed to those who were perhaps hesitant to “waste time” in nature when he wrote “The time will not be taken from the sum of your life. Instead of shortening, it will indefinitely lengthen it and make you truly immortal. Nevermore will time seem short or long, and cares will never again fall heavily on you, but gently and kindly as gifts from heaven.”

Pinchot was the “rationalist” who significantly diverged from the ethical arguments and related solution strategies espoused by Muir. In fact, the two, who crossed paths at a number of junctures, occasionally butted heads in real life [106].⁵³ For Pinchot, the problem was not the desecration of untouched nature and the alienation of modern society, but the waste and abuse of natural resources, whether through ignorance or greed, which should instead be put to the highest possible public good:

[Pinchot] pointed out that while the lumberman was concerned with squeezing the last penny from the woods without regard for consequences, the forester managed them scientifically so as to obtain a steady and continuing supply of valuable products... the nation could have its forests and use them too. ([105], p. 134)

Pinchot likened the idea of protecting natural areas against human use to the “locking up” of the nation’s resources ([106], p. 269). Instead, influenced by his training as a professional forester from an early age and his contact with the significant advancements in forestry science being employed in some European countries, Pinchot viewed the heart of conservation to be the idea that natural resources should be utilized for “the greatest number for the longest time” ([112], p. 48). In terms of forest management, this simple axiom translated into a view of forestry not as protecting the intrinsic value of the forest ecology, but as “the practical knowledge of how to use the forest and range without destroying them” ([74], p. 306). Pinchot, however, did not argue for the privatization of forests and thus for their efficient allocation according to the market mechanism; rather, he argued that, due to the extensive time scales involved in forest production, government agencies were the most appropriate stewards of the nation’s forest endowment ([113], p. 100). Pinchot wrote extensively on the principles and practice of what today might be called “sustainable” forestry, often emphasizing in particular how scientific forestry was necessarily knowledge intensive and long-term. Pinchot eventually became the first director of the United States Forest Service, leaving a management legacy that continues to heavily influence U.S. forestry policy today.

While conservationists and preservationists agreed on the need to curb environmentally destructive behavior, it is in terms of the competing solution strategies, stylized as “wise use” (i.e. conservation) versus “no use” (i.e. preservation), which the two camps continued to fundamentally disagree. The tension between the conservationist and preservationist strategies, while continuing

⁵³ They also occasionally got along. Pinchot, for example, in his autobiography *Breaking New Ground* ([74], p. 103), fondly refers to a night spent camping with Muir at the Grand Canyon as “such an evening as I have never had before or since”, labelling Muir “a story teller in a million”, and remembering in particular that “when we came across a tarantula [Muir] wouldn’t let me kill it. He said it had as much right [to be] there as we did.”

to play a major role in contemporary debates over the human management of nature, was, I would argue, in principle resolved through the integrative perspective advanced by Aldo Leopold. Leopold agreed with Muir and Pinchot in identifying the problems of environmental degradation in poor human thinking and actions. “By and large”, Leopold wrote, “our present problem is one of attitudes and implements” ([114], p. 263). In particular, Leopold shared Muir’s view that the wanton waste and destruction of the environment was to a large degree based in the denial of intrinsic value to nature, leading many to view nature in the same way as any other property, which was a question of instrumental rationality, not of ethics:

When godlike Odysseus returned from wars in Troy, he hanged all on one rope a dozen slave-girls of his household who he suspected of misbehaving during his absence. This hanging involved no question of propriety. The girls were property. The disposal of property was then, as now, a matter of expediency, not of right and wrong... Land, like Odysseus’ slave-girls, is still property. The land-relation is still strictly economic, entailing privileges but not obligations. ([114], p. 237-238)

However, rather than positioning himself in either the romantic or the rationalist camp, Leopold demonstrates the complementary relationship between these two arguments. He argued that an extension of ethical consideration to what he called the “wider biotic community” ([114], p. 239-243) was necessary for a sound, sustainable long-term management of natural areas and resources. For Leopold, conservation of the environment amounted to striking a balance between scientific control of nature and an ethical appreciation for its intrinsic complexity and significance.⁵⁴ This perspective is quite different from that of Pinchot who sometimes thought of forestry as simply “tree farming” ([106], p. 269), as well as different from that of Muir who fiercely advocated specifically for wildness. Leopold’s genius was his realization that the “wise use” of the nation’s resources also relied on the appreciation and “preservation” of ecological complexity and stability. In reasoning his position, Leopold drew on his personal experience in wildlife management as well as the emerging scientific findings in ecology and other life sciences [115] (not to mention moral philosophy and a whole lot of creativity).

The transformation of perspective which Leopold advocated was perhaps most famously captured in his celebrated essay *Think Like a Mountain* ([114], p. 138-140). In this short piece, Leopold recalls how his belief as a young man that “no

⁵⁴ “Conservation is a state of harmony between men and land. By land is meant all of the things on, over, or in the earth. Harmony with land is like harmony with a friend; you cannot cherish his right hand and chop off his left. That is to say, you cannot love game and hate predators; you cannot conserve the waters and waste the ranges; you cannot build the forest and mine the farm. The land is one organism. Its parts, like our own parts, compete with each other and co-operate with each other. The competitions are as much as part of the inner workings as the co-operations. You can regulate them – cautiously – but not abolish them” ([114], p. 189-190).

wolves would mean hunters' paradise" was deeply flawed, as it took a purely instrumental perspective on natural resource management which would ultimately undermine its own purpose.⁵⁵ This is because it neglected to consider the interconnectedness between predator and prey which allows the desired deer pollution to persist over time. The main argument made by Leopold here is profound for its time, when the science of ecology was still in its infancy, though today the point is canon in the conservation sciences. Leopold himself contributed significantly to ecological understanding, both in terms of articulating a theory of the interdependent relationships between ecological sub-systems, perhaps the clearest example being predator-prey interactions, and in terms of integrating ecological knowledge into management practice (e.g. [116]). Unlike some preservationists, however, Leopold was not suggesting that hunters should stop hunting entirely; he himself was a lifelong hunter and outdoorsman. Instead, such a recognition of mutual dependence requires that the hunter (a proxy for humans in general) "think like a mountain", meaning they must extend their boundaries of consideration to include the intrinsic value of the ecological relationships between animals, plants and the landscape if the desired benefits sought from natural environments are to persist into the future. This, furthermore, has pedagogic corollaries, namely that the preservation of intact natural systems is necessary if environmental managers were ever to be able to properly understand how management practices influence ecological processes [115].

For Leopold, the adoption of the needed ethical extension, famously formulated under the rubric of his *land ethic* (see [114], p. 237-264), at the level of the *individual* is of the utmost importance. This is because he saw government intervention through land acquisition and preservation as in many ways limited and thus not to be relied on to solve the problems of use and abuse on e.g. the extensive holdings of private land ([114], p. 249). The extension of consideration that the land ethic called for would need to permeate the minds of the private property owner equally as much as the institutions of government. To this end, throughout his life Leopold was an active writer, teacher and political commentator who

⁵⁵ In one of Leopold's most famous verses, after firing his rifle on a pack of wolves from atop a nearby ridge, he had an epiphany worth quoting at length: "We reached the old wolf in time to watch a fierce green fire dying in her eyes. I realized then, and have known ever since, that there was something new to me in those eyes - something known only to her and to the mountain. I was young then, and full of trigger-itch; I thought that because fewer wolves meant more deer, that no wolves would mean hunters' paradise. But after seeing the green fire die, I sensed that neither the wolf nor the mountain agreed with such a view... Since then I have lived to see state after state extirpate its wolves. I have watched the face of many a newly wolfless mountain, and seen the south-facing slopes wrinkle with a maze of new deer trails. I have seen every edible bush and seedling browsed, first to anaemic desuetude, and then to death. I have seen every edible tree defoliated to the height of a saddlehorn. Such a mountain looks as if someone had given God a new pruning shears, and forbidden Him all other exercise. In the end the starved bones of the hoped-for deer herd, dead of its own too-much, bleach with the bones of the dead sage, or molder under the high-lined junipers" ([114], p. 138-140).

established the profession of game management, occupied the chair of game management at the University of Wisconsin, and worked for the U.S. Forest Service for many years. Leopold was eventually given the honor of adviser on conservation to the United Nations, though his appointment came to a premature end when he died in 1948 fighting a brush fire on his neighbor's farm ([114], publisher's note on the author, p. 296).

While the details of the strategies suggested by Muir, Pinchot and Leopold for curbing environmental degradation differed in their logics and practicalities, they all share a similar feature, which is the focus on the regulating and directing of individual behavior, whether that of a forester, hunter, politician, or urban dweller. These competing perspectives continue to normatively buttress a wide variety of practical steps taken by federal, state and local governments to address the country's mounting environmental problems. They can also be distinguished from more recent strategies of environmental "governance" which promote innovation and entrepreneurialism in management strategies, often predicated on the idea that the environment is best managed, at least in part, through the mechanism of market competition rather than government regulation (see Section 3.1 below).

2.2 From Managerialism to Neoliberalism (ca. 1970 – Present)

While early thinkers like Muir, Pinchot and Leopold provided some normative roots for addressing ecological problems, greater centrality of environmentalist concerns in wider public opinion came somewhat later. Growing social consciousness and empirical evidence underpinned the two decades of social engagement around environmental issues between roughly 1970 and 1990 known broadly as the U.S. Environmental Movement [117]. Pioneers in getting the message out to the general public regarding the scale and severity of the country's environmental problems played a significant role in pushing the environmental issue into the public light, perhaps the most famous and oft cited example being Rachel Carson and the publication of her celebrated book *Silent Spring* [118] in 1962. In Florida, the writings and activism of Mary Stoneman Douglas (e.g. [80]), writing several decades earlier, played a role similar to Rachel Carson in publicizing the environmental problems specific to the state. Along with these environmental frontrunners, insights from the blossoming environmental sciences increasingly provided evidence of environmental degradation and knowledge of its potential consequences, while highly publicized catastrophes such as the Great Smog of London in 1952, the Cuyahoga River fire in 1969, the Love Canal landfill pollution disaster in 1978, the tragic Bhopal chemical leak in 1984, and the

Chernobyl nuclear disaster in 1986, among others, forced environmental pollution issues into the public mainstream (see [117]). Among academics and politicians, landmark conferences such as the *United Nations Conference on the Human Environment* held in Stockholm, Sweden, and groundbreaking reports such as the *Limits to Growth* [119], both in 1972, signified the infiltration of environmental concerns into the upper echelons of the world's knowledge and policy elites [120].

In response to the general social awakening and mounting political pressure regarding environmental degradation, many federal, state and local governments adopted public policies aimed at curbing the growing problem. Public policy can be broadly defined as “a system of laws, regulatory measures, courses of action, and funding priorities concerning a given topic promulgated by a government entity or its representatives” [121]. In the United States, environmental public policy has involved a mixed bag of conservation and preservation strategies; in other words, legislation aimed at promoting the *wise use* of natural resources and legislation aimed at *preventing use* of certain natural resources (see Section 2.1 above).

Some regulatory agencies already existed by the mid-20th century, such as the National Marine Fisheries Service (NMFS) which was established in 1871, or the United States Fish and Wildlife Service (USFWS) which was created in 1940. However, most of the major environmental regulatory infrastructure at federal and state levels was adopted somewhat later, in concert with the wider environmental movement in the country. An important part of this regulatory infrastructure involved what Bosselman [122] has called the “quiet revolution” in land use policy, meaning the trend towards increasing state (*contra* market) coordination of local and regional patterns of land use and development, which affected much of the United States starting in the 1970s. Florida, having experienced extremely rapid growth in the 1950s and 60s, was in many ways at the forefront of this “revolutionary” movement [123]. However, while states began adopting individual environmental regulations on their own, national level legislation was eventually adopted as means to prevent the perverse economic incentives created by an imbalance in state-level regulation. As S. Meyer ([124], p. 3) has noted:

national environmental legislation were born out of the concern that the patchwork of diverse state environmental standards evolving in the early 1970s would wreak havoc on interstate commerce and create competitive disadvantages for states striving to improve environmental quality. National environmental legislation was expected to level the playing field.

At the federal level, some of the most well-known and influential environmental legislation enacted in these decades includes the Clean Air Act (1962), the Clean Water Act (1972) and the Endangered Species Act (1973). Many other examples

could be provided. However, because I am going to focus the discussion more specifically on the problem of coastal erosion when developing the case study of Flagler County and the City of Flagler Beach below (see Section 2.3), it is relevant here to point out the part of the United States' environmental regulatory framework which pertains to the management of coastal environments in particular. Along with these famous water, air and species acts, the U.S. federal government also passed the Federal Coastal Zone Management Act (CZMA) in 1972 [125].⁵⁶ The CZMA offers guidelines for inter- and intra-agency cooperation on coastal management matters, establishes procedures for funding and land acquisition, and offers incentives for coastal states to develop state-wide coastal management programs based on the state's unique coastal characteristics. The U.S. Environmental Protection Agency, established in 1970, together with the NMFS, the USFWS, the National Oceanic and Atmospheric Administration (NOAA) and the USACE, shares responsibility for implementing this coastal policy framework.

The CZMA encourages states to adopt a variety of coastal management related policy and planning components which should feed into a multi-level comprehensive strategy for coastal resource management that is tailored to the needs of each individual coastal state. The main components included establishing, for example ([126], p. 4):

- The boundaries of the state's coastal zone and the coastal land, water and natural resources that have a direct and significant impact on coastal waters.
- Geographic areas of particular concern.
- The authorities and enforceable policies of the coastal management plan.
- The organizational and enforceable policies for implementing the coastal management plan, including the responsibilities and interrelationships of local, area-wide, state, regional, and interstate agencies and management process.
- Shoreline erosion/mitigation planning.

In addition to these core components, in order to ensure that federal activities within state boundaries do not clash with the state's attempt to effectively manage its coastal resources, the CZMA also includes a provision for "federal consistency", that is, the requirement that "federal actions that affect any land, water, or natural resource of a state's coastal zone must be consistent with the enforceable policies of the state" ([126], p. 9). In other words, the consistency of any federal project with state policy goals is judged in terms of the state's own coastal resource management policy framework.

⁵⁶ In 1982, in response to decades of unfettered development on barrier islands, the Coastal Barrier Resources Act (CBRA, Public Law 97-348) of the United States was enacted which prohibited any federal funding from being spent in a way that encourages development on the country's fragile and vulnerable barrier islands. See: <https://www.gpo.gov/fdsys/pkg/STATUTE-96/pdf/STATUTE-96-Pg1653.pdf>

Table 1:

State-level agencies and tasks under the FCMP. Source: ([126], p. 11-12)

State-level Agency	Implementation tasks under the FCMP
Florida Department of Environmental Protection (FDEP)	If a state agency determines that a proposed federal activity is inconsistent, the agency must explain the reason, identify the enforceable policies, and identify any alternatives that would make the project consistent. In such a situation, the FDEP issues the formal state response to the appropriate party.
Florida Department of Agriculture and Consumer Affairs (DACS)	Manages state forests for multiple public uses; regulates aquaculture facilities and shellfish processing plants; regulates the use of pesticides to protect public health.
Florida Department of Economic Opportunity (DEO), Division of Community Development	Oversees compliance with requirements for local government comprehensive planning, developments of regional impact, and development in areas of critical state concern, etc.
Florida Department of Health (DOH), Division of Environmental Health	Regulates drinking water, on-site sewage disposal systems, monitors beach water for bacterial indicators & aquatic toxins, etc.
Florida Department of State (DOS), Division of Historical Resources	Protects state historical and archaeological resources.
Florida Department of Transportation (FDOT)	Develops and maintains the state's transportation system.
Florida Division of Emergency Management (DEM)	Ensures that Florida is prepared to respond to emergencies caused by a wide variety of threats
Florida Fish and Wildlife Conservation Commission (FWC)	Protects and manages fresh & saltwater fisheries, marine mammals, birds, and upland game & non-game animals (including endangered species).
The Florida Building Commission (FBC) of the Florida Department of Business and Professional Regulation	A 25-member technical body responsible for the adoption of the Florida Building Code.
The regional Water Management Districts (WMDs)	Responsible for the comprehensive planning, management and development of water resources for consumptive uses & water resource preservation.

The National Coastal Zone Management Program portion of the CZMA offers incentives for states to voluntarily adopt coastal management programs, of which 34 coastal states have followed suit. In 1978 Florida adopted the Florida Coastal Management Act (codified as Chapter 380, F.S., Part II, Coastal Planning and Management), which authorized the production of the Florida Coastal Management Program (FCMP) [126]. After overcoming early hiccups⁵⁷, the FCMP was approved in 1984 and remains the central guiding platform for coastal management activities throughout the state today. The FCMP is comprised of a network of 24 enforceable policies the implementation of which is shared among 10 agencies (Table 1), headed by the Florida Department of Environmental Protection (FDEP).⁵⁸

⁵⁷ Despite Florida being a frontrunner in laying the groundwork for a comprehensive coastal management strategy, the process of federal approval of the FCMP was more contested and drawn out than other coastal states because of infighting among the Florida legislature over to what degree the existing coastal management legislation should be adjusted to e.g. meet federal grant requirements, with the state often coming up short in terms of meeting federal expectations ([127], p. 61).

⁵⁸ Between the 1960s and 1970s in Florida, the creation and merger of various agencies responsible for environment-related activities, in particular the Internal Improvement Trust Fund, the Game and

In addition to the FCMP, the state had also passed the Florida Beach and Shore Preservation Act (BSPA) (Chapter 161, Florida Statutes) for the explicit purpose of addressing the problem of erosion which was increasingly viewed as threatening the state's coastal resources (e.g. beaches) and infrastructure [128]. The primary purpose of the BSPA was the control of coastal development and the facilitation of coastal restoration to be accomplished through three interrelated programs [129]:

1. The Coastal Construction Control Line (CCCL) Program which is meant to protect the state's beach and dune systems from imprudent upland construction that could weaken, damage or destroy the integrity of the beach and dune system.
2. The Beach Management Funding Assistance Program which reviews funding applications and provides funding assistance for beach restoration projects and inlet management projects to restore the coastal system and address critically eroded beaches.
3. The Beaches, Inlets and Ports Program which processes joint coastal permits and environmental resource permits for beach restoration projects, erosion control structures, piers, deep water ports and coastal inlets. The BIP program also reviews coastal data for quality control and provides strategic planning for beach and inlet management activities.

Like the FCMP, the FDEP is also responsible for implementation of the BSPA.⁵⁹ From its inception, all of Florida's 67 counties, uniquely, were included in the FCMP.⁶⁰ Only 35 of Florida's counties, however, physically abut the Atlantic Ocean or Gulf of Mexico, meaning it is only these counties that are facing critical erosion⁶¹ problems and thus the only counties in need of coastal construction regulations.

Freshwater Fish Commission, the Florida Department of Health, and the Florida Department of Pollution Control, came together to form the Florida Department of Environmental Regulation. This agency, between the 1970s and the 1990s, was charged with the regulation, maintenance, conservation, compliance and enforcement of a wide variety of environmental activities, including those pertinent to coastal development. The Department of Environmental Regulation, in turn, merged with the Florida Department of Natural Resources in the 1990s to form the Florida Department of Environmental Protection (FDEP), which remains the premier body for environmental policy and decision making at the state-level.

⁵⁹ Most recently, the FDEP adopted the Strategic Beach Management Plan (SBMP) in 2008 to enhance the efficacy of the FCMP. The SBMP outlines specific strategies for constructive actions taken to address critically eroded beaches and inlets throughout the state ([126], p. 34).

⁶⁰ This is because the entire geographical area of the state, being a peninsula, is heavily influenced by oceanic processes; this is only the case for two other coastal management plans developed under the CZMA, Delaware and Puerto Rico ([127], p. 62).

⁶¹ By the term "critical erosion" I mean to invoke the technical term used by the FDEP, which is defined as "a segment of the shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost." [130].

Coastal Management Levels, Major Policies and Responsible Agencies

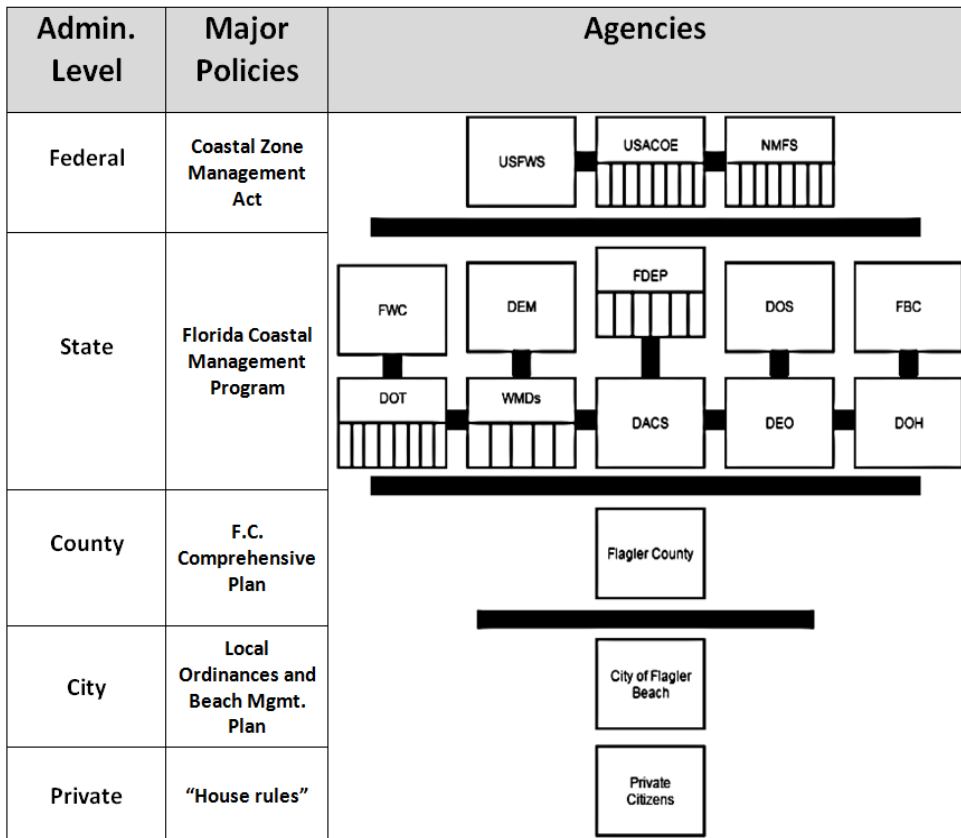


Figure 12: Florida’s coastal management jurisdictional scale. The smaller divisions within agencies indicate that the agency is divided into districts. Author’s graphic, 2017.

Generally speaking, the structure of environmental management in the United States is hierarchical, meaning that lower-level spatial domains are covered by and beholden to the constraints imposed by higher-levels of organization (see [67]). Just as the FCMP is developed within the framework of the federal CZMA, county and municipal-level management strategies must also be developed within the boundaries of the state’s regulatory framework (Figure 12). City councils and private property holders, being at the lowest level of the spatial domain hierarchy, are beholden to rules and regulations imposed by all higher-level authorities. This concentration of regulatory burden at the bottom of the administrative hierarchy is what Murawski ([131], p. 687) called the “paradox of scale”, meaning the “smaller the spatial resolution, the larger the number of institutional entities that may

potentially be involved in decision making.” The federal and state-level management plans are on a more general level and provide broad-stroke policy for a wide variety of coastal contexts. Within these constraints, however, the contingencies of physical geography and historical development make it necessary for lower-level authorities, such as counties and municipalities, to draft their own localized policies which are tailored to the specific needs of concrete contexts. The trend over the past few decades toward neoliberalization in Florida, as elsewhere in the United States, however, is having important influence on the kinds of environmental management strategies adopted by local, state and federal government (see [132]), with fiscal constraints and increasing competition in particular incentivizing a re-orientation of government priorities. After reviewing more general trends in this direction, the concrete case of Flagler County and Flagler Beach is developed in Section 2.3 below.

Neoliberalism and the entrepreneurial state

The adoption of federal and state coastal management policies, like other public and environmental policies and agencies, represented an increasingly direct and significant role of government in managing social and environmental problems which broadly characterized the post-WWII period’s combination of Keynesian economics and welfare-state politics.⁶² The adoption and enforcement of social safety nets, environmental protections and restrictions on production reflected a model of public administration which Harvey [134] called “managerialism”. Generally speaking, this model views the primary responsibility of government as ensuring that social needs are met and problems solved within designated administrative boundaries. This furthermore required the (not necessarily exclusive) concentration of decision making power in a central state apparatus capable of facilitating the execution of general government functions. This is in stark contrast to more recent “neoliberal” trends in public policy which, instead of trying to buttress a significant public sector in the economy, expand social protections or extend environmental regulations, are predicated on the dismantling of these managerial institutions and mechanisms, aiming instead to facilitate inter-spatial competition and devolution of responsibility [135].

Today, Florida’s county and municipal governments have substantial (though, as we will see, not total) freedom and responsibility when it comes to issues of land use and environmental planning, though current circumstances are relatively recent

⁶² Marcuzzo [133] argues that there is a tendency for most people to assume Keynes himself was a strong proponent of state-welfarism, but that this isn’t necessarily the case, and while Keynes’ theory involved more active government economic policy, the roots of the welfare state are found elsewhere.

(ca. 2011) and potential for state control over local land use decisions had been much stronger in the past. For example the state's famed Growth Management Act (GMA), adopted by the Florida legislature in 1985, established a hierarchical policy framework which gave state government ultimate say over land use decisions through the multi-level coordination of comprehensive plans and the enforcement of concurrence and compact-development requirements [136]. However, recent changes to the state's growth management legislation have in many ways inverted the power structures of the growth management institution so that state level government plays a much smaller role in monitoring and regulating land use decisions while local governments are delegated more decision making responsibility [123]. While some commentators praised these changes as a much needed update of what they saw as an antiquated and sluggish system which discouraged growth and development [137], others drafted obituaries lamenting these changes as representing the "death" of growth management in the state (e.g. [138, 139]).

Regardless of whether one is for or against these recent changes to the state's growth management institution, I have argued elsewhere [132] that they exhibit a distinctly *neoliberal* character in their general orientation. By this I mean that reforms of the GMA broadly aimed to devolve responsibility and encourage inter-spatial competition, these intentions themselves being indicative of a broader turn in the orientation of public policy in the United States towards market fundamentalism. This turn began in the late 1970s and early 1980s in response to economic stagnation and the discrediting of Keynesian economic policy, perhaps most famously (or explicitly) pursued under the Reagan administration [140]. As Paul Mattick ([141], p. 19) has noted:

Interestingly enough, the loss of faith in Keynesian theory that came with the return of economic stagnation in the 1970s, now accompanied by inflation, led not to a search for new ways to grapple with the nature of the 'business-cycle' of alternating contractions and expansions, but to a renewed insistence that the market, if only left to itself, would provide the best of all economic worlds.

Such an insistence relies on the idea that, given the complexity of modern economies, the competitive market mechanism and the price signals it produces offer the only practical means for receiving the information needed to make rational economic choices.⁶³ Beyond wealth creation, however, proponents of neoliberal policies⁶⁴ often insist that increased competition and minimal

⁶³ "Under competition – and under no other economic order – the price system automatically records all the relevant data. Entrepreneurs, by watching the movement of comparatively few prices, as an engineer watches a few dials, can adjust their activities to those of their fellows" ([142], p. 58).

⁶⁴ A label which Ostry et al. [143] of the International Monetary Fund remind us is "used more by critics than by the architects of the policies".

government intervention are not only important in terms of wealth creation, but seen as fundamental to the realization of individual freedom.⁶⁵ Hayek ([142], p. 45) put the point this way:

Liberalism is opposed... to supplanting competition by inferior methods of guiding economic activity. And it regards competition as superior not only because in most circumstances it is the most efficient method known but because it is the only method which does not require the coercive or arbitrary intervention of authority.

Neoliberalism as a social-scientific signifier has gained significant traction over the last several decades, most recently experiencing a notable revival in academic and common parlance post-2007 financial crisis [146]. Neoliberal policy is widely considered, by both advocates and critics, to have its intellectual origins in the theories of Chicago School economists such as Milton Friedman (see [147], p. 83-124) and the social theory of Austrian School economists such as F.A. Hayek, though to suggest that this combination amounts to a perfectly coherent and well-articulated politico-economic philosophy would be misleading.⁶⁶ However, regardless of the “rascal” nature of the concept [146], on a very general level, neoliberal policy can be said to rest on two fundamental principles:

The first is increased competition—achieved through deregulation and the opening up of domestic markets... The second is a smaller role for the state, achieved through privatization and limits on the ability of governments to run fiscal deficits and accumulate debt. ([143], p. 38)

A “smaller role” for the state, however, does not imply *no* role for the state; rather, the state takes on a limited but crucial role in planning for the creation of conditions conducive to market competition.⁶⁷ As Harvey ([148], p. 64) has put it, “according to theory, the neoliberal state should favour strong individual property

⁶⁵ See for example Milton Friedman’s *Capitalism and Freedom* [144] or Friedrich Hayek’s *Freedom and the Economic System* [145].

⁶⁶ Jamie Peck ([147], p. 8) cautions against the tendency to reduce neoliberalism to any sort of monolithic characteristic or quality: “Crisply unambiguous, essentialist definitions of neoliberalism have proved to be incredibly elusive. The word has become the bane of many a political lexicographer. It would be a wrongheaded endeavor, in fact, to attempt to reduce neoliberalism to some singular essence—say, as a condensate of Hayek’s personal philosophy, or Chicago School theory, or hard-boiled Thatcherism—and not only because these, too, have been movable objects. By its nature, as an oxymoronic form of “market rule,” neoliberalism is contradictory and polymorphic. It will not be fixed. Perhaps, instead, the closest one can get to understanding the nature of neoliberalism is to follow its movements, and to triangulate between its ideological, ideational, and institutional currents, between philosophy, politics, and practice”.

⁶⁷ Again, Hayek ([142], p. 46) put the point plainly: “Planning and competition can be combined only by planning for competition, not by planning against competition. The planning against which all our criticism is directed is solely the planning against competition”.

rights, the rule of law, and the institutions of freely functioning markets and free trade” where “private enterprise and entrepreneurial initiative are seen as the keys to innovation and wealth creation”.

The neoliberal turn in economic and public policy propagates the idea that the government’s crucial but limited role is to create conditions conducive to market competition, and the government itself should likewise be exposed to the resulting increasing pressure to stay competitive and attractive to investors. Neoliberalism, for the public sector, means that it too must dawn the “entrepreneur’s new clothes” [149] if they are to stay afloat in the sea of increasing inter-spatial competition. This means enhancing competitive advantage through innovative partnerships and other arrangements such as public-private partnerships (PPPs) ([150], p. 129).

A quarter century ago, Harvey ([134], p. 8-11) noted the emergence of four stylized strategies for entrepreneurial governance which reflect particular kinds of competitive advantage, namely 1) the production of goods and services (e.g. resource base, location), 2) the spatial division of consumption (e.g. consumer attractions and entertainment), 3) command and control functions (e.g. communication and transportation networks), and 4) redistribution of surpluses through central governments (e.g. military, education and health investments). All of these types could today be classified as early expressions of neoliberalism’s now “customary” forms ([151], p. 397). These options are not mutually exclusive, as Harvey ([134], p. 10) points out, but hybridist and potentially synergistic, their combinations and outcomes helping exacerbate uneven development and thus the uneven fortunes of metropolitan regions. All of these strategies, to varying degrees, are pursued by Florida’s state and local governments.

In Florida, among the most explicit examples of this neoliberal turn would be the state’s reliance on largely publically funded PPPs to assist in specifying its competitive advantages and promoting these advantages through lobbying and marketing. Back in the mid-1990s, Florida was among the first states in the nation to place the principle responsibility for economic development in the hands of a PPP called Enterprise Florida (EF1). EF1 is a PPP between Florida’s businesses and government leaders, and remains among the principle economic development organizations in Florida.⁶⁸ EF1 promotes numerous industries, including aviation and aerospace, life sciences, manufacturing, defense and homeland security, information technology, financial and professional services, logistics and distribution, cleantech and headquarters. Tourism, the largest single industry in the state, has its own PPP which was established by the Florida Legislature in 1996, namely the Florida Commission on Tourism, which operates as VISIT

⁶⁸ After months of threats by Florida legislatures to cut EF1 funding (see e.g. [152]), Governor Rick Scott recently signed into law a bill which provides continued funding for both EF1 and Visit Florida, while also supposedly addressing the transparency concerns many had regarding how the these PPPs allocate their funding (see e.g. [153]).

FLORIDA.⁶⁹ Being the official tourism marketing corporation for the state, VISIT FLORIDA is connected with over 11,000 tourism industry businesses, including mega-corporations like Disney, for whom it facilitates advertising and communications to domestic and international markets.

The strategies adopted by PPPs to market the state's competitive advantage are diverse. The EFl, for example, emphasizes a "business-friendly climate" which comes fully-stocked with a "business-friendly legislature, favorable tax climate, and large market" [154].⁷⁰ Florida's 65 Enterprise Zones, which provide tax incentives to businesses in targeted sectoral and geographical areas [155], offer a good example of one tool with which Florida's "business-friendly" climate is produced in practice.⁷¹ EFl's language also emphasizes competitive advantages regarding the state's "multi-modal infrastructure" and its "strategic, global location", including its position within the 2nd largest Foreign Trade Zone network in the country [157]. Florida currently has around 19 commercial airports, 15 deep-water seaports, and extensive highway and freight rail networks.⁷² Taken together, Florida's geographic location, its "friendly" regulatory environment and its extensive public infrastructure are presented as advantageous to businesses hoping to maintain a competitive edge in domestic or international markets.

VISIT FLORIDA, like EFl, emphasizes the competitive advantages of the state, in particular its well established brand as a national and international travel destination, touting its "strong network of industry partners" which offers opportunities for collaboration which "have the potential to trump competitive brands in specific global markets" ([159], p. 109). Florida physical geography is also said to lend a competitive advantage to specific industries, for example sports, which VISIT FLORIDA says can benefit from the state's "year-round mild climate" ([159], p. 119). In addition to the agreeable climate, the abundance of sandy beaches and other natural features are consistently emphasized as having long been a major draw for tourists from around the country, and more recently around the world, with VISIT FLORIDA providing branding, networking and information services to businesses hoping to maintain a competitive edge in ever more competitive domestic and international markets in tourism [160].

While the use of this sort of marketing language by economic-oriented PPPs is not surprising, it is revealing as a signifier of the underlying market logic guiding

⁶⁹ See <https://www.visitflorida.org>

⁷⁰ The marketing phrases quoted here as exemplary of the logic of these PPPs are largely taken from their websites and annual reports.

⁷¹ As an indicator of how "business-friendly" the state has become, The Tax Foundation (a conservative think-tank) ranked Florida 5th among U.S. states on their 2016 business tax climate index (see [156]).

⁷² However, according to the American Society of Civil Engineers (see [158]), the state's over-all infrastructure report card sits at C- (below mediocre) and continues to decline due to persistent lack of financial support resulting from insufficient tax revenues, among other causes.

these important players in the governance of Florida's natural and built environment. Whether resulting from natural endowments like climate and geography, or from public investment like transportation infrastructure and education facilities, these public "assets" are presented as being primarily available for the economic advantage of private enterprise.⁷³ Furthermore, while these PPPs are largely taxpayer funded, they are overseen by some of the wealthiest and most politically powerful industry leaders and elected officials. Enterprise Florida, for example, is chaired by the state governor (currently Rick Scott), but a private entity can pay up to \$50,000 for a seat on the board [161]. Taken together, all of the above promotional activities, the external gaze of place-branding, the construction of competitively advantageous business tax infrastructure, the capturing of federal spending in the form of military and space technologies, and even the reliance on PPPs themselves, are all today well known, and some would even say customary [151] neoliberal governance strategies.

While environmental protections were greatly extended in the 1970s, beginning in the 1980s and early 1990s planning which was viewed as potentially detrimental to economic growth in the United States was increasingly being challenged by neoliberal reformists, and deregulation was increasingly being promoted in the name of economic growth [162]. In Florida, the non-enforcement, gradual weakening and eventual dismantling of the GMA throughout the 1990s and early 2000s, in the end, meant that the once famed regulatory system showed little impact on the local planning process and was largely ineffective in curbing further environmental degradation [163]. The most recent changes to the GMA in 2011, furthermore, deepened this drive to devolve decision making responsibility to the local level [132]. And like the state itself, local governments in Florida have increasingly been expected to compete with other local governments for private investment, tourism spending and public funds allocation. The influence of these increasing competitive pressures is, like the state more generally, reflected in the changing environmental management strategies being adopted by some Florida local governments.

⁷³ For a more general critique of the corporate reliance on commons, see ([78], p. 139-150).

2.3 Growth and Change, Flagler Style (ca. 1890 – Present)

Throughout the United States, the next level below the state on the administrative scale is the county⁷⁴, what Benton and Feiock [164] aptly label “institutions of governance and agents of service delivery”. Florida currently has 67 counties which were established at different points in time, generally in response to increases in concentration of population and urban development, as the need for service provisioning grew and local political officials and residents sought to gain more direct control over decision making in their immediate areas.

County governments in Florida, like elsewhere in the U.S., “were originally established to assist the state government in the administration of state programs at the local level”, acting as “satellite” offices which represented subdivisions of the “administrative arm of the state” ([164], p. 242). As creatures of the state, counties have traditionally been mandated to bear a wide variety of responsibilities ranging from implementing state healthcare and welfare programs to providing various municipal-type and urban-type services (e.g. waste management; see [164], p. 254-259). The structure of county government in Florida is typically “fragmented and headless” where policy decisions are made by an particular combination of independently elected officers depending on the specific government structure adopted, the most common being a county administrator/manager appointed by the 5-7 member county commission ([164], p. 244). Throughout the second half of the 19th century, the density of counties in Florida was highest in the north and west, in line with the population center of the state (see Figure 8). However, after the turn of the 20th century the explosion of population and development which followed in the path of Henry Flagler’s railroad lead to a rapid increase in the number of counties along the eastern and southern portions of the peninsula (Figure 13).

In the northeastern part of the Florida peninsula, Henry Flagler’s railroad linked and improved a series of older and smaller sections of railway historically used for the movement of raw materials from harvesting locations to shipping ports located along the rivers and coastal areas.⁷⁵ In Saint John’s County, which contains the City of Saint Augustine and is the oldest county in the state, the railroad fragments which would eventually become portions of the East Coast Railway connected Saint Augustine to New Smyrna via Crescent Lake and the Saint John’s River. These three locations all offered port access where the frontier industry products such as timber and turpentine could be collected and transported to distant markets.

⁷⁴ 47 states have counties. The remaining states use different labels to indicate the same type of administrative unit, e.g. parish in Louisiana.

⁷⁵ As discussed in Section 1.3, this combining of smaller railroads was an instance of the *centralization* of capital.

The area between Saint Augustine and New Smyrna in particular was relatively wild and scarcely populated, with few, small frontier and agricultural communities scattered along the rail lines making up practically all of the area's population until the mid-20th century. While the East Coast Railway passed through, beyond track improvements the area did not receive the same level of attention compared with other places, such as Saint Augustine and Miami, and therefore never received the significant boost of investment and optimism which Henry Flagler's exuberant wealth brought to other areas along Florida's east coast.

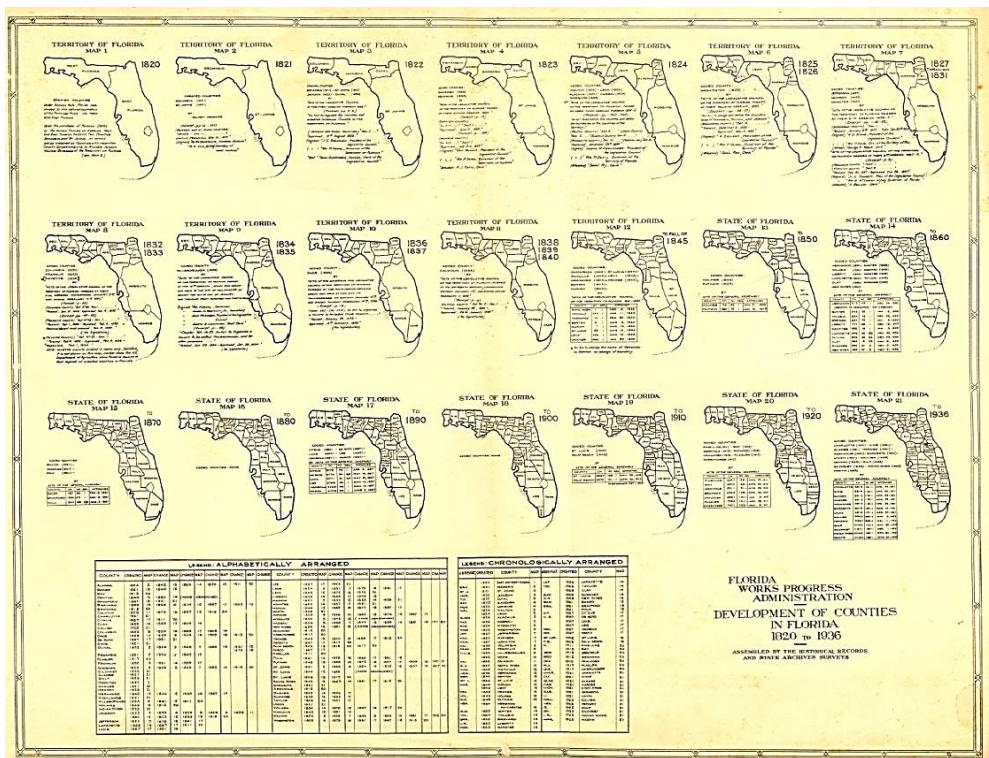


Figure 13:
Development of Counties in Florida 1820-1936. Source: [165].

This of course did not stop some entrepreneurs from trying to take advantage of the development fever which swept Florida in the early 20th century (see Section 1.3). In the vicinity of Crescent Lake in northeastern Florida, which had, since the Seminal Wars, been completely dominated by frontier industry activities, various land development companies were instrumental in attracting capital to the area in the early 1900s [166]. For example, the Bunnell Development Company,

incorporated by entrepreneurs I.I. Moody and J.F. Lambert in 1909, marketed the undeveloped lands in and around Crescent Lake to distant audiences through advertisement publications such as *The Bunnell Home Builder*. These publications were circulated in northern cities such as Chicago and New York and targeted prospective financiers and residents, encouraging them to live, work and invest in the state's undeveloped areas. Companies touted the benefits of Florida's climate and soils, its cheap land, and crowed about the explosion of productive activity sweeping the state. Take for example this passage from a 1916 edition of *The Bunnell Home Builder* [167] advertising the properties for sale in the area around Crescent Lak, which would eventually become Flagler County:

Florida for many years has been far-famed for her delightful winter climate, and the tourists particularly have flocked to that "Land of Flowers" when the cold winds were raging over the northern states... However, the idea that Florida is only desirable as a winter resort is a great fallacy. To realize the real worth of Florida as a home state, and as a place where one may make a good livelihood, you must see it when the crops are being harvested and when the farmers are receiving the returns from the combination of soil and marvelous climate... I want you to visit Bunnell in the midst of her busy season, and therefore I invite you and urge you to join me in a trip to Bunnell, taking advantage of the homeseekers' excursion which leaves Chicago on Tuesday night...

Such boastful advertisements were often successful in attracting settlers to the area in the first decades of the 20th century, but on a scale significantly smaller than the booming urban areas such as Miami in the southeast. Still, as the region's population grew, there developed a sentiment among the areas political leaders that they should pursue "a separate political subdivision, a new county, to better serve the needs of these communities and their peoples" ([168], p. 67). As a result, substantial lobbying efforts to gain approval of a new county were advanced in the state capital by influential movers-and-shakers such as I.I. Moody, who eventually succeeded in "bringing home the bacon", as a local newspaper put it at the time [169]. Flagler County was officially established in 1917 and was named in honor of Henry Flagler's substantial influence in the state. The county was carved out of portions of St. Johns County to the north and Volusia County to the south, with the county seat located in the newly incorporated City of Bunnell.

In addition to Henry Flagler's railroad, another significant development in transportation and access in the state was the dredging of the Intracoastal Waterway (also known as the Florida East Coast Canal) down the entire east coast of Florida by the Florida Coast Line Canal and Transportation Company and the USACE in the 1890s. In northeastern Florida, this canal connected the Matanzas River to the north with the Halifax River to the south through modern day Flagler County. The dredging of the Intracoastal Waterway enabled delivery of building

materials from larger centers of industry, such as Jacksonville, for the construction of the first roads and buildings in coastal areas which had been practically uninhabited since the Seminole Wars, which had the further effect of attracting more developers and prospective settlers to the area [170]. Along with this increased access, the material brought to the surface in the process of dredging the Intracoastal Waterway was deposited in spoil piles along the east and west banks of the canal, in many places filling in the soft-bottomed salt marsh and mangrove swamps upon which some housing and commercial developments were later to be constructed (see for example Figure 16 below).

In 1909, W.C. Cookman built the first residence in the area which would become the City of Flagler Beach (initially named Ocean City). The house was located on the mainland side of the Intracoastal Waterway on land purchased from the Bunnell Development Company, and was followed by the first permanent graded and shelled access road which was constructed in 1913 to connect the new coastal settlement to the larger community of Bunnell further inland [170]. Also in 1913, George Moody, brother of I.I. Moody of the Bunnell Development Company, submitted a request to homestead 169 acres of land on the local barrier island with the intention of developing a beach front resort and housing development in the spirit of those developed by Henry Flagler and his followers elsewhere along the east coast [171]. This homesteaded property was eventually platted as Moody's Subdivision, which laid out the city's infrastructure plan and parceled land into individual lots for sale as private property (see [172], Figure 3).

Just like I.I. Moody and J.F. Lambert founded the Bunnell Development Company, George Moody and other investors chartered the Ocean City Improvement Company in 1921, which allowed them to leverage capital to build streets and sidewalks and, as a local Flagler historian has put it, "other things for the beautification of one of the finest town sites along the east coast of Florida" [173]. This included the maintenance of transport access to the barrier island from the mainland, which in time has included everything from a small two-car ferry to the current four lane concrete structure with 65ft vertical clearance, the scale of access infrastructure reflecting growth in population and productive activity in the city (Figure 14). In 1923 the Ocean City settlement was formally incorporated as the City of Flagler Beach, which was considered at the time an important drawing factor for the town's future development [174].

Municipalities are created by the granting of a sort of "license to operate as a city" ([164], p. 247) by the state known as a charter. Once granted a charter, Florida cities "have discretion except as limited by law in almost every arena except taxation, where the constitution restricts their authority. In addition, municipalities are normally responsible to enforce state law within their boundaries and have the power to make local laws (called ordinances) that operate only within

their boundaries” (ibid).⁷⁶ Services provided by municipalities typically involve police and fire services, utilities, parks and recreational facilities and waste management, as well as maintaining sidewalks and streets. The number and type of services generally reflect a municipality’s organizational form and tend to increase with the size of the municipality (see [164], p. 247-248). Flagler Beach’s municipal structure is hybrid, involving an elected five member city commission, an elected mayor and a commission appointed city manager.

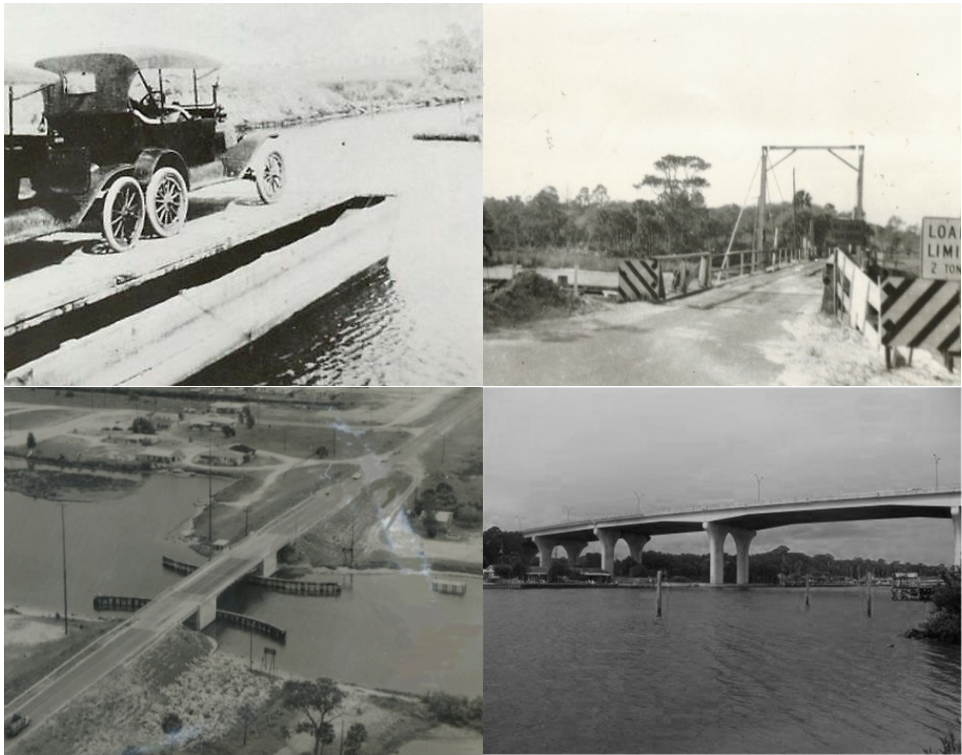


Figure 14:
Top left: Accessing Flagler Beach initially involved a two car ferry which shuttled visitors cross the Intracoastal Waterway to the barrier island, circa 1920. **Top right:** Early road access was provided by this simple turn-style bridge in circa 1930. **Bottom left:** As Flagler Beach’s population grew, a larger draw bridge was constructed, shown here in this circa 1960 aerial photo. **Bottom right:** The city’s current bridge was constructed high enough to allow for passing vessels without opening. Sources: Top left, top right and bottom left courtesy of the Flagler Beach Historical Museum. Bottom right: Author’s photo, 2014.

George Moody served as the first mayor of Flagler Beach, all the while he and his business constituents continued to push for the further development of the city and

⁷⁶ Florida Constitution, Article VIII, Section 2(b) states that Florida municipalities may “perform municipal functions and provide municipal services, and may exercise any power for municipal purposes except as otherwise provided by [state] law”

county. As previously mentioned, despite the efforts of Moody and others, Flagler County remained relatively neglected by big money developers compared to many other Florida counties throughout the first half of the 20th century. While cities like Miami, Jacksonville and Tampa all had populations in the hundreds of thousands by 1950, the entire population of Flagler County did not pass 5000 until after 1970. The county's economic base eventually followed the general trend in the state in shifting from mostly frontier to mostly sunshine industries (see Section 1.3), but prior to 1970 the county's economy was still dominated by agriculture, cattle ranching and natural resource extraction.⁷⁷ At the same time as Walt Disney was turning Orlando into the world's most popular theme park destination [85], Flagler County seemed to be slipping into the shadows in terms of investment. For example, between 1960 and 1970, Florida's population as a whole grew by 37% while Flagler County's measly population of around 4500 actually *declined* by 2.5% in the same period (see Figure 9 above).

The contribution from the City of Flagler Beach to the county's overall population, given the size of the settlement, grew to quite disproportionate levels in the decades between 1940 and its peak in 1970. For scale, the municipal area of Flagler Beach is about 4 square miles, or less than 1% of Flagler County's total land area of 571 square miles. However, it accounted for nearly 20% of the total population in Flagler County by 1970. The older and more scattered populated places which made up the other 80% at this time were in the central and western part of the county, such as the county seat in the City of Bunnell and the unincorporated rural lands of today's lesser known and less frequently trafficked agricultural communities like Dinner Island, Espanola, Dupont, Korona and Favoretta. Many of these populated rural places have their origins in the early settlement days before the creation of Flagler County, having sprung up along the early rail and river networks which allowed for the export of frontier industry products, the dominant livelihood in the area since the time of post-Civil War settlement (Figure 15).

⁷⁷ In addition to forestry, some small-scale mining was pursued in Flagler County prior to 1970. The Lehigh Cement Plant, for example, was constructed by the Lehigh Portland Cement Company in Flagler Beach 1952 and intensively mined the local coquina bed rock for the production of construction grade cement. After operating for roughly seven years, the plant was closed in 1965 "due to labor disputes and economic uncertainty", according to the Flagler County Historical Society.

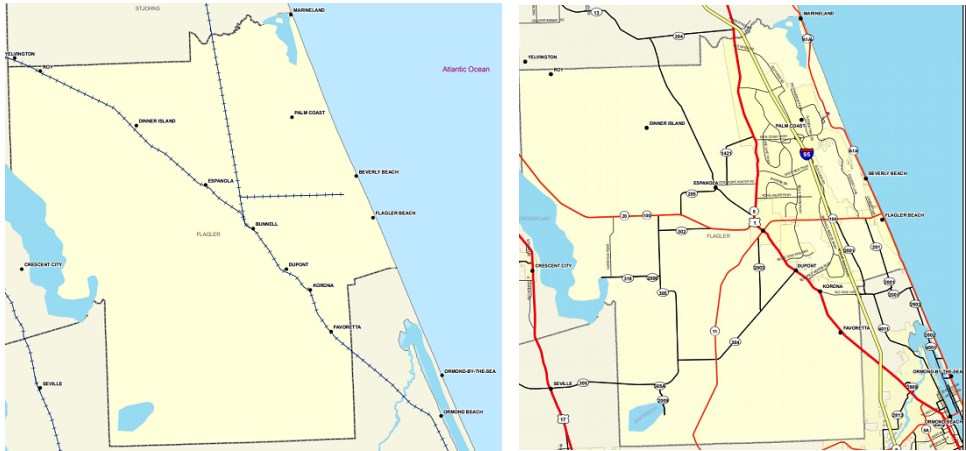


Figure 15:

Left: Flagler County's railway network. The first settlements in Flagler County were located along what became the East Coast Railway, where agricultural and forestry products could more easily be shipped to markets further north. **Right:** Flagler County's road network. Private car access is provided within and between urban areas in the county's growing eastern half, as well as within portions of the county's more rural western half. Source: maps courtesy of Florida's Educational Technology Clearinghouse, available at <http://fcit.usf.edu/florida/maps/>.

To encourage further investment and development, the construction and maintenance of basic infrastructure like roads, bridges, drainage and mosquito control, in addition to municipal elections, took up much of the focus of the newly created Flagler Beach City Commission's public meeting minutes between 1925 and 1927.⁷⁸ George Moody and other elected officials approved the hiring of companies and individual laborers to raze the barrier island topography and vegetation in order to grade roads and clear construction lots. Other amenities were also constructed to attract prospective residents, businesses and, of course, tourists. These included a grand hotel, casino, bathing house and the city's famous fishing pier, the latter which was first proposed by George Moody and consent, permission and approval for construction given by the city council on April 6, 1926.

Historical photographs of the city from this period show how dune vegetation had been stripped away and dune structures leveled to facilitate construction of houses, businesses and roads. Most of this early development was located between the middle of the island and the ocean (Figure 16), both because a beautiful view and proximity to the beach could command higher property values, but also because this area offers the most stable foundation for urban development without

⁷⁸ All city meeting minutes are available on public record at: <http://www.cityofflaglerbeach.com/index.aspx?nid=139>

having to resort to the relatively expensive process of infilling wetlands to construct artificial land. The concentration of development in these relatively stable areas has had major impacts on maritime forests⁷⁹ and dune plant communities on the state's barrier islands. Other portions of George Moody's subdivision in Flagler Beach did however require the infilling of wetlands to provide the physical foundation for housing construction, for example in the construction of the finger-canal housing development known as Venice Park around 1950 (Figure 16).

Among Flagler Beach's most significant infrastructure to be established in the city's early days was the "ocean skirting" road known as Ocean Shore Boulevard. Hype and speculation over the coastal road and the potential for it to attract residents and investors was huge even before construction began. Local newspapers, such as *The Flagler Tribune* in 1925, advertised the new road as "one of the most scenic routes down the east coast of Florida ever planned", and boasted how it was already attracting investment: "Property values along the route of this highway are increasing by leaps and bounds. Flagler Beach... has seen tremendous strides in development and real estate transactions since the plans for the boulevard were completed" [175]. In a September 6, 1926 meeting of the Flagler Beach City Council, local officials formally passed a resolution for the construction of portions of the coastal road in Flagler Beach. Extensions of the road were added both by the city and private residents before, in 1929, the State Road Department (which became the FDOT in 1969) took over the construction and maintenance responsibilities for various smaller sections of the road which were eventually combined into State Road (SR) A1A.⁸⁰ More than any other physical structure, SR A1A, which today runs along the entire east coast of Florida, was constructed either on or near the crest of the natural beach fore dune in the vicinity of Flagler Beach.

⁷⁹ "the realization that barrier islands are migrating slowly landward and that shoreline erosion is a natural and largely uncontrollable geologic phenomenon has focused the attention of oceanside developers on maritime forests because such areas usually represent the most geologically stable portions of an island" ([90], p. 62).

⁸⁰ The state road department was swayed to take over the coastal road as a result of lobbying in the Florida House of Representatives by local developers like George Moody, as reported by local newspapers at the time, e.g. [176].



Figure 16:

Top: Aerial photograph showing the intersection of Moody Boulevard (SR 100) and Ocean Shore Boulevard (SR A1A) in Flagler Beach, ca. 1930. The image shows how portions of the barrier island were cleared and graded, most predominantly along the ocean front. This included the construction of houses and businesses, including the Flagler Beach Hotel (center) which no longer exists. **Bottom:** George Moody's Venice Park housing development under construction ca. 1950. Mechanical dredges were used to excavate sediment, which was then deposited inside of concrete bullhead walls and bulldozed flat, forming water front real estate where lots would be bought and houses constructed along a series of finger canals. Source: Photos courtesy of Flagler Beach Historical Museum.

Prior to 1970, Bunnell and Flagler Beach remained the only urban developments within the county, with Bunnell acting as the commercial center for the various inland agricultural communities and Flagler Beach a small-scale tourist destination and coastal community. The tide turned drastically, however, after the announcement of the 90,000 acre “new town” of Palm Coast⁸¹ in 1969, which allowed Flagler County, according to its first Comprehensive Plan (1974), to “finally begin to be affected by the building boom that has swept through the other Florida coastal counties” ([177], p. 32). The emphasis on economic development and the neglect of growth management policy discussed in Section 2.2 was particularly clearly manifest in Flagler County, where the pace of development achieved throughout the 1980s, 90s and 2000s reaching breakneck speeds (the county grew 163%, 76% and 90% in these decades, respectively), while urban sprawl and resulting environmental impacts continued largely unabated. Most of this growth can be attributed to the development of Palm Coast.

The infusion of capital for the planning and construction of the Palm Coast community came from the ITT Community Development Corporation, and was initially conceived to accommodate 750,000 residents [178], though this was eventually negotiated down to ca. 250,000 due to environmental and other practical constraints. While Flagler County over-all had lain relatively dormant in comparison to many other Florida counties, in the decades after 1970 it achieved population growth rates greatly surpassing those of famed growth hubs like Miami-Dade County, and Florida as a whole (see Figure 9 above).

One indication of the substantial impact Palm Coast had on the county and neighboring towns can be seen in its rapid ascension as a percentage of the total population. As previously mentioned, Flagler Beach accounted for roughly 20% of the county’s population in 1970, but after the settlement of Palm Coast, Flagler Beach quickly dropped in its relative contribution. Palm Coast, on the other hand, skyrocketed past Flagler Beach, surpassing in a decade what took Flagler Beach more than half a century to achieve in terms of population (Figure 17). The importance of this shift in relative contribution to over-all growth goes well beyond the aggregate indicator of total population. It also signifies a major shift in the qualities of development for the county over-all, in particular a major shift from rurality to urbanity. After the settlement of Palm Coast, county wide construction skyrocketed, with more than 95% of all constructed facilities in the county having been built after 1970. However, while Flagler Beach housing construction peaked in the 1980s, with only about 15% of the city’s total housing stock being

⁸¹ Palm Coast, one of the largest cities ever planned by a corporation in Florida, has its own fascinating development story, involving extensive deforestation and wetland drainage, as well as often vicious social conflicts between the founding ITT Corporation, elected officials and residents. The story, however, must unfortunately be left to future efforts by this author or another. For a brief history, see <https://www.palmcoastgov.com/about/history>

constructed after the year 2000, Palm Coast has continued to grow, with nearly 50% of its total housing stock being constructed after the new millennium (Figure 17).

Among the important points to take away from this brief description of Palm Coast's impact on Flagler County's growth trend is its contribution to the rapid increase in the county's total built environment. This rapid increase in housing and other buildings signifies a substantial shift in the county's economic base away from the rural industries in the western unincorporated areas (though these remain important) to urban real-estate development and service industries catering to residents and tourists. It also signifies that the county has experienced a substantial degree of environmental change. Between 1996 and 2010, for example, the area in Flagler County considered "high/medium intensity developed" or "low intensity developed" grew by 67.5% and 35% respectively, while forested area decreased by 26% in the same period ([179], also see Figure 17 below).⁸²

In 2005, Flagler County was leading the nation in the rate of both population and housing growth [181]. Such growth came with massive increases in land and housing prices in the county (largely inflated by speculation), similar to those experienced elsewhere in the state as a result of the post-2000 "Florida housing boom" [182]. The collapse of tremendously inflated real-estate prices in places such as Florida was an important determining factor in the economic downturn which began around 2007 and became widely known as the "Great Recession" [141]. States such as Florida which had gained much of their economic growth through inflated real-estate prices and the corollary industries such as construction, where hit doubly hard as the financial recession set in, being plagued with both the highest rates of unemployment (in 2010, unemployment in Flagler County had reached 15%, compared to 11% in Florida, and 9% in the United States)⁸³ and the highest proportion of "sub-prime" housing foreclosures, leaving many people without homes or jobs [183].

⁸² Some 95,000 acres of Flagler County forest were lost to wildfire between June and July, 1998, in the most catastrophic fire season to ever impact the county (see [180]). However, the statistics cited here are specifically related to forest area in the county lost to development.

⁸³ For Flagler County stats see <http://research.stlouisfed.org/fred2/data/FLFLAG5URN.txt>; For Florida stats see <http://www.floridajobs.org/labor-market-information/data-center/statistical-programs/local-area-unemployment-statistics>; for U.S. stats see <http://www.infoplease.com/ipa/A0104719.html>

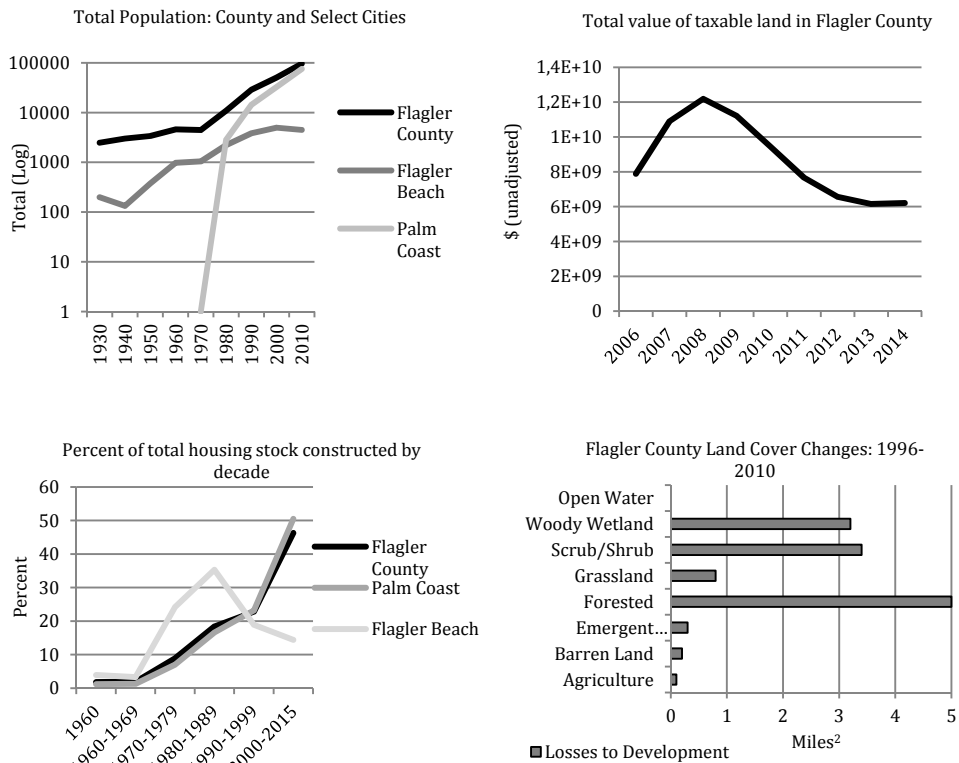


Figure 17:
Top left: Source: U.S. Census Bureau; **Top right:** Source: [184]; **Bottom left:** Source: [185]. **Bottom Right:** Source: reproduced from [179]

As a result of the real-estate market collapse, Flagler County, the “poster child” of the state’s boom and bust [186], lost roughly 50% of its taxable property value between 2008 and 2013 (Figure 17) as it transformed, as a local newspaper put it, from among the “fastest growing to hardest hit” counties in the country [187]. Only very recently has the Flagler-Volusia County area begun to rebound economically, being re-designated as one of the fastest-growing areas in the nation in 2017, with some taking this as a sign that the county, as a local newspaper punned, has “boom to grow” [188]. The impacts of the recent financial crisis on Flagler County, and the prioritization by state and local governments of reinvigorating economic growth, is an important part of the current context within which decision makers are operating. It, for example, has important impacts on the weight decision makers given to competing considerations, and even what role local government itself plays in pursuing development (and by extension, environmental protection) goals and priorities.

******This chapter began with the slow-but-sure awakening of the American public to issues of environmental degradation stemming from unregulated industrial and urban development, which had exploded in Florida in particular around 1920. The specific history of uniquely American environmental public policy [189] was underpinned by the normative positions of John Muir, Gifford Pinchot and Aldo Leopold, and institutionally buttressed by a strong managerial state. As post-WWII economic policies underpinned rapid growth in the middle-class, places such as Florida experienced rates of economic, in particular urban, growth equaled by increases in resident population and tourism flows. The economic crisis of the 1970s and the subsequent discrediting of Keynesian economics, however, signaled the beginning of a shift in policy orientation from one predicated on managerialism to one predicated on neoliberalism. With these broad shifts in orientation in mind, the chapter closed with a narrative of the concrete process of economic and urban development in coastal Flagler County. I highlighted in particular how processes of urbanization have led to local problems of environmental degradation which local governments are expected to address. At the same time, local governments are facing increased competitive pressure and tighter fiscal constraints, which, as we will see below, combine with other administrative constraints to severely restrict the possibilities open to local environmental managers. In Part Two below, I evaluate a series of proposed strategies for managing coastal environmental degradation in Flagler County, and in particular in Flagler Beach. The main intention in doing so is to organize the variety of solutions suggestions from “worst” to “best” according to their theoretical and practical adequacy for dealing with the environmental challenges specific to the Flagler County and Flagler Beach context.

PART TWO:

Evaluation of Competing Solutions

Chapter 3

Governance and the Environment

Sensitive plants grow by the inch and die by the foot.
Walking in the dunes damages the fragile environment.
- U.S. National Park Service⁸⁴

⁸⁴ Department of the Interior. Informational sign code 9050-KOD. This particular sign was located at Matanzas Inlet, St. Johns County, Florida.

3.1 From Local Government to Local Governance

In the previous chapter, I introduced the idea that the inward gaze of the post-WWII managerial state has increasingly given way to the outward entrepreneurial gaze of the neoliberal state, with significant implications for how state and local governments are expected to act and which activities they are expected to prioritize. Adding to these new pressures, the economic recession which began in 2007 has put local governments such as Flagler County under intense financial stress, making it more difficult for such local governments to provide the services they are expected to provide and collect the revenues they rely on. The intersection of increasing competitive pressure, downloaded responsibility and tightening fiscal constraints is leading to major adjustments in the strategies state and local governments are turning to in managing their local environments, with return on, and attractiveness to, investment increasingly being seen as key decision making criteria. This amalgam of economic constraints, furthermore, overlaps with political geographic constraints imposed on local governments through long-standing structures of formal administrative hierarchy. When taken together, local governments are shown to be extremely limited in their capacity to solve problems of environmental degradation, though they are increasingly being expected to do just that.

Historically, in Florida as elsewhere, the creation of local governments has been primarily to support the implementation of state policies and the provisioning of a variety of services and functions; as a result, local governments must operate within the statutory limitations of the state. When a municipality, for example, is granted a charter by the state, it is endowed with considerable discretion in fulfilling its rights and responsibilities in providing functions and services, though this discretion is subject to limitation by constitutional law.⁸⁵ At both county and municipal levels, such discretion includes the capacity to create and enforce local laws (ordinances), as well as performing planning and management functions.

Similar to many other counties in the state in the 1970s, Flagler County adopted its first Comprehensive Plan in 1974 in order to support efforts to contain or prevent what came to be recognized in later years as an “urban sprawl” problem in much of the state [190]. This was well before the passing of the previously mentioned Florida GMA in 1985, which made it compulsory for counties and local governments to adopt and coordinate their respective comprehensive plans with the state [136]. The Flagler County Comprehensive Plan outlines areas designated for rural and urban land uses and sets policy guidelines for coordinating and

⁸⁵ Florida Constitution, Article VIII, Section 2(b) states that Florida municipalities may “perform municipal functions and provide municipal services, and may exercise any power for municipal purposes except as otherwise provided by [state] law” (see [164], p. 247).

controlling future development of infrastructure and residential subdivisions. In its 1990 update, in line with legislation which had been passed at state and federal levels over the preceding decades, the county adopted a “Coastal Zone Protection” component into its comprehensive plan which provides guidance for enforcement of conservation and development policies through existing coastal regulatory laws within the county ([177], p. II-26). The amendment also designates what is considered the “coastal zone” from a county planning perspective, a designation which involves consideration of both strategic steering of future development and of the need to coordinate public safety procedures regarding e.g. evacuation during hurricanes. The Flagler County Comprehensive Plan was most recently updated in 2010 (with a planning horizon to 2035), including an elaboration of more direct guidelines for coastal conservation and preservation, including ([191], p. 10-11):

- Preserving and retaining ocean views, beaches, public beach access, and parks.
- Promoting dune protection and pursuing other means to prevent and mitigate beach erosion.
- Maintaining the Scenic A1A Highway [Ocean Shore Boulevard] and the beachfront character through design guidelines and other development regulations that minimize visual impacts.
- Protecting coastal development and populations from hazards to life and property by limiting density increases on the barrier island

The county’s policies to preserve, promote, maintain and protect the coastal environment are, like the FCMP and the CZMA, *guiding* policies, and as such do not directly prescribe management strategies or actions. Instead, municipal governments are allocated substantial responsibility regarding the establishment of local regulatory infrastructure to ensure that higher level policy goals are met as far as possible, while simultaneously pursuing specific, local community interests. At the municipal level, these local measures generally take the form of zoning regulations, local ordinances and commission resolutions.

Managerialism and coastal management in Flagler Beach

In Flagler Beach, the placement of SR A1A and other coastal infrastructure so close to, even directly on top of, front barrier sand dunes has created erosion problems along the local beach from the earliest days of the city’s establishment, as is clear from historic photographs (see section 2.3). The lack of environmental regulation⁸⁶ which characterized the first several decades after Flagler Beach’s

⁸⁶ This is not strictly true, as the city had adopted some specific restrictions before this time, for example banning the mining of sand from the local beach access ramp in 1925.

founding also meant that activities such as beach driving and walking on the sand dunes were common, even encouraged (Figure 18).

The impacts of foot and vehicular traffic on the dunes were further exacerbated by sporadic storms and other natural erosional forces. Among the most dramatic historical examples is Hurricane Dora, which made landfall just north of the Flagler Beach area in 1964, bringing hurricane force winds, severe erosion and wide-spread damage from Flagler County to the Georgia state line [192]. The erosion caused by Hurricane Dora in Flagler Beach undermined sections of SR A1A, prompting the FDOT to install sections of rock revetment to reinforce the roads structural integrity, adding to the piecemeal efforts of local authorities and private residents undertaken over the years to “stabilize” eroding sections of the local sand dune system ([193], p. 1-7).

Recognizing these early erosion control efforts, it is important to point out that the subsequent adoption of more general legal frameworks by federal, state and county governments, even when they prescribed more specific actions rather than general guidance, were not always adequate to deal with the concrete environmental problems in particular locations. In many places, local decisions which continue to influence coastal management efforts today were made prior to the establishment of legal regulatory frameworks. Many of these decisions have become physically and legally “embedded” in the landscape in ways that directly influence future planning and decision making efforts [194]. The Florida SBMP, for example, which explicitly seeks to restrict construction in vulnerable coastal locations by establishing the CCCL, does not help in directly dealing with the erosion problems experienced by the City of Flagler Beach because it does not apply retroactively. Much of the city’s current beach front infrastructure, in particular SR A1A, is located beyond the boundary established by the CCCL (Figure 18), meaning it might not be approved for construction if it were newly planned today.

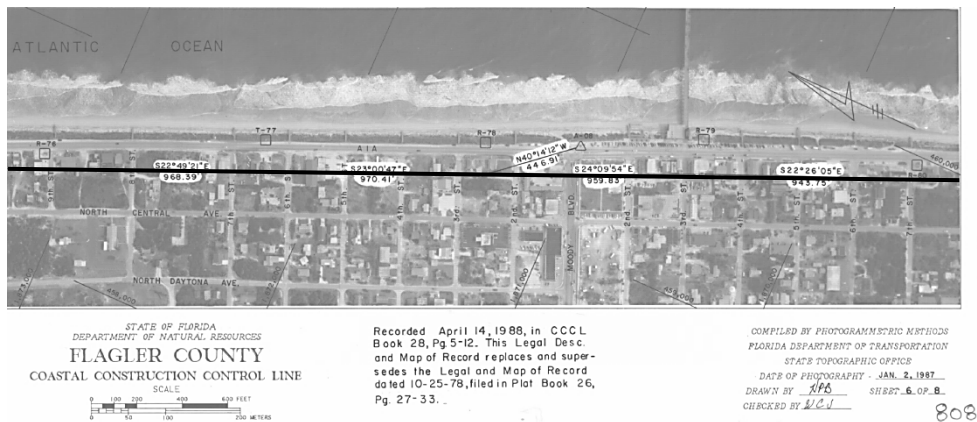


Figure 18:

Top: Cars parked directly on top of the front sand dune along Ocean Shore Boulevard (SR A1A) in Flagler Beach, ca. 1930. Source: Flagler Beach Historical Museum. **Bottom:** Detail of CCCL planning map in Flagler Beach, 1988. The enhanced solid black line running horizontally across the photo is the CCCL, surrounded by surveying coordinates. SR A1A and other structures which preceded the establishment of the CCCL are located beyond its current boundary. Source: Florida Land Boundary Information System (www.labins.org).

In order to address its specific erosional issues, the City of Flagler Beach has adopted a variety of municipal-scale mechanisms for controlling development and managing its local beach environment. Like Flagler County, Flagler Beach has also formulated a Comprehensive Plan [195] which contains a specific Conservation/Coastal Element detailing objectives and conservation- and preservation-oriented policies⁸⁷ designed to regulate activities influencing the

⁸⁷ Examples of conservation-oriented policies are found under Objective E.1.2 9J-5.013(2)(b)2 *Groundwater Resources* which provided guidance to ensure the efficient use of water by residents and businesses, while examples of preservation-oriented policies are found under Objective E.1.4

coastal environment within city boundaries. The city has also adopted a plethora of coastal management-related ordinances, namely those found under the Flagler Beach Code of Ordinances, Chapter 6- Beaches and Recreation. Many ordinances were passed specifically to regulate citizen and visitor behavior deemed destructive, such as the local ban on beach driving (Ord. No. 80-19). Other non-legislative strategies to direct and control the behavior of citizens and visitors were also adopted to complement the city's regulatory ordinances, for example the building of dune over-walks, planting of vegetation and installation of fencing to prevent people from trampling the dunes (Figure 19).⁸⁸

Many of the most high-impact local measures taken to protect the city's beach and wetland environments are credited to the work of the late, longtime resident and city commissioner Betty Steflik, viewed by many as an environmental hero in the city. Betty Steflik played a central role in the process of writing construction regulations, establishing environmental goals and building the city's system of dune-overwalks. Among her most enduring legacies is the preservation of the mangrove and saltmarsh habitat which today is known as Betty Steflik Memorial Preserve at Flagship Harbor. This public park, a maze of boardwalks, nature trails and gopher tortoise burrows, was once planned to be developed into a strip mall and housing complex similar to the Venice Park housing community constructed by George Moody in the 1950s. However, a coalition of environmental groups, citizens and elected officials were able to draw on the city's environmental policies to pass what became City Resolution 90-16, *A Resolution Supporting the Preservation of Real Property Known as 'Flagship Harbour'*. This resolution officially had the city purchase the land for purposes of environmental conservation and public recreation, and the property today is designated for conservation under the city's official zoning regulations (see [172], in particular Figures 4 and 5). After her death in 2004, many obituaries celebrated Betty Steflik's life by recalling how 'Flagler Beach would have a totally different look today if it were not for her vision and commitment' [198] and how 'the picturesque Flagler Beach of today is a result of Steflik's commitment and vision for the environment' [199].⁸⁹

9J-5.013(2)(b)4 *Fish, Wildlife, and Vegetation* which provide for the protection of threatened or endangered species and habitats through building restrictions and public land acquisition.

⁸⁸ In response to major damage caused by Hurricane Matthew, the Flagler County TDC proposed in June 2017 an awareness campaign dubbed "Dodge the Dunes". "The goal of the campaign", according to TDC Director of Tourism Marketing, was to "educate [beach-goers] about the importance of beach renourishment, conservation and sand dune preservation" (quoted in [196]).

⁸⁹ I think it is important to recognize the contributions made by citizens and elected officials like Betty Steflik, which would include many other current and previous individuals, as they have collectively achieved substantial progress in raising awareness and taking practical actions to restore the damage from the past and to mitigate any further problems. We can learn a lot from them (see [172]). However, it would be untrue to suggest that degradation of the city's coastal



Figure 19:

Top Left: Posted signs in downtown Flagler Beach warn citizens and visitors of the penalties for violating local ordinances. **Top Right:** a newly constructed dune over-walk (ca 1980) provides beach access without trampling fragile dune vegetation. **Bottom:** recently planted vegetation, post-Hurricane Matthew, which discourages individuals from walking down the dune. Source: Top left: Author's photo, 2014. Top right: Flagler County Historical Museum. Bottom: Joy McGrew for FlaglerLive [197].

environment has not continued in many ways, in particular regarding beach erosion which in many locations has only gotten worse.

Continuing to build on the foundation laid by people like Betty Steflik, the city's most recent effort to get a handle on the beach erosion problem involved assigning an ad hoc committee to develop a city beach management strategy, which resulted in the City of Flagler Beach *Beach Management Plan* [200] adopted in 2014. This document articulates a general strategy and some concrete recommendations for how the city can pursue its "beach vision"⁹⁰ within the confines of the more general city and county comprehensive plans and state and federal regulations.

A neoliberal shift in local environmental governance?

The environmental management strategies considered thus far, such as local ordinances, have aimed to address degradation within municipal boundaries, in line with that Harvey called "managerialism" [134], or as Marinetto ([201], p. 60-63) points out, what would have been termed traditional government before the "governance" turn in political science in the 1970s and 80s. Political scientist Mark Bevir ([202], p. 1) for example, begins his introduction to governance with a fairly standard explanation of how governance differs from government, namely that the former "focuses less on the state and its institutions and more on social practices and activities"; that is, governance refers to "all processes of governing, whether undertaken by a government, market, or network, whether over a family, tribe, formal or informal organization, or territory, and whether through laws, norms, power or language".

Starting in the 1970s, political science theories about the state began arguing that the traditional, centralized state was "failing and enfeebled", being either overburdened by too many responsibilities or becoming fragmented into a vast network of semi-autonomous organizations; as a result, according to the new "governance theory", government structure has transformed "from hierarchical bureaucratic organization to a fragmented and decentralized entity" incapable of single-handedly addressing modern social and environmental challenges ([201], p. 52-53). Authoritative scholars Magali A. Delmas and Oran R. Young, for example, open their 2009 book *Governance for the Environment*, with the passage "We live in an era in which the demand for governance... is growing, while confidence in the capacity of government – the conventional mechanism for handling such matters – to address problems of governance is waning" ([203], p. 3).

⁹⁰ Flagler Beach's Vision Statement reads as follows: Preserving our environment as a community asset; Maintaining our Old Florida heritage and small town charm; Providing a safe, healthy and clean environment; Supporting the development of local business to provide services to residents; Promoting and supporting eco-tourism through our natural resources; Providing opportunities for education, culture and recreation ([200], p. 2).

Such changes to the centrality and extent of state responsibility and power is thought to necessitate the formation of unique constellations of public and private actors as means to fulfill the responsibilities previously assigned to but no longer being fulfilled by government proper. An example would be the PPPs Florida embarked on in the 1990s discussed in Section 2.2 above (see also [132]). Arguments for the introduction of non-state actors into social and environmental management arrangements (i.e. governance) are predicated on the idea that governments are “sluggish”, that they “lack the discipline of the market”, and that they “regularly fall prey to corruption”, leading some not only to welcome, but to explicitly encourage a future of “governance *without* government” (e.g. [203], p. 5-9, emphasis added). Such transformations in perspective on the role of the state coincide with the previous discussed (Section 2.2) crisis of Keynesian economic policy in the 1970s and the subsequent ascendance of what is now commonly referred to as neoliberal policy.

The shift towards neoliberal policy reform in Florida, as in the United States more broadly, has been accompanied in part by a shift in government strategy from one predicated on “managerialism” to one predicated on “entrepreneurialism” [132]. The “defining characteristic” of entrepreneurial governance, explains Du Gay ([204], p. 155), is the “generalization of an ‘enterprise form’ to all forms of conduct – to the conduct of organizations hitherto seen as being non-economic, to the conduct of government, and to the conduct of individuals themselves”. This shift in orientation lends itself to the creation of innovative arrangements involving a variety of public and private actors for purposes of facilitating economic development as a means to satisfy social needs, rather than satisfying those needs directly through the tax-based redistribution characteristic of managerialism. Such a competitive orientation signifies the prioritization of the “speculative production of place” over the more traditional managerial goals of addressing territorially bound social and environmental needs ([134], p. 8). Entrepreneurialism in government activities becomes more prominent as they adjust to “heightened levels of economic uncertainty by engaging in short-termist forms of interspatial competition, place-marketing and regulatory undercutting in order to attract investment and jobs” ([205], p. 58).

Whether Flagler County or Flagler Beach exhibit an entrepreneurial orientation in their approach to coastal management is somewhat ambiguous. This ambiguity comes from the fact that neoliberal policy reform, as *re*-form, is necessarily predicated on the dismantling or infiltration of pre-existing policy frameworks and institutions, resulting in hybridized, or “variegated”, concrete outcomes [206]. However, there are important indications that both county and city government entities are increasingly turning to and relying on entrepreneurial strategies, even if more traditional aspects of local government activity remain in place, lending plausibility to the argument that county and city officials have to some degree been

forced to dawn the “entrepreneur’s new clothes”, as Andy Merrifield has put it [149]. For example, in Flagler County the Tourism Development Council (TDC), a relatively autonomous entity originally associated with the Flagler County Chamber of Commerce before being taken over by county government [207], was established to more aggressively and strategically promote the county’s competitive advantages. Since its inception, the TDC has undertaken concerted efforts to advertise the Flagler County area to prospective investors, tourists and residents. The county, for example, has been rebranded as *Palm Coast and the Flagler Beaches*, while the City of Flagler Beach was actively involved in a national competition held by Budget Travel [208] in 2013 to be named one of the “coolest small towns in America”.

The TDC is comprised of a mixture of county appointed government officials and private business leaders who are involved in the tourism industry, and is overseen by its executive director who reports to the county administrator. The TDC’s official role is to make “recommendations to the Flagler County Board of County Commissioners to oversee the uses of Tourist Development Tax collected”, though as the Flagler County administrator noted in 2015, the TDC has taken an increasingly active role in event organizing, subsidy allocation and purchasing of equipment [207]. Tourist Development Tax is collected through a specialty surcharge on the county sales tax, known popularly as a “bed tax”, which is applied to hotel, motel, RV and other short-term rental charges. The collected tax revenue is funneled into one of three funds, Fund 109 Capital Projects; Fund 110 Promotional Activities; and Fund 111 Beach Restoration, each of which is allocated a specific percentage of the Tourism Development Tax revenue collected.⁹¹ In 2016, the TDC reported \$9.94 in tax revenue collected for every dollar invested in tourism in Flagler County, with tourism employing nearly one-in-four working residents and being responsible for nearly \$70 million in payroll.⁹²

Beyond branding, the TDC has also on occasion moved to offer incentives to attract big-crowd events, for example the 6,000 person Spartan race which, in 2015, TDC members proposed be held in the historic Princess Place Preserve in the northern part of Flagler County [209]. The suggestion infuriated many local residents, with one local critic claiming it amounted to “pimping Princess Place”, calling it a “rape in the making” [210].⁹³ Regardless of opinions about the TDC and its antics, it is hard to argue with the fact that the Tourism Development Tax collected has provided for an increasingly important source of public revenue,

⁹¹ See http://www.flaglercounty.org/visitors_and_amp_tourism/tourist_development_council.php

⁹² See <http://www.travelmediapressroom.com/palm-coast-flagler-county-florida-continues-reap-benefits-tourism/>

⁹³ After strong pressure was put on both the county commission and the TDC by county residents, the Spartan race was eventually moved to private land [211].

growing nearly tenfold over the last 15 years (rates have increased from 3% to 5% in this time, Figure 20).

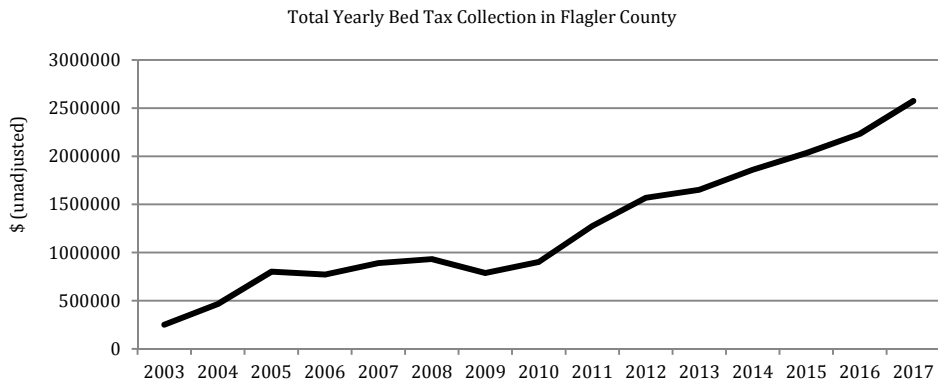


Figure 20:

Collected bed tax in Flagler County, levied against temporary stays in hotels and other accommodations, has increased from \$250,000 in 2003 to \$2,500,000 projected in 2017. The tax revenue collected, shared among several tourism-related activities, is the only formal source available for beach management projects. Source: [212]

While previous modes of managerial governance (i.e. government) involved counties and local governments as “service providers” and “extensions of the state administrative apparatus”, neoliberalism promotes devolving decision making responsibility to local governments without necessarily providing them with the formal mechanisms (i.e. financial, legal, etc.) to meet these new responsibilities [135, 213]. Such an unmanageable burden can force local governments to privatize public services or to resort to other forms of PPP to meet citizens’ needs. As Canadian research chair in political economy Jamie Peck ([135], p. 18) has noted:

Some cities will be able to muddle through [neoliberal policy reforms] by cutting corners (and maybe the odd department) while keeping the streetlights burning; for many others, ongoing fiscal restraint, service retrenchment, and public-private workarounds seem set to reshape the operating environment over the medium term.

In response to the increasing competitive pressure and tightening fiscal constraint characteristic of neoliberal reforms, innovative approaches to attracting investment and revenue collection by local governments, such as the TDC and its collection of Tourism Development Tax revenues in Flagler County, are becoming increasingly significant in terms of funding public projects and services, including environmental management. For example, in Flagler County revenues collected by the TDC provide the only formal funding pot for beach management activities in the county. In this way, funding for environmental management is directly linked

to tourism flows, meaning that increases in public funds available for environmental purposes rely on growth in the local tourism economy. This is not to say that the more traditional approaches to environmental management, such as local ordinances, are becoming unimportant, as they remain central components of broader environmental governance strategies. Rather, I want to emphasize the increasing interconnectivity between environmental management and economic growth, with the former more and more relying on the latter for funding.⁹⁴ This also suggests that, rather than being a policy *choice*, local governments are increasingly *forced* to act entrepreneurial first and foremost in order to even stay afloat. The increasing number of municipalities filing for Chapter 9 bankruptcy in the United States provides one strong indication of the potential consequences local governments experiencing the pressure of neoliberal reforms might face if they are not able to stay competitive and attractive to investors [135, 213].

Still, regardless of the number of ordinances adopted or the amount of tourism tax raised, many local governments are still seriously limited in their ability to effectively address environmental problems in other ways, as formal decision making power and adequate funding sources often lay beyond the reach of municipal officials and residents.

3.2 Critical Erosion and Limits to Local Governance

Local governance, predicated on local autonomy and inter-municipal competition, is encouraged under neoliberalism. Local governments, as a result, are often doubly constrained by the pressures imposed through neoliberal policy itself (i.e. heightened competition) as well as pre-existing controls imposed by, for example, the structures of political geography or the particularities of local physical environment. This realization leads us to the important point made by Neil Benner and colleagues [206] that actually-existing neoliberal reforms are never undertaken *tabula rasa*, but instead only exist in hybridized forms, with market-oriented reforms in practice always interacting with inherited institutional settings. Any changes in responsibility of local governments in Florida, for example, will necessarily interact with pre-existing limitations on decision making spaces as well as constitutional constraints on revenue generation. As a result, local governments like Flagler Beach, despite their best efforts, are often found not to be in a position to solve the problems with which they are faced, at least not on their own.

⁹⁴ To further substantiate this point, it is worth noting here that the most recent suggestion on how to fix the erosion problem after Hurricane Matthew (see Section 6.2) fundamentally relies on a combination of state funding and TDC funding, the latter being sourced exclusively through increases in the county bed tax [214].

In order to clarify why the City of Flagler Beach, and Flagler County for that matter, are systematically limited in their ability to manage the erosion problems in the city, it is important to specify more precisely what the erosion “problem” actually is. First, it is important to point out that, as we will see in Section 4.2, erosion itself is not a problem *per se*, and in fact is a natural, inherent component of barrier island developmental morphology [215, 216]. However, the interaction between erosional processes and coastal infrastructure or habitat deemed important by social actors produces what is called “critical erosion” [130]. The designation of erosional sections of beach as “critical” is meant to specify that there are important interests that are being threatened by erosional processes that are in need of protection. The formal designation of a coastal line as critically eroded opens up the possibility for state and federal funding for long-term management and restoration of specific sections of shoreline as part of the SBMP (pursuant to Sections 161.101 and 161.161, Florida Statutes). Currently, about half of the designated critically eroded shoreline in Florida is managed in some way under the general supervision of the FDEP [130].

Critical erosion in Flagler Beach is part of a much wider network of critically eroded shoreline statewide. The most recent assessment of critically eroded coastline showed that some 412 miles of Florida’s shoreline is considered critically eroded (amounting to roughly 50% of the state’s sandy beaches), with about 4.8 miles being located along the Flagler County coast (Figure 21). Since critical erosion surveys began in the late 1980s, the problem of critical erosion has continued to grow due to the dual influences of sporadic coastal hazards (e.g. Hurricanes, Nor’easters) and the continued expansion of Florida’s coastal population and related development.

The critical erosion in Flagler Beach is threatening beach front infrastructure largely developed prior to the establishment of the CCCL and other regulations, most notably SR A1A. As was seen in Section 2.3, back in 1929 George Moody, the founder of Flagler Beach, and his colleagues lobbied the Florida House of Representatives to transfer maintenance responsibilities for what would become SR A1A in the city over to the FDOT [176], which has the primary legal right and responsibility to manage the state’s transportation infrastructure. The FDOT is also formally part of the consortium of state agencies responsible for the implementation of the FCMP, positioning the agency as potentially central to coastal management decision making throughout the state depending on the context.

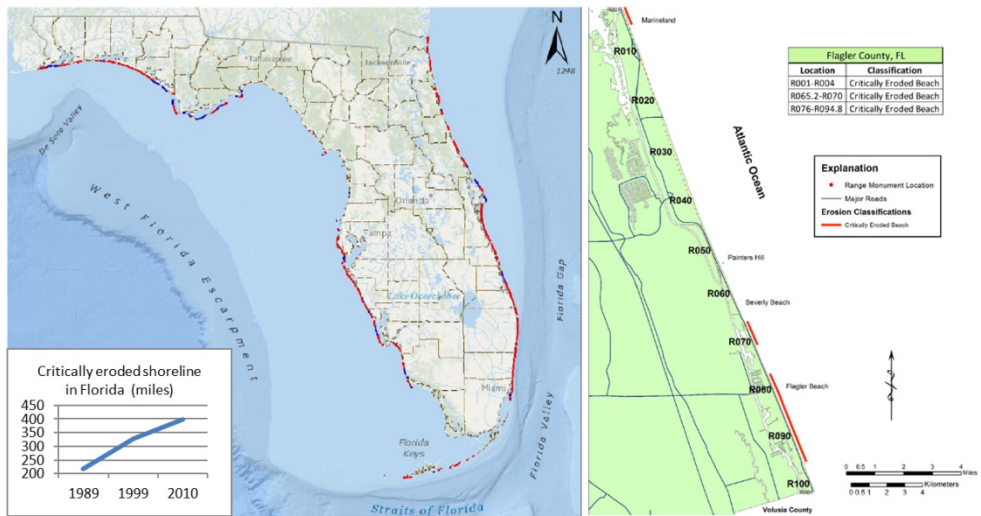


Figure 21: Left: Critical eroded beaches in Florida. Right: Critical eroded beaches in Flagler County, including Flagler Beach. Source: Red lines indicate critical erosion. Source: Left, Author’s maps, 2017. Right graphic and critically eroded shoreline data from [130].

Local limits through administrative hierarchy and fiscal constraint

The City of Flagler Beach is structurally limited in its ability to address its erosion problems in two fundamental ways, administratively and fiscally. The first has to do with the state’s political geography, in particular the restrictions imposed by what is known as a transportation right-of-way. The FDOT’s power to act as an agent of the state at the local level is derived from and bounded by its legal right-of-way. In legal language this boundedness is discussed in terms of “ingress” (encroaching on the right-of-way) and “egress” (protruding from the right-of-way), both which the FDOT has the legal authority to control and the legal obligation to abide by, as established under Statutes 334.044 (14).

The kind of decision making power found in the FDOT’s right-of-way is the same as what Hägerstrand and Clark ([68], p. 21) call “territorial competence”. This concept captures the idea that physical actions in the landscape are “always effectuated by some primary actor... whose rights are protected by law or according to local customary principles but at the same time also strictly limited in space by the same rule systems.” Within its allotted territory, the FDOT has statutory competence, and indeed legal responsibility, to “coordinate the planning and development of a safe, viable, and balanced state transportation system serving

Beyond the constraints imposed by political and physical geography, the structure of Florida's public revenue system imposes serious constraints on the municipal-level capacity to collect funds, as "local jurisdictions find themselves in the same basic situation as the state, with constitutional and statutory limitations on raising revenues" ([219], p. 55). These restrictions on the collection of municipal revenues include property tax constraints such as setting maximum mileage rates and homestead tax exemptions, sales tax constraints such as limitations on use of sales tax revenues and the requirement of voter approval of new sales tax, and income tax constraints which both state and local governments are constitutionally prohibited from collecting ([220], p. 317-320). As Pelham ([163], p.17) explains, this structural squeeze on revenues has affected local governments ability to manage the problems that have come with the state's rapid growth:

Historically, Florida's local governments have relied primarily on local property taxes to finance their operations. This reliance on the property tax carries with it a built-in incentive for local governments to approve development because it will increase the local tax base. Although the Legislature has provided for some other optional local taxes, such as local sales taxes, it has imposed a voter referendum requirement for exercise of these powers... The lack of adequate alternative revenue sources for local governments hinders their ability to effectively implement state growth management requirements.

The reliance on these limited funding streams is apparent from a time series of Flagler Beach and Flagler County revenues divided among their sources (Figure 23). Generally speaking, Florida municipalities tend to generate most of their revenues from the provisioning of municipal services which are amenable to user charges and fees, including utilities and waste management. This means that local governments traditionally rely less on property taxes (*ad valorem*, or AV taxes) for public revenue than counties do⁹⁷, though they still constitute critical revenue streams. As would be expected, service charges on e.g. utilities have historically made up the lion's share of Flagler Beach's revenue flow. This has become a smaller lion's share however as AV taxes have grown in their contribution, a result both of increasing property values and increases in the mileage rate of taxation.⁹⁸ Other general government taxes, for example local sales taxes, have decreased in their relative contribution over time. In terms of per capita contributions, residents

⁹⁷ Counties rely more on AV taxes because the services they generally provide, such as police and court systems, make it difficult to raise revenues from fees and surcharges (see [220], p. 321).

⁹⁸ In October, 2017, the Flagler Beach City Commission moved to raise their service fee rates about 25% on average across the board. The lack of revenue resulting from a neglect to raise such fees in recent years has caused substantial financial trouble for the city and poor maintenance has led to the need for major over-hauls of some the town's basic service infrastructure [221].

are, generally speaking, paying more per person into each category than they were 20 years ago.

Florida's local governments, including counties, municipalities, and special districts, generally provide three basic types of services: traditional services, for example maintaining roads, operating legal and correctional systems, providing health care and hospitals, etc.; municipal-type services, for example providing utilities, fire protection, and consumer inspections; and urban-type services, for example waste management, parks and recreation, parking facilities, etc. (see [164], p. 254-259). Flagler County government, like the majority of counties in Florida, predominantly provides traditional services to all county residents, while the municipal government in Flagler Beach provides a mixture of municipal-type and urban-services. Both local governments lump all expenditures into a series of categories for accounting purposes, most notably Culture and Recreation, Physical Environment, and Transportation (Figure 23). By far the largest percentage of municipal expenditure in the city is related to physical environment, which includes urban-type services such as solid waste management, water treatment, and maintaining public buildings as well as the city Fire Department. Culture and Recreation expenditures make up the next highest group, which includes municipal-type services such as maintenance of city parks and libraries. Transportation, which involves the maintenance of city roads and parking areas, makes up the smallest percentage expenditure of the three main categories.

The proportion of public revenues spent on various expenditure categories in Flagler Beach has, since 1993, remained relatively stable over-time, with physical environment expenditures absorbing around 80% of the city total expenditures annually. The other categories have also remained mostly steady over the last two or so decades. This indicates how, even as the total revenue coming into the city has increased over-time, increases in collected revenues have not led to increased expenditures for other purposes than those traditionally prioritized, for example new expenditures on beach erosion management. In fact, even the *ability* for Flagler Beach to spend the sales tax it does collect on beach protection was subject to approval by the Florida Attorney General, which it was only recently granted in 2012 [222]. Still, today the city has no official line in its budget specific to beach management.

As an example of the fiscal constraints under which Flagler Beach elected officials must operate, consider that the city has tended to allocate between 5% and 10% of its total annual expenditures to local transportation costs. Between 2001 and 2007, the city's annual expenditures averaged around \$3.4 million, meaning somewhere between \$170,000 and \$340,000 would have been spent on annually on transportation. The annual maintenance costs for the eroding section of SR A1A between 2001 and 2007, however, was \$1.25 million (see Section 5.1), or roughly 40% of the city's *total* expenditures, though of course expenses varied greatly year

to year depending on the frequency of storms and other factors. Even if the city had the legal capacity to address the critical erosion problems, the constraints imposed by the state's public revenue system means that the city cannot collect public revenues adequate to cover the expense of maintaining the eroding sections of SR A1A in the city, at least not without making substantial spending cuts to basic services. Instead, the city is heavily reliant on the allocation of state funds for purposes of maintaining SR A1A and the critically eroded dune that threatens to undermine it. As one Flagler Beach commissioner noted, while many residents enjoy the benefits of living near the beach, the state subsidizing of the real costs of transportation keeps many residents from understanding the true financial burden of erosion management in the city (Interview 2):

FBCC: They see the beauty, they see it, they experience it, they think that ocean is gonna be there for ever and ever, but they don't look at the small, underlying problems. And because it hasn't hit Flagler Beach in the pocket book, it hasn't hit us. We've not been told that we have to replace A1A *laughing*, we've not been told that you can't have a pier anymore, because we don't have the money to keep it going, you know, we pay portions but we're subsidized. So, unless the state stops subsidizing us, and we take ownership of it, people don't [feel the financial impact]... all they care about [is] "Keep my taxes low".

The financial limits of the city to manage the critical erosion problem were, however, made crystal clear in the aftermath of Hurricane Matthew. Very nearly making landfall as a strong category 2 storm in Flagler County early on Friday, October 7th, 2016, Matthew was the most destructive hurricane in the history of the county. Prior to arrival in Florida, the storm had already pummeled Haiti and Cuba, killing more than a thousand people. The storm caused an estimated \$60 million in damage to the county's beaches alone [223], while the cost of repairing a 1.3 mile section of SR A1A in Flagler Beach which was badly damaged in the storm was initially estimated at anywhere between \$10 million and \$222 million depending on the specifics of the selected repair project [224]. For comparison, Flagler Beach's *total* expenditures in 2014 amounted to just over \$4 million.

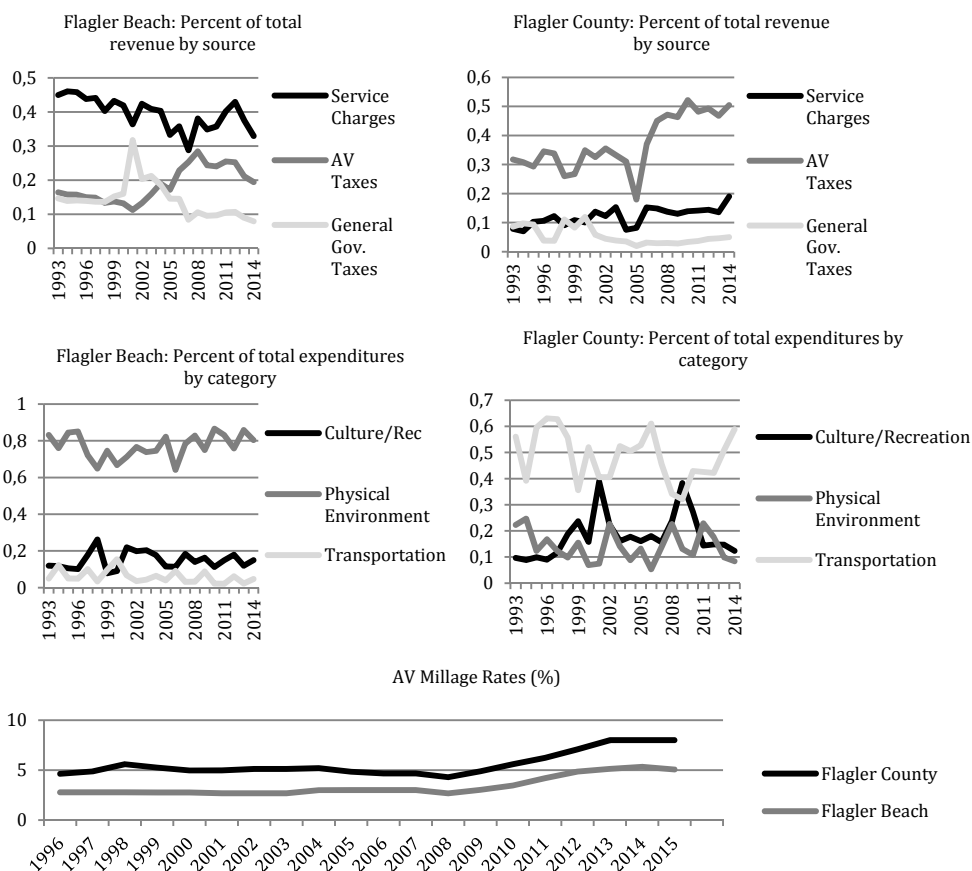


Figure 23:

Top Left: Revenue by source for Flagler Beach and **Top Right:** Revenue by source for Flagler County. The missing percentage is made up of a combination of various smaller contributions, such as interest and earnings, and judgments, fines and forfeits.

Middle Left: Flagler Beach expenditures by category. **Middle Right:** Flagler County expenditures by category. **Bottom:** County and Municipal millage rates over time. Note the rise in rates at both county and city levels after the financial crisis which began to hit the county hard in 2008. Source: Data courtesy of the Flagler County Clerk of Court.

Beyond the municipal boundaries of Flagler Beach, Flagler County elected officials and agencies maintain substantial responsibility for managing the county's beaches, along with providing a slew of other traditional and municipal-type services. Beach maintenance is funded at the county level through a special sales tax related to short-term rentals and hotels, known as a "bed tax", collected into a fund controlled by the county TDC. In the wake of Hurricane Matthew, in order to

increase the funds available for beach restoration (not including the damage to SR A1A in Flagler Beach), the county moved to raise the bed tax rate from 4% to 5%, and increase (at least in the short term) the proportion of those revenues dedicated to beach restoration [225]. However, even with the increased revenue, the county's coffers are wholly inadequate to cover the price tag of restoring the county's beaches (the majority of the county's money, like Flagler Beach, is used up on providing other services), and with the limited money that is available the county is looking to stretch it as far as possible to address beach problems elsewhere in the county, leaving Flagler Beach at a lower level of funding priority [226]. Such limited financial means have left both Flagler County and the City of Flagler Beach heavily reliant on financial support from the state or federal governments regarding long-term management of critical erosion.

The precarious position in which the Flagler Beach and Flagler County must operate in terms of beach management was clearly exposed by the fact that a single storm, Hurricane Matthew, has all but completely eliminated the county's ability to fund response and recovery from subsequent storms. As a local newspaper commented in early 2017, nearly six months after the storm:⁹⁹

Flagler is still recovering, with its beaches sheared of millions of cubic feet of dunes that must be replaced. County spending to recover from the storm has severely depleted county coffers and required an increase in the tourism sales tax, from 4 to 5 percent, to help defray current and coming costs... The county literally cannot afford another severe storm striking its territory: it would most likely not have the money to recover, absent greater intervention from state and federal sources [228].

Elected officials in the City of Flagler Beach recognize the constraints imposed by the state's political geography and public revenue system. For example, the Flagler Beach Public Works Director reminded me in an interview in 2015, "really the beach isn't ours. It's called Flagler Beach, but it's really FDOT right-of-way" (FBPWD, Interview 3). While, regarding financial constraints, another elected official who sits on the Flagler Beach City Commission explained to me in an interview in 2014 how the city is not only unable to afford beach restoration and management, and thus is reliant on county, state and federal subsidies, but that the city itself is placed in competition with other cities within the county and state which also seek financial support from higher levels of government (Interview 2):¹⁰⁰

⁹⁹ A similar problem has also been the case for the state as a whole, with the costs of hurricane cleanups resulting from the 2016 and 2017 hurricane seasons "taking a toll on budgets" [227].

¹⁰⁰ In order to increase the city's chances of securing funding, Flagler Beach maintained a long-term paid relationship with the K-Street lobbying firm Marlowe & Company which pushed for securing funding for the city and county from the federal government. The hiring of such a lobbying firm in response to increasing economic competition between municipalities to gain access to diminishing

FBCC: If there's no grant money, you don't get [a beach management project], you don't get anything without a grant. This city [Flagler Beach] is not gonna turn over 3 million dollars for a [beach restoration] study. We don't have it. So, whoever has it wins. You have 400 critically eroded miles in the state of Florida; 400. 200 are being dealt with in some way shape or form. There's still 200 out there that haven't been touched. We're one of them. How do we get two miles of our little beach, how do we beat out the other guy? ... It's very frustrating, very very frustrating. The big boys down in Miami that have the big tourist money, the big hotels, all the hotels that have big money, their all gonna win over us, I mean let's face it. Is anybody in the Hammock¹⁰¹ suffering from beach erosion? That's where the money is in Flagler County... it's here [in Flagler Beach]; this is where the critical area is.

As a final example, the City of Flagler Beach's recently completed Beach Management Plan offers further indication that the city has reached the limit of its capacity to address its critical erosion problems. After nearly two years of reviewing the history and current influences on and approaches to beach management in the city, the report authors compiled a series of recommendations on how the city could improve its beach management strategy. The recommendations, however, focused on strengthening the beach management local governance mechanisms which are already in place, including more effectively enforcing existing laws and ordinances, engaging in community and visitor education and outreach, keeping the environment clean of waste, improving communication with other agencies and continuing to direct the behavior of visitors and residents with signage and by blocking access to the dunes with post-and-rope or thorny vegetation ([200], p. 49-55). No potential funding mechanisms or potential budget items were recommended. All of the suggestions build on strategies which already exist in the city and, as I have demonstrated above, are significantly constrained when it comes to addressing their most serious critical erosion problems which are contained within the FDOT right-of-way.

******The City of Flagler Beach has the capacity to regulate individual actions by passing local-level ordinances, building dune over-walks, etc. And it has, since at least the 1980s, done so. And it has achieved an important degree of success in mitigating further damages to the coastal environment. However, the structure of political geography in coastal management in Florida means that the city does not have the capacity to address the biggest issues associated with critical erosion, in particular those decisions regarding the location and maintenance of the transportation corridor SR A1A. Furthermore, even in a world where the city *did* have decision making power over the local state road, the financial burden of

federal revenue streams is representative of the kinds of impacts being felt as a result of neoliberal policy reforms at federal and state levels. I discuss this issue in more detail in Section 2.2 above.

¹⁰¹ The Hammock is the local name for a residential area in the northern part of Flagler County.

maintaining (or, in the post-disaster context, reconstructing) the road far exceeds both the city's and the county's ability to collect public revenues, leaving both in many ways at the mercy of state and federal agencies which must provide financial support for larger-scale coastal management projects. In Flagler Beach, the dominant agency involved in managing the local beach is undoubtedly the FDOT, and their perspective on the critical erosion problem is in many ways reflective of their position as an appendage of state government and its commitment to maintaining basic conditions for economic production.

Chapter 4

From Bad Behavior to Structural Constraint

We're not in the beach [management] business.
We are going to do what we have to do to protect our road.

-FDOT District 5 Environmental Permit Coordinator¹⁰²

¹⁰² Quote transcribed from a recorded public FDOT Emergency Meeting held in Flagler Beach City Hall, October 13, 2016. This particular FDOT representative was introduced to the public as a “biologist and expertise in all kinds of critters and flowers and dunes and all of that.”

4.1 Where Priorities and Constraints Collide

There are major structural constraints¹⁰³ on the ability of citizen's and elected officials in the City of Flagler Beach to manage critical erosion affecting their local environment, but there are also actions the city can and has taken to prevent individual residents and visitors from further degrading the local environment. This has largely taken the form of a system of regulations and incentives. However, the limited ability of the city to dedicate revenue, combined with the restrictions imposed by state political geography, mean that the primary capacity for solving the critical erosion problem in many ways lies beyond the reach of municipal government and residents.

The current location of SR A1A makes it the most prominent asset under threat from critical erosion in Flagler Beach. This has produced a situation where the FDOT, an agency not generally associated with coastal management, plays a dominant role in managing the city's critical erosion problem. The FDOT, as one would expect any transportation agency to be, has been active in continually managing erosion damage to SR A1A; however, the consequences of the agency's activities have been a serious bone of contention in the city for decades. Understanding how and why the FDOT acts as they do in response to critical erosion requires becoming acquainted with the powers and duties conferred on the FDOT as an agency of the state, as these are the key to uncovering the organizational and legal structures that both prescribe and constrain its actions.

The FDOT is the state's primary transportation agency, and as such it serves a particular and limited role among a variety of other agencies in implementing the state's policies, including the FCMP (see Section 2.2). When the FDOT comes into contact with citizens as a result of its normal activities, it is generally through its district representatives that are responsible for organizing physical meetings with elected officials, hearings for public comments, etc. And because of this face-to-face interaction between FDOT and citizen, there is a tendency to lay the blame on these representatives when problems with the FDOT arise. One local elected official, for example, complained about the agencies "complacency", suggesting the problem may be related to the agency staff (Interview 2):

FBCC: There's some complacency at the FDOT, I don't know what it is, don't know if its people getting ready to retire, there's no urgency until the fire is already in full force *laughing* you know? There's no preventative stuff, there's no, there's no interaction with the local governments: "what do you need, what do you want?"

¹⁰³ By structural constraints I mean to invoke the concept of *social structure*, which can generally be understood in terms of John Scott's useful definition: "Social structures are complex articulations of the institutional and relational elements of social life into a distinct and comprehensible pattern that constrains individual and group actions" ([229], p. 84).

While it may be tempting to conflate the FDOT as an agency with the current staff of the FDOT, I think it is important to clarify that these are quite different things; in fact, if you removed all of the current staff at the FDOT and replaced them with others while leaving everything else the same (i.e. policies, etc.), the FDOT as such would remain undisturbed. By this I mean to emphasize that the activities of the FDOT cannot be fully attributed to the contingent actions of particular employees, but are instead determined by the agencies internal structure.

The FDOT acts according to its internal structure. This structure is related to what the FDOT *is*, meaning, what is its *necessary nature* as a thing (i.e. an agency), not from what it does in any particular context. In other words, the essence of the agency will not be found in an enumeration of particular instances of practice, which may be present or absent in varying contexts¹⁰⁴; rather, we find it articulated in the powers bestowed on the FDOT through an objective legal framework. Given this internal structure, in general the FDOT cannot act like something else, say an environmental agency, or a lizard, but only like a transportation agency, or else it would cease to be what it is. This means that one should not expect the FDOT to prioritize endangered species, or eat flies, but only to facilitate transportation. Regardless of whether this internal structure is actualized in any given context, it persists as the fundamental essence of the FDOT as an entity.

So, irrespective of the contingencies of any given context, the FDOT possesses a set of essential powers and responsibilities which define it as a transportation agency.¹⁰⁵ These powers and responsibilities are codified in the Florida Statutes under Title XXVI Public Transportation (Ch. 334-349).¹⁰⁶ The agencies general obligations, rights, responsibilities, etc. are articulated in section 334.044 and include, among others: coordinating the planning, implementation and maintenance of a statewide transportation network; creating and adopting agency rules and regulations which allow it to fulfill its duties¹⁰⁷; advancing and acquiring local and

¹⁰⁴ “It should be stressed that the difference between a thing which has the power or tends to behave in a certain way and one which does not is not a difference between what they will do, since it is contingent upon the flux of conditions whether the power is ever manifest or tendency exercised... A copper vase remains malleable even if it is never pressed out of shape. It is contingent whether an electric current is ever passed through a copper wire. But it is necessary, given its electronic structure, that it be a good conductor of electricity” ([230], p. 212-213).

¹⁰⁵ It should be clarified from the start that the fact that the FDOT as an agency is immaterial does not preclude its objective existence. Rather, the FDOT is part of what philosopher John Searle [231] called “institutional reality” because, as a “social institutional fact”, it has a function assigned by society which endows it with a set of powers, such as obligations, rights, responsibilities, etc. In other words, the FDOT has objective being because society in general collectively acknowledges it does, and abides accordingly. For a good example, see ([231], p. 17-18).

¹⁰⁶ See <http://www.flsenate.gov/Laws/Statutes/2016/Title26/#Title26>

¹⁰⁷ Rulemaking within the FDOT is carried out pursuant to Florida Statutes Title X, Chapter 120, Section 20 and 536. See <http://www.flsenate.gov/Laws/Statutes/2016/120.536> and <http://www.flsenate.gov/Laws/Statutes/2016/120.54>

state funds for transportation related activities; employing the power of eminent domain to acquire necessary private or public property for purposes of transportation; enhancing environmental benefits of transportation projects, which includes preventing roadside erosion; and taking “any other action necessary to carry out the powers and duties expressly granted” under Chapter 334. These activities are operationalized through the establishment of a transportation right-of-way.

The FDOT’s powers and duties are furthermore guided by a set of primary statutory goals and objectives that establish the basic principles of decision making. As codified in Florida Statutes 334.046, the prevailing principles to be considered in planning and developing the statewide transportation network are:

1. Preserving the existing transportation infrastructure
2. Enhancing Florida’s economic competitiveness
3. Improving travel choices to ensure mobility

In addition to these statutory obligations, rights and responsibilities, the FDOT also has the additional distinction as a key element in the State of Florida’s State Emergency Response Team (SERT) which is tasked with addressing various needs in times deemed emergencies (e.g. natural disasters). The SERT is comprised of 18 different Emergency Support Functions (ESF) ranging from communications to animal services.

Nationally, the United States Department of Transportation (U.S. DOT) serves as the lead agency for ESF #1, which is focused on transportation, while the FDOT is the lead agency at the state level. The ESF mechanism, which was originally conceptualized by the Federal Emergency Management Authority (FEMA), is activated at the national level whenever notification of a threat or an imminent or actual incident is received by the U.S. DOT, while at the state level it is activated through an emergency declaration by the Governor of the state. Powers bestowed on the FDOT through the activation of the ESF mechanism include both initial emergency support activities, such as reporting damage and identifying temporary transportation alternatives when infrastructure is damaged, as well as continuing and ongoing actions post-emergency, such as coordinating the restoration and recovery of transportation infrastructure and future prevention, preparedness and mitigation [232]. The ESF mechanism expedites decision making and consolidates normally disaggregated departments in the interest of quick responses to and recovery from various disaster scenarios.

FDOT priorities in critical erosion management

The FDOT's decision making is broadly guided by a set of core policy principles, namely 1) preserving the existing transportation infrastructure; 2) enhancing Florida's economic competitiveness; 3) improving travel choices to ensure mobility (Florida Statutes 334.046). Tourism and retirement services in particular are a dominant feature of Florida's economy, accounting for nearly three quarters of the state's total economic base ([53], Chapter 15). Because of its predominance in the state's political economy, the sector commands the attention and prioritization of private and public actors alike, including transportation. Mormino ([71], p. 116) explains the significance of tourism in modern Florida in this way:

In an example of the tail wagging the dog, Florida has become utterly dependent upon tourism and revenues generated by visitors. The Trojan Horse of Florida politics, tourism dominates any discussion of economics and politics. In some counties, special hotel/tourist taxes generate staggering sums of revenue, but such funds are often restricted to promoting tourism. With its excessive reliance upon a sales tax, Florida's treasury depends necessarily upon out-of-state tourists who pay-for-play. Democrats and Republicans may disagree upon the regressive nature of a sales tax, but all politicians have promoted expensive projects to boost tourism.

When it comes to tourism, Flagler County and Flagler Beach are no exception. Indeed tourism was the entire impetus behind the establishment of the City of Flagler Beach by George Moody (see Section 2.3). Throughout the county, tourism continues to increase in importance today, both in attracting potential future residents and as a direct source of public revenue, e.g. through surcharges on tourist amenities [212]. SR A1A in particular is viewed by local, county and state government officials and local businesses as essential because it serves several core functions necessary for the continuation of tourism-based economic activity. The core functions provided by SR A1A are the same as those I outlined in Section 1.2 regarding transportation's role in the functioning of capitalist political economy, namely supporting commodity production, consumption and circulation. Reference to SR A1A's importance in the economy is the most prominent motivation given for why the road needs to be protected from the effects of critical erosion in Flagler Beach, though the FDOT's other duties as a state agency of course also appear as motivations, for example issues of public safety and access. Here are a few examples from a FDOT study produced for a proposed erosion control project presented to the City of Flagler Beach in 2010 ([218], specific page numbers follow quotes):

Stabilizing and protecting the SR A1A corridor will improve the economic viability of local businesses by maintaining access. In addition, the project will improve

mobility and safety in the area by stabilizing SR A1A and preventing road closures and traffic detours. (p. ES-1)

FDOT is committed to protecting SR A1A in its existing location, as this road is a hurricane evacuation route, a designated State Scenic Highway (A1A Ocean Shore Scenic Highway), a National Historic Byway, and provides an economic base for the region. (p. ES-2; 1-4; 7-2)

The loss of the protective dune could undermine the roadway, which would significantly affect the public safety function of SR A1A as an emergency evacuation route and SR A1A's role as an economic base for eastern Flagler County. (p. 1-4)

Beach erosion caused by storms has resulted in road closures and detours. Road closures may adversely affect businesses and cause delay to motorists. Many of the businesses are accessed directly from SR A1A and are dependent on tourism. Stabilizing and protecting the SR A1A corridor will improve the economic viability of businesses by maintaining access. (p. 4-8 and 4-9)

The main idea is that maintenance of SR A1A will support the economic viability of businesses within the City of Flagler Beach, by maintaining access and the community's tax base. Many of the businesses are accessed directly from A1A and are dependent on tourists. Beach erosion caused by storms has resulted in road closures and detours in the past, and loss of the roads functions adversely affect businesses and cause delays for motorists ([218], Appendix G, p. 29).



Figure 24:

Left: Long stretches of the federally registered A1A Scenic and Historic Coastal Byway in Flagler County offer unobstructed views of the Atlantic Ocean, as seen in this photo taken from a north-bound vehicle in Flagler Beach. **Right:** Motorcyclists park in front of the Golden Lion oceanfront restaurant in Flagler Beach during “Biketoberfest” in October 2017, with free access to the local beach only a few steps away. Source: Left, Author’s photo, 2014 and Right, photo courtesy of Linda Provencher.

The contribution of SR A1A to the local and regional economy is difficult to precisely quantify. However, the 7000+ average daily trips made along the Flagler Beach stretch of the road in 2016 reported by the FDOT gives an indication of the volume of traffic utilizing the road on a regular basis.¹⁰⁸ These daily trip numbers of course vary throughout the year, and can increase dramatically during special events such as “Bike Week” and “Biketoberfest”, each which attracts tens of thousands of additional travelers during specific weeks of the year. Many of these travelers ride along SR A1A and frequent Flagler Beach bars and restaurants (Figure 24). In addition, to attract further tourism traffic up and down the SR A1A corridor, the portion of the road that passes through Flagler County and Flagler Beach has also been labeled the A1A Scenic and Historic Coastal Byway, which indicate its official designation as an American Byway, making it part of the broader National Scenic Highway system [233].

In addition to the FDOT’s more generic motivations for maintaining economic infrastructure, and rough indicators like average daily trips taken, those officials who are formally responsible for attracting tourism to the county and city also strongly emphasize the importance of SR A1A in the local and regional economy. Take for example a conversation I had with two representatives of the Flagler County TDC who responded to my question about the importance of SR A1A this way (Interviews 6 and 7):

Me: ...What about A1A? Do you see that as something really central to the flow of tourism, etc.?

FCTDCVP: Without a doubt, yeah, without a doubt. See A1A for us is very unique and unlike most destinations on the eastern coast of Florida. We certainly have our miles and miles of A1A being right on the beach, which other destinations do not have. So that availability of being able to see [the ocean] as you’re driving on [A1A] is very unique. It’s also unique in the fact that we don’t have sky rise condos and, you know, sky rise resort properties and hotels along it as well. So it’s one of the things that we feel visitors are taking advantage of when they’re coming here, from that stand point. They’re looking for a destination of our type, that isn’t as congested a tourist destination as others...

FCTDCMD: We find that we have a lot of accidental tourists, so because the accessibility to our beaches is so easy, and free, I mean every block there is a [beach access] walkover and you can just, as you know, drive right up and pop out of your car. So, as people are traveling either North to South from Saint Augustine, Jacksonville, down to Daytona and further, they kind of just stumble upon our town, and they see how easy it is to get to the beach. They don’t have to park at a garage and you know, shuffle all their stuff down to the beach. So, in that respect I believe

¹⁰⁸ Information retrieved from FDOT Florida Traffic Online (2016). Available at: <http://flto.dot.state.fl.us/website/FloridaTrafficOnline/viewer.html>

we wouldn't have as many visitors and those accidental tourists that come for the day, maybe only have lunch, but then another time maybe say "oh, this is a great place, we should come back another time".

Officials responsible for the non-economic government functions provided by transportation, such as emergency response, also recognize the economic functions of the road as essential; in particular, because of the tax revenue tourism generates which helps support the funding of other government activities. This is particularly important in light of the limited tools available to local and county governments regarding revenue generation, with taxes on sales and services being an important source of public funds (see Section 3.2). The Flagler County Public Safety Director for example, when asked about the consequences of losing SR A1A in a severe storm, explained to me the potential repercussions of losing the tourism dollars attracted by SR A1A (Interview 5):

FCPSD: If Flagler Beach loses A1A then they lose business, they lose business, now the tax, now its back on the tax payers for residential [services], and if they get to a point where they are depending on nothing but residential tax dollars, they will defunct. They've got to have that business income. And where's all your business income? It's up and down A1A.

SR A1A, in addition to serving economic functions, also fulfills important social functions by acting as the only major north-south corridor which has been formally designated as a state Hurricane Evacuation Route along the county's coast. The designation and maintenance of evacuation routes for responding to the seasonal tropical storms which frequently impact Florida is an essential component of emergency preparation and response. Again, speaking with the Flagler County Public Safety Director, he explained to me why, beyond the economic aspects, maintaining A1A in its current location is viewed as desirable from an emergency preparedness standpoint (Interview 5):

FCPSD: Well, here, I'll tell you, A1A is valuable, I mean to me you can't even put a price tag on it... If I've got to evacuate 10,000 residents beach side, I have no corridor to get that done if you take A1A away from me. Because, I'll tell you right now, there is no place in Flagler Beach, if you wanted to readjust, realign, move [A1A]... if some type of project happens like that, for the citizens of Flagler beach, you take away their only north south corridor to [evacuate].

However, even these purely social functions are not devoid of any connection to the economic functions of the road. The Flagler County Public Safety Director pointed to synergies between SR A1A's role in sustaining economic activity and general public safety and emergency response. He in particular highlighted the role of businesses in supporting officials in post-disaster response and recovery. For

example, he offered me this hypothetical in response to my admittedly poorly worded question about what motivates their decision to maintain SR A1A in its current location (Interview 5):

Me: Can you speak in terms of community safety as well as, opposed to just individual property and, etc., so up-keeping the road for the sake of, kind of, the sustainability of the economy and these kinds of things, is that also something that kind of works into the decision making process?

FCPSD: Absolutely, absolutely. I mean, you know, I don't really get involved in a whole lot of economic development until, you know again, after the fact. So again there's a natural tie in for me to work, in a blue sky environment, with my economic development director, saying "I want those, you know, if a catastrophic event happens at the beach, I want those vendors at the beach to get involved in the recovery and response". So one thing, one service that they provide today, that could become a public safety response. In other words, every vendor that is at the beach can become a part of the response because they can feed my responders...

This hypothetical scenario, incidentally, is exactly what happened in the aftermath of Hurricane Matthew in October, 2016. After the storm had cleared, local restaurants were called upon to provide food and other services to returning residents, many of which lacked electricity or whose homes were wind or water damaged. This included local emergency responders, such as Flagler police forces, as well as additional support provided by National Guard personnel who had been dispatched from various regions of the country to support relief efforts (Figure 25).



Figure 25:

Left: Damage to SR A1A after Hurricane Matthew in October, 2016. Right: A local resident talks with a member of the National Guard deployed to Flagler Beach to keep the peace and support recovery efforts. Author's photos, 2016.

After Hurricane Matthew, nearly 1.5 miles of SR A1A inside Flagler Beach city limits was impassable, affecting local residents and businesses located along the

damaged portion of the road. In response to the hurricane, the USACE and Florida Governor Rick Scott declared a state of emergency which triggered SERT and ESF, after which the FDOT began to undertake a series of emergency response tasks, including reporting damages and planning for temporary alternative travel routes. In an emergency meeting held by the FDOT less than a week after Hurricane Matthew struck, transportation department representatives addressed an anxious crowd of residents, business owners and elected officials to inform them of the department's plans to address the damaged section of road and to allow the public the opportunity to express their concerns. The motivations offered by department representatives helped point to the FDOT's departmental policies which informed its position on why rebuilding the road was important, with the road's economic functions be emphasized in particular:

The main goal is to get that road open as quickly as we can and to restore the road way... Now we know business access and homeowner access is very important, so today we are getting a contract together to fully analyze that. So, we wanted to let you know that is important as well, and we know what's important to you.

Later in the conversation, they continued:

The biggest need, I mean obviously we will meet all of our permit requirements, as we do on all of our projects, but I know the biggest need is to have the road open as soon as possible, and that will help the community businesses and residents, so our primary goal [is] getting that road open, that's number one.

As part of the continuing disaster recovery efforts, less than two weeks after the damage occurred, Governor Rick Scott, who is administrative head of all executive branch agencies including the FDOT, formally ordered the FDOT to expedite the re-opening of the damaged portions of A1A. The official statement from the governor's office regarding prioritizing the expedited re-opening of the road further demonstrates that the road's economic function was a central concern and motivating factor in its reconstruction:

Getting our communities back to work as quickly and safely as possible is our number one priority and we must make A1A operational as soon as we can. That's why I've directed FDOT to use all available resources to get A1A reopened as soon as possible. This expedited timeline will get residents and tourists back onto A1A so that families and businesses in the area can get back on their feet and return to their normal routines [234].



Figure 26:

Top left: Damage to SR A1A post-Hurricane Matthew. **Top right:** Dump trucks haul loads of sand during reconstruction of SR A1A. **Bottom left:** Bulldozers spread fill sand and grade the newly constructed road side. **Bottom right:** SR A1A after reconstruction, with filled and rebuilt sand dune covered with burlap fabric (and eventually with rocks).

Despite initial estimates that reopening the damaged section of SR A1A would take several months [235], Governor Rick Scott backed up his statement with an incentive package that offered a \$1 million bonus to the road contractor for finishing the reconstruction ahead of schedule [236]. Less than one month after Hurricane Matthew hit, after undergoing a series of temporary reconstruction measures, SR A1A was reopened in Flagler Beach to, as a local newspaper crowed, “Governor’s Applause” and “Businesses Cheer[ing] With Relief” [237] (Figure 26).

Structural constraints on FDOT activities

The FDOT has legal obligations and policy commitments to maintaining SR A1A in its current location, which it justifies primarily in terms of preserving the economic, but also the social functions of the road. This sentiment is echoed by local, county and other state officials, as well as many residents and business owners. However, *why* the FDOT continues to protect A1A from critical erosion is not the same as *how* they do so. The reader will recall (see Section 3.2) that the FDOT is not only empowered to take action within its legal right-of-way, it is also legally restricted to this right-of-way. This means that the options available to the FDOT regarding erosion control and prevention must be implementable within the limits of the FDOT's territorial competence. Within the confines of the right-of-way, which protrudes anywhere from 50 to 70 feet from the center line of SR A1A (Figure 27), the FDOT has identified a set of near-term options which it considers preferable regarding the nature of the problem, and the fact that long-term options require more complex coordination with other state and federal organizations who hold decision making power beyond the boundaries of the FDOT right-of-way (e.g. the U.S. Army Corps of Engineers).

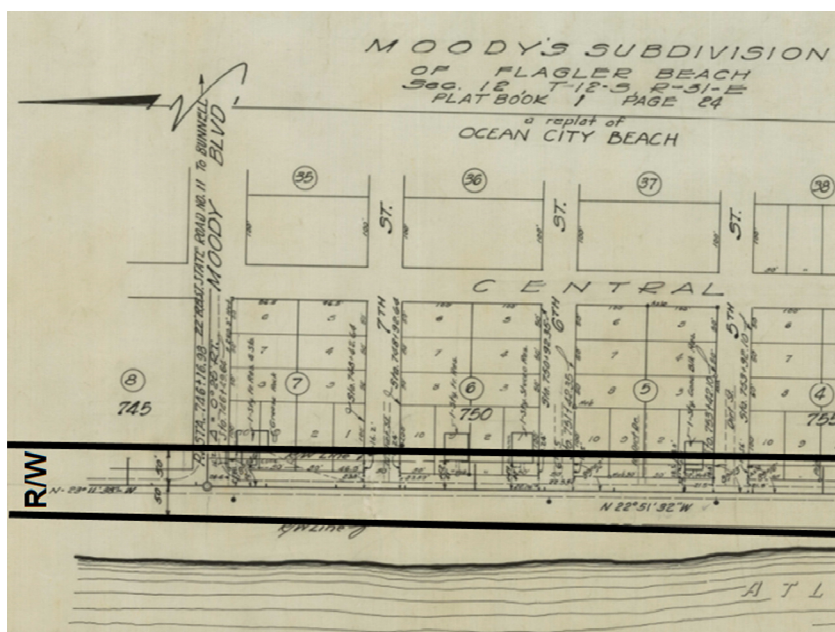


Figure 27: Detail of FDOT right-of-way map in Flagler Beach (1950). The map clearly shows how the official right-of-way (R/W, enhanced in black) extends over the fore-dune, giving the FDOT legal control over beach management decisions. This same right-of-way constrains the FDOT's erosion control options. Source: Image courtesy of the Florida Department of Transportation, District 5, 2016.

The FDOT is able to adopt one of three erosion control treatments which are within its authority to implement ([218], p. 2-2; see Figure 28 below). As the FDOT explains, the conditions under which they are trying to address critical erosion in Flagler Beach, in particular the sporadic and uneven nature of the damage caused, leads them to adopt a fix-it-as-it-breaks philosophy as their preferred approach: “In this situation of potentially severe and rapid erosion in localized sections of SR A1A, the FDOT-preferred approach to the stabilization of the roadway is to design site-specific solutions that are warranted by the extent and severity of the erosion” ([218], p. 2-2). This means that the specific choice of shore stabilization infrastructure is selected depending on the severity of the damage following a particular severe storm event.

This piecemeal approach to critical erosion management has dominated in the past, and in Flagler Beach it has historically translated into a patchwork of these different hard stabilization infrastructure techniques. Historical photographs and FDOT records show that some coastal stabilization infrastructure in Flagler Beach was installed prior to the adoption of coastal management legislation at the federal and state levels, for example after the severe damage inflicted by Hurricane Dora in 1964. However, since the adoption of this legislation the FDOT is responsible for getting permits from other state and federal agencies when undertaking construction projects which affect certain parts of the coastal environment, for example construction beyond the CCCL or the mean high water line.

The first official permits were granted to the FDOT by the Department of Natural Resources (now the FDEP) in 1981 (FL-14) and 1985 (FL-44 ATF) for construction of an extended rock revetment along SR A1A, parts of which had been constructed in the 1960s ([218], p. 5-1). While reactionary maintenance and repairs took place throughout the 1990s, the severe hurricane season of 1999-2000 caused considerable erosion in Flagler Beach, prompting the FDOT to submit an emergency application (FL-198 AFT) for construction within the CCCL for further enhancement of the rock revetment installed in the 1980s, which by then was failing in several places. At this time, the rock revetment was extended to the length it is today, approximately 9000 feet ([193], p. 2-75).

Alternative	Photo		Description
Seawall with Sand ⁽¹⁾			Buried, near-vertical structure built along the coastline for the purpose of retaining upland soils and/or structures.
Granite Rocks with Sand ⁽²⁾			Armoring of the shoreline slope by installing granite rock rip-rap varying in size from 100 to 400 pounds. Consists of the armored layer, filter layer, and toe protection.
Coquina Rocks with Sand ⁽³⁾			Armoring of the shoreline slope by installing coquina stone or masonry.

Figure 28:

There are three primary alternative strategies for addressing critical erosion available to the FDOT in Flagler Beach, all of which involve the construction of hard stabilization infrastructure. Source: ([218], p. 2-6).

Prior to 2005, the dumping of sand and granite or coquina rocks had been the only technique employed by the FDOT for maintenance of the eroding road shoulder. However, after a severe storm season and the resulting erosion caused road closures along stretches of SR A1A in Flagler Beach, the FDOT installed a 153 foot section of concrete capped steel sheet-pile seawall as an emergency repair ([193], p. 2-2). The permit for installation of the emergency seawall was granted by the Army Corps of Engineers in just a matter of days over the time which for many is the Christmas Holiday (Figure 29).

While such actions are clearly within the legal rights of the FDOT, the installation of hard infrastructure under emergency conditions is undertaken without consultation with local residents or the City of Flagler Beach. This has tended to breed frustration with some elected officials, particularly since the city has passed local resolutions and ordinances specifically against the construction of seawalls and other structures seaward of SR A1A ([238], p. 567). For example,

when discussing the process for installing emergency erosion control infrastructure with a Flagler Beach City Commissioner, she expressed her frustration with the FDOT process this way (Interview 2):

Me: So when that big storm comes and the emergency happens, [the FDOT] is just gonna put a seawall up?

FBCC: That's it, they don't need the City of Flagler Beach to sign off on it. They get an emergency order from the governor and they put it in. That's all they need. That's what happened here. That was done, there's no permit that's ever been pulled faster than that seawall permit, it was done on Christmas Eve. I mean it was done at night *laughing*, you know like robbers, they came here and, that's what they do.

Me: And all of a sudden?

FBCC: Yea, it shows up. "We had to do it, it was an emergency". We [the City of Flagler Beach] have a resolution against it, but that doesn't hold up to anything.

Since installing the rock revetment and the emergency seawall, the FDOT has been granted a series of nationwide permits by the USACE which allow it to continue maintaining the infrastructure without undertaking further permitting. The Nationwide No. 3 Permit (No. SAJ-2005-11010NW-AWP) in particular gives the FDOT the ability, as it sees fit, to facilitate "repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure, or fill... provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification" ([239], p. 1, cited in [238], p. 567).

Regarding this power to pursue road maintenance under active state and nationwide permits, the Flagler Beach Mayor, in an interview in 2014, expressed not only frustration with the installment of a particular emergency seawall, but with the ever present possibility that the FDOT could at practically anytime decide to construct more seawalls without the approval of local government or residents, a looming prospect which provided some of the impetus for the city to actively seek alternatives (Interview 1):

Me: [the FDOT] is allowed to kind of trump some of these permitting things in an emergency situation, is that right? Which is where a lot of this [hard infrastructure] came in?

FBM: Yes, absolutely. Absolutely, um, the seawall for one, that was an emergency situation.

Me: Emergency meaning road, right?

FBM: Yes, if the road is going to cave in they can put up whatever they need to put up to maintain that road. And that was kind of the driving force behind [the idea that] we need to fix the beach before something like that happens because they still could come in at any day and say “look this is falling in, and were tired of dumping sand, were tired of doing this, were just gonna put this, you know, seawall”.

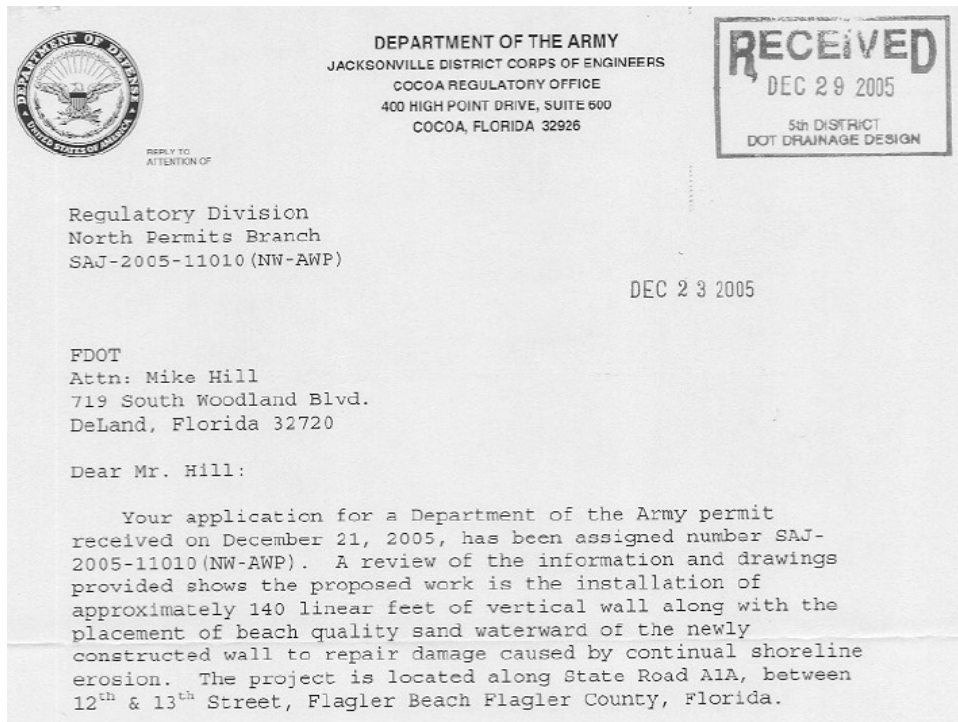


Figure 29:

A detail of the emergency coastal construction permit granted to the FDOT for construction of a seawall in Flagler Beach, Dec. 2005. Source: Scanned image courtesy of the Florida Department of Transportation, District 5, 2016.

While the Mayor’s concerns apply to emergency situations, in fair weather the FDOT is legally obligated to consult local officials and residents regarding its planned activities. However, the ability for locals to influence the content of FDOT projects is extremely limited, with “participation” often amounting to simple consultation or even tokenism, something I have elaborated in more detail elsewhere [238]. The only real choice regarding project content local elected officials have is the complete rejection of the FDOT project proposal, or what the FDOT calls the “no action alternative”. But, as a Flagler Beach City Commissioner recognized in an interview in 2014 (Interview 2), “no action” does not necessarily mean nothing will happen:

Me: so, is it possible that that “no action” alternative might manifest anyways, because of lack of decision making?

FBCC: oh yeah, and we knew that going into this, we said “no action is an action”. Doing nothing is an action.

Me: yeah, which basically leaves the FDOT with right-of-way, and that’s about it?

FBCC: correct, that’s it.

In absence of a locally funded and legally permitted alternative, future discretion would be left to the FDOT and its preferred approach of holding the line with seawalls. Of course, the FDOT does not encourage the no action alternative. Rather, the FDOT emphasizes that the no action alternative would have further detrimental consequences for the local economy and public safety, would continue to cause environmental damage, and would potentially lead to the abandonment of the road, leaving the local government responsible for future maintenance ([218], p. 2-1).¹⁰⁹

While taking “no action” remains a “viable alternative through the public involvement process” ([218], p. 2-2), it comes with considerable risks for local government who could potentially be left with a collapsing and unusable road without the ability to generate the amount of public revenue required to maintain it (see Section 3.2). However, even the abandonment of the road to local government would not necessarily be the outcome, as the FDOT still maintains the legal capacity to address emergency instances of critical erosion which threaten the road, and this would not be nullified by the city’s choice of a no action alternative. Rather, it is a very real possibility that the FDOT would instead continue to pursue their preferred approach by installing stability infrastructure as needed in response to continuing critical erosion

¹⁰⁹ “If no action is taken and SR A1A is not maintained, the result could potentially be failure and loss of this vital arterial as a thoroughfare resulting in negative effects to the environment and community. Elements of the No Action Alternative would include the following: Potential failure and loss of SR A1A potentially impeding through traffic, Re-designation of SR A1A and evacuation route onto another State Road, which would require relocation of the roadway, traffic analysis, local roadway improvements, and additional signage, Impacts to local access including 58 residential parcels (39 with no alternative access) and 49 non-residential parcels including commercial uses (25 with no alternative access), Potential adverse environmental effects, Effects to the scenic vista, Potential impacts to local and regional economy, and The loss of Historical and Scenic Byway designation. In addition, all pavement and subsurface soils, if not compatible with coastal beach habitat sand would be removed, and suitable sand brought in to stabilize the area; or the roadway would be abandoned and maintenance responsibilities would be adopted by the local county and city municipalities” ([218], p. 2-1).

After several decades of increasingly expensive, piecemeal repairs to the section of SR A1A threatened by critical erosion, the FDOT began designing what it considered a permanent solution to the problem to be implemented as needed in response to future threats to the road. The proposed project was eventually revealed in the form of a Project Development and Environment (PD&E) study in 2010, which outlined the FDOT's plan to extend the small section of emergency seawall in response to future critical erosion in the city, which would eventually lead to a seawall running along much of the length of the city.

While the rock revetments that have existed in the city at least since the 1960s have been viewed as problematic by residents and local elected officials, seawalls are particularly controversial in the city as they are well known to have detrimental consequences to the adjacent beach ecosystem when installed (see e.g. [240], p. 49-55). Yet, the installation of a seawall is exactly what the FDOT proposed as the ultimate solution to the city's critical erosion problems. Why, despite well-known criticisms and public resistance, did the FDOT propose a seawall? Of course, part of the answer has already been given, namely that the FDOT is constrained by its right-of-way and must adopt solution options that are implementable within these constraints. However, why a seawall *specifically* was proposed by the FDOT as a long-term solution has to do with its implicit following of the economic logic and decision making principles of cost-benefit analysis (CBA), discussed in more detail in Section 5.1.

Because the City of Flagler Beach is structurally constrained in its ability to address its critical coastal erosion problems, it is left with few options beyond local level governance mechanisms aimed at controlling the direct impact of residents and visitors on the beach environment. Instead, the FDOT, which maintains control over management decisions within its right-of-way, is left as the primary agency responsible for managing many of the city's most pressing erosion problems. Within its constraints, the City of Flagler Beach has tended to emphasize controlling and correcting environmentally destructive behavior with ordinances, penalties, etc. The FDOT's perspective on the critical erosion problem, however, is quite different. Rather than viewed primarily as a behavioral issue, they conceptualize the problem as a structural concern for the local and regional economy, as damage to the road would mean less tourism access, less consumption and less revenue generation. This structural problem in turn relies on a structural solution, namely the commitment to and practice of road stabilization which has generally taken the form of hard erosion prevention infrastructure.

The detrimental consequences for the local environment of installing hard infrastructure, in particular seawalls, are a serious bone of contention for local residents and elected officials. However, the FDOT's approach to solving the tension between economic development and environmental management, while not committed to environmental protection, cannot be so easily dismissed, and instead

can be argued coherently and convincingly to be in line with perhaps the most dominant approach to SD. However, to understand why, it is first important to clarify exactly what it is about seawalls that are problematic.

4.2 Sand Dunes and Seawalls

On July 24, 2007, at 5:30 p.m. in the City of Flagler Beach, the FDOT held a public hearing on their proposed long-term plan to address critical erosion along SR A1A in the city. After the FDOT laid out their plans to construct sections of seawall on an as-needed basis as a “permanent” solution to the problem, local residents were given the opportunity to voice their opinions on the proposal. The last person to speak publically was a resident and local business owner named Rusty, and he had a simple message: “seawall”, he said, “to me, is a bad word” (cited in [238], p. 571). This turned out to be a sentiment shared among the majority of residents that voiced opinions that night, as well as most of those who submitted written comments on the project. Here are a few more examples from written submissions ([218], p. 6-5, Table 6-2):

No seawalls. Seawalls make things worse than they are now.

I’m against a seawall of any type.

This project will be the end of Flagler Beach as we know it. A seawall is not the answer.

Why such resistance to seawalls? What exactly is it about the FDOT’s preferred choice that at least some see as seriously problematic? The simple, colloquial answer is that seawalls harm, even “kill” beaches [241]. But the more precise answer has to do with *why* this is the case. Understanding why involves understanding both the specifics of the physical geography and ecology in the vicinity of Flagler Beach as well as the way coastal protection infrastructure is designed to interfere with these natural processes.

In Section 2.3, I discussed the founding of the City of Flagler Beach by George Moody, including how maintaining access to his newly homesteaded property required the construction of transportation access, including a bridge. This was necessary because the vast majority of the municipal area of Flagler Beach is located on a coastal barrier island, a prominent landscape feature along the U.S. eastern seaboard. Barrier islands are thin, sandy strips of land running parallel to a coast line but remaining separated from the mainland by a narrow body of water, such as a lagoon or tidal creek. If you have been to a beach in Florida, chances are

pretty good that you have already visited a barrier island. When driving along Florida's eastern or panhandle coast, it's hard to miss the hundreds of bridges which connect the states' many barrier islands to the mainland. Barrier islands are crucial to both the state's coastal ecology and tourism economy, and as such are perhaps the most politically contested of all Florida ecosystem types regarding how and for whom they should be managed:

People do not live peacefully with barrier islands. It seems that the richer the country is, the less placid the coexistence... Finding a solution to the human-caused changes in barrier islands preoccupies many a government entity around the world. Many a politician's career rests on satisfying the varied interests that focus on barrier islands, and more than one political career has foundered in the process. ([242], p. 3)

To drive the point home, consider that some substantial portion of cities including Miami, Fort Lauderdale, West Palm Beach, Daytona Beach, Saint Augustine, Jacksonville, Fort Myers, Panama City and Pensacola are on barrier islands.

Barrier islands as bio-geomorphic systems

There have historically been a variety of competing theories of how barrier islands are formed [243]. However, it is generally acknowledged that barrier islands form along shorelines which have a shallow sloping continental shelf, a sufficient amount of sediment, and are influenced by energetic sources of sediment transport, such as currents and waves. Together, these factors, along with sea level fluctuations, control the morphology and evolution of barrier island systems at a landscape scale ([244], p. 212-219). Barrier islands are relatively unstable, or what Bellis ([90], p. 9) calls "geologically ephemeral" earth surface features, meaning they are in a state of nearly perpetual flux in geological terms. Barrier islands can *prograde* seaward (i.e. grow bigger), *erode* in place (i.e. get smaller) and *migrate* parallel or perpendicular to the mainland (i.e. move) depending on the variable influence of controlling factors like sediment supply or rate of sea level change, as has been and continues to be the case for Florida's barrier island systems [245, 246]. Florida's barrier islands are relatively young, geologically speaking, having formed in only the past few thousand years due to a reduction in the rate of sea level rise in the late Holocene, which allowed for the growth and stabilization of barrier island systems along much of the Atlantic and Gulf coast of North America [247-249]. Throughout Florida, sediment source and supply can, however, vary significantly. In Flagler County, for example, much of the beach sand comes from an underlying bedrock layer known as the Anastasia Formation (see [247]), a giant slab of coquina rock eroding in the Atlantic Ocean which fills the regions beaches

with an orange-hued hash chocked full of mollusk shells and shark teeth (Figure 30).



Figure 30:
Left: Shell hash still cemented in a coquina boulder. **Right:** The characteristic orange hue of an Anastasia shell hash beach. Both photographs from Washington Oaks State Park in Flagler County. Source: Author's photos, 2015.

At less-than-landscape scales, the purely geophysical aspects of barrier island formation, such as sediment supply, on- or near-shore topography and sediment transport become somewhat insufficient to explain the dynamics of individual barrier islands. This is because the structuration and stability of individual barrier islands, while limited by these underlying factors, are also controlled by interactions between sedimentary processes and *biological* factors [250]. In other words, the dynamics of change for individual barrier islands involve interactions between geological processes and living organisms, and as such are best understood in *bio-geomorphological* terms. This concept refers to the interplay between biological and geomorphic landscape components which, through their mutual interactions, produce biophysical features and patterns in the landscape. While ecologists and geomorphologists have historically considered the influence of these components on landscape formation in isolation, bio-geomorphology recognizes that “[f]eedbacks between geomorphic and ecological components are developmentally intertwined” ([251], p. 213).¹¹⁰ Barrier islands are among the best

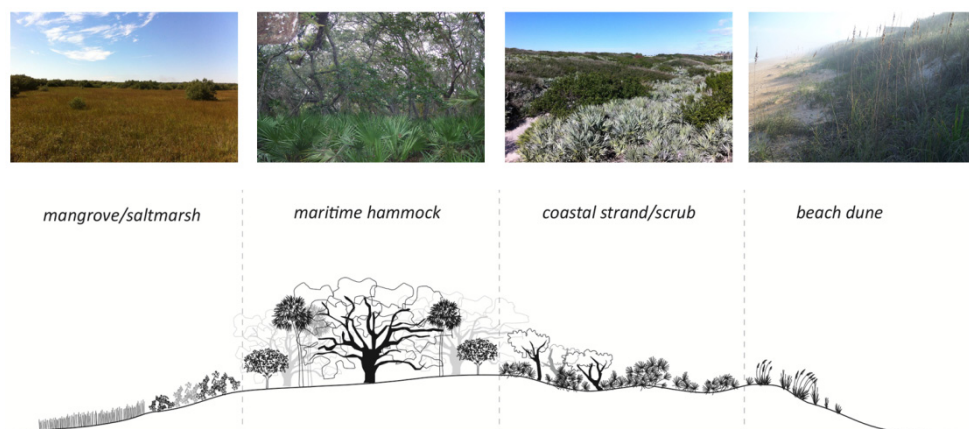
¹¹⁰ This recognition of a mutual developmental influence between organisms and their environment has a long pedigree, but has taken on new significance in light of the increasing work being done on epigenetics and niche ecologies which demonstrate that the developmental influences which stem from practical organismic activity contribute to an ontological flux which underpins the struggle for predictability and survival in evolutionary processes [252]. The recognition of this “participation” in evolution, from the human perspective, requires that we not only recognize that our practical actions in the landscape have important implications for other humans and non-human

examples of the complex-adaptive behavior exhibited by bio-geomorphic systems [254].

The feedbacks which help shape individual barrier islands are best thought of as bio-geomorphic. The bio- part of this admittedly clumsy word has to do with the various species of plant which have evolved to colonize and thrive in the sunbaked, salt drenched, constantly shuffling environment that is an oceanic sandy beach and dune system. The geomorphic part has to do with the processes which influence sand distribution, including underlying geology, continuous sand transport mechanisms such as currents and what are called disturbances, the most common being tropical or winter storms. Their interaction is characterized by a weak feedback between frequency of disturbance and plant-mediated topographic modification, the outcomes of which influence the probability and severity of subsequent disturbance events; in other words, the more seldom over-wash events occur, the more dune building plant species can become established, which in turn increases the height and stability of the dune crest and thus reduces the probability of future over-wash events (and vice versa) [255]. Historical rates of shoreline erosion also influence the height and stability of existing fore dunes, and where historical erosion has been higher, over-wash events tend to be more common [256].

This bio-geomorphic interplay results in one of two ideal-type “stability domains” for barrier island dune systems, namely low and high islands [215]. When erosion and disturbance dominate, islands tend to be low in elevation and remain susceptible to future disturbances. However, when bio-geomorphic dune building processes dominate, islands tend to maintain higher elevations and remain more resistant to future disturbances (Figure 31). While some individual islands may be dominated by one or the other of these potential stability domains, it is common to find, particularly on larger islands, a hybrid-matrix of both of these possible stability domains within a single island, which in turn interplay and influence each other [216].

nature, but that we recognize that we can engage in evolutionary processes rationally and strategically to promote sustainability and undermine socially detrimental inequalities [253].



<p>Mangrove swamp is a dense forest occurring along relatively flat, low wave energy, marine and estuarine shorelines. Salt marsh is a largely herbaceous community that occurs in the portion of the coastal zone affected by tides and seawater and protected from large waves.</p>	<p>Maritime hammock is a predominantly evergreen hardwood forest growing on stabilized coastal dunes lying at varying distances from the shore.</p>	<p>Coastal strand/Scrub is an evergreen shrub community growing on stabilized coastal dunes, often with a smooth canopy due to pruning by salt spray. It usually develops as a band between dunes along the immediate coast.</p>	<p>Beach dune is a predominantly herbaceous community of wide-ranging coastal specialist plants on the vegetated upper beach and first dune above the beach (fore-dune).</p>
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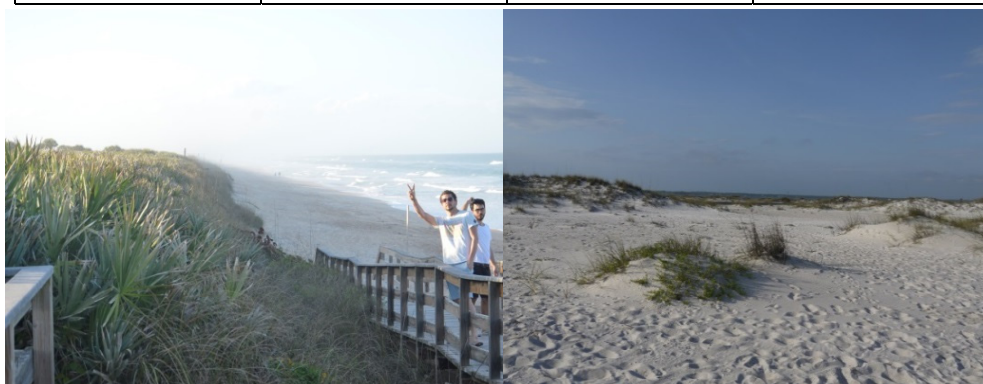


Figure 31:

Top: A cross-section of a typical barrier island, including characteristic ecosystem stratification. Source: Author's graphic, 2017. Descriptions from [257]. Graphic completed with the help of the lovely Linnea Berg. **Bottom Left:** A high, well-vegetated dune crest indicates this dune system in Canaveral National Seashore is not disturbance dominated; **Bottom Right:** A low, sparsely vegetated and fragmented dune crest indicates this barrier dune system near Pensacola Beach is disturbance dominated. Source: Left, author's photo, 2016; Right, author's photo, 2017.

The bio-geomorphic interactions between dune vegetation and sedimentary processes result in the zonal structuration of barrier island plant communities, the

proportions of which will differ from island to island depending on the above described factors (e.g. disturbance frequency, sea level change rate, etc.). A cross-section of the floral zonation pattern found on a typical Florida East Coast Barrier Chain (see [247], p. 19, Figure Florida.24) island demonstrates the transition zones (also known as “ecological boundaries” [258]) between the ocean side plant communities, the mid-island forests and the tidal marshes that line the landward side of the island (Figure 31).

Historically, the majority of construction on barrier islands has been in interior areas of individual islands, in particular between the coastal strand/scrub and maritime hammock plant communities, as these plant communities generally represent the most geologically stable areas on an island. Locating infrastructure in these areas provides for a more firm foundation compared, for example, to salt marshes or mangroves which have to be infilled before construction becomes feasible. All developers have to do is raze the sand dunes and remove vegetation before construction can begin. Furthermore, by locating infrastructure towards the interior of the island, it is better protected from coastal hazards, such as storm surge and wave attack, because it is located behind the primary fore-dune which is the first and best line of defense against Poseidon. Research shows that people and property which are buffered by intact coastal ecosystems are substantially more protected from coastal hazards and the effects of sea level rise than those without such natural buffers [259].

The protection provided by intact coastal ecosystems like the beach dune community is both in terms of mitigation of damages caused by coastal hazards (e.g. directly blocking storm surge), as well as by enhancing the ability for the natural buffer to recover when a disturbance does occur, which reduces the rate of beach erosion and builds dune height and width over time. Even so, single events, such as powerful hurricanes, can cause major erosion and substantially reshape portions of individual barrier islands in a very short period of time. For example, dramatic changes to the local barrier island system in northern Flagler County occurred as a result of Hurricane Matthew in October, 2016 (Figure 32). And while a well vegetated dune system can help reduce the amount of erosion that takes place during a severe storm, large amounts of erosion can still occur along large stretches of beach in the short-term. However, in the long-term, as long as the sand budget is not obstructed and sea level change is consistent, large coastal storms do not seem to be a major driver of coastal recession [260]. Even when dramatic events like Hurricane Matthew gobble up tens of meters of shoreline in a single day, the presence of coastal vegetation helps to re-stabilize and re-build the dune system, returning the beach to the state which defines its long-term trend (Figure 32).



Figure 32:

Top left and right: Repeat GoogleEarth images showing the creation of a new inlet. Top Left: February 2016, pre-Hurricane Matthew; Top Right: Nov, 2016, post-Hurricane Matthew. Source: Google, 2017. **Bottom:** a well vegetated fore-dune in northern Flagler Beach helped mitigate erosion during the storm, while leaving exposed roots and stems which, as they grow, will help initiate the dune recovery process. Source: Author's photo: 2016.

Beyond the presence of vegetation itself, high levels of biodiversity in vegetation communities are correlated with stability in barrier island dune systems [254]. This is because the interactions between different plant species of varying dimensions and behaviors, and their geophysical environment enhance the rate of sand collection and increases the breadth and depth of a stabilizing system of roots, which in turn builds dune elevation upon which new species can become established [255]. Moreover, diversity also buffers a plant community against the impacts of hazards, such as drought, giving the plant community more resilience in the long run. Samples of the fore-dune plant community in Flagler Beach, collected as part of a revegetation plan I had been working on with the City Commission and Mayor, resulted in the identification of over 20 different species of varying relative coverage (Figure 33; for field sampling protocol, see Appendix 2). Most of the species are typically found in Florida's barrier island beach dune community (e.g. sea oats, dune sunflowers and beach elder, see [257], p. 70), with some invasive species also present (e.g. Brazilian pepper).¹¹¹

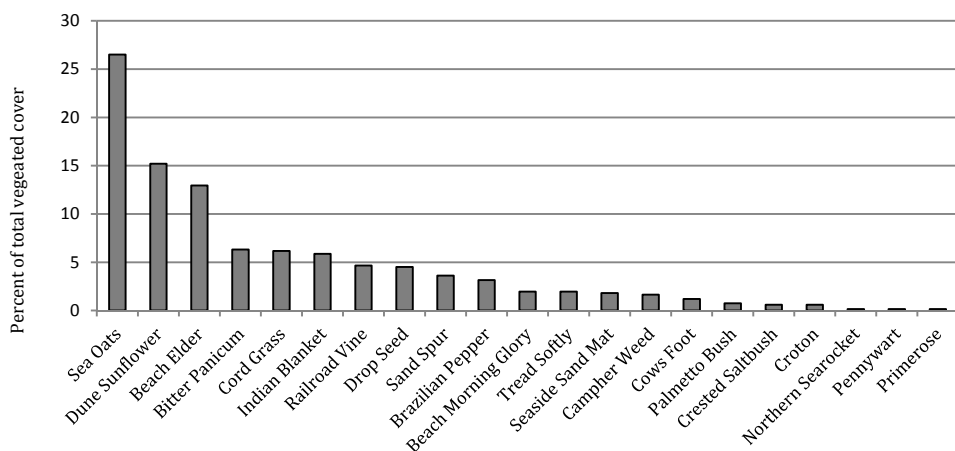


Figure 33:
Sample of dune plant richness and relative cover in Flagler Beach. Source: Author's unpublished data

Sea level rise and the future of sandy beaches

According to the Intergovernmental Panel on Climate Change's Fifth Assessment Report [261], published in 2014, the average global sea level rose about 0.2 meters (7.5 inches) between 1901 and 2010, and this increase is virtually certain to continue beyond the 21st century even if greenhouse gas emissions were to stay at

¹¹¹ Some common species, such as the prickly pear cactus (*Opuntia sp.*), were not captured by the sampling technique but were visually present at the sampling location.

their current levels, which is unlikely to happen.¹¹² IPCC projected sea level rise by 2100 vary from 0.2 meters (8 inches) at the lowest end, to nearly 1 meter (39 inches) at the highest (relative to 1986-2005, see [261], Figure SPM.6), though IPCC estimates of magnitude and rate are considered by many to be conservative and more recent studies suggest the magnitude and rate of sea level rise may be far greater [262].

The oldest instrument records for sea level changes in the United States are from tide gauges at Key West. These measurements show that adjusted relative sea level rise (RSLR)¹¹³ in Florida has averaged 2.4 mm (0.1 inches) per year between 1846 and 1992, which is consistent with IPCC estimates [264]. This rate of RSLR stayed the same when recently updated [265]. While this number may seem small, it adds up and, furthermore, the rate of RSLR is increasing [266]. Looking to the future, the Southeast Florida Regional Climate Change Compact has estimated RSLR projections for purposes of adaptation and mitigation.¹¹⁴ These include short term projections, where relative sea level is expected to rise 6-10 inches by 2030 and 14-26 inches by 2060 (above 1992 average sea level), and the long term, where it is expected to rise between 31 and 61 inches by 2100 [267].

Though annual increases in sea level may seem minor, their cumulative effects, in combination with other factors like increased hurricane intensity, is likely to cause major disruption to coastal ecosystems and societies [268]. Generally speaking, coastal ecosystems, such as marsh lands [269] and barrier islands [215, 216] can naturally adjust to RSLR if they have enough space and adequate sediment to do so. But in many places coastal developments such as roads, homes and hotels, are in the way of coastal ecosystems, reducing their ability to naturally

¹¹² For example, global GHG emissions have continued to rise over the past several decades and are expected to continue rising in the foreseeable future. See <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>

¹¹³ Changes in sea level are not uniform, meaning they do not happen in the same way everywhere. Rather, there is variability in both rates and impacts of sea level changes at the global, regional and local levels. At the global level, SLR is caused primarily by the swelling of ocean water as it warms (thermal expansion) – a warming that is caused by increasing greenhouse gas (GHG) emissions into the atmosphere – as well as by increases in water volume from melting land ice (for example, glaciers on Greenland or Antarctica). Other factors, such as ocean circulation patterns, decadal variability and regional geology also influence the rate and degree of SLR at the regional level, leading to differences between regions of the world, such as that between the North Atlantic and the Indian Ocean. At the local level, other non-climate related factors such as compacted ground from construction, changes in the supply of sediment, and subsurface resource extraction (e.g. water and oil) also influence the rate and degree of SLR and lead to local differences. Because of these different interacting factors, scientists often use the term relative sea level rise (RSLR) when they study the impacts of sea level changes in order to emphasize the need to consider all these factors when conducting research and developing management plans which will help guide future development and policy actions (see [263], p. 367-368).

¹¹⁴ Here, mitigation implies those actions taken which aim to reduce the amount of SLR (such as reducing GHG emissions), whereas adaptation implies those actions taken to avoid harm from SLR that is or will occur (such as relocating infrastructure).

adjust to RSLR. By preventing coastal systems, such as barrier island sand dunes, from undergoing their natural adjustments to RSLR, for example by building seawalls, humans can speed up the loss of coastal habitat [268, 270]. These effects are in addition to a slew of other anthropogenic impacts on beach ecosystems throughout the world, ranging from sand mining to micro-plastic contamination [271]. The loss of natural coastal habitats means that the people and property which had been protected by these natural barriers will be at increased risk from coastal storms, flooding and erosion [259, 272]. It also means that, in the absence of corrective measures, the world's natural beaches, as two prominent coastal scientists put it, may be "facing extinction" [273].

The continuation of RSLR in the 21st century is projected to put millions of American citizens at risk, with the risk only increasing as coastal populations continue to grow. Florida currently has between 385,000 and 1.5 million people at risk if RSLR reaches 0.9 m (35 inches) or 1.8 m (70 inches), respectively. The number of at risk citizens is projected to increase to 1.2 million (0.9 m SLR) and 6.1 million (1.8 m SLR) by 2100 when population growth is factored in, far more than any other coastal state ([274], p. 2).

The impacts to be felt in Florida as a result of rising sea levels are similar to those to be felt around the world [268]. The Florida Oceans and Coastal Council has outlined the major impacts of RSLR in Florida which are already occurring and likely to increase in the future. These include 1) changes in barrier islands, beaches, and inlets; 2) changes in estuaries, tidal rivers, and coastal forests; 3) higher storm surge and impacts on coastal infrastructure; 4) threats to coastal water supply and wastewater treatment; 5) increases in beach erosion and re-nourishment; 6) impacts on coastal planning; 7) increased flooding risks [275]. Considering these impacts, in the absence of timely and wide-spread infrastructural retreat [276], the potential GDP at risk in Florida as a result of RSLR and resulting coastal squeeze is projected to range between \$7-\$98 billion throughout the state, with coastal development and tourism accounting for the majority of the potential loss ([265], also see [277]). Unfortunately, as a FDEP Environmental Specialist remarked in a telephone interview in 2016, "Florida is still in a state of denial about sea level rise" (FDEPES, Interview 10). Such denial was perhaps most clearly expressed in the accusations made against the state Governor Rick Scott that he attempted to "bane" state employees from the use of the term "climate change" in any official communications [278]. Adding to such problems of political will, currently local coastal governments are planning to develop *most* of the land vulnerable to sea level rise along the U.S. eastern seaboard [279].¹¹⁵

¹¹⁵ Flagler County, for example, recently approved a new development along SR A1A in the northern part of the county, despite strong resistance from residents and the fact that the area to be developed had been badly inundated by storm surge during Hurricane Matthew in 2016 and Hurricane Irma in 2017 [280].

Stability infrastructure and barrier island bio-geomorphology

The discussion of barrier island bio-geomorphology above proceeded largely under the assumption that we were considering islands that had not experienced significant anthropogenic manipulation. And on natural islands, erosion is not a problem, it is a systemic necessity. However, over 400 miles of Florida's sandy beaches are currently designated as *critically* eroded, meaning that shoreline erosion is threatening infrastructure or habitat considered to be of human value. More than half of these critically eroded beaches are located along the Atlantic coast ([130], p. 12, Table 1). The location and form of development along Florida's Atlantic coast has predominantly been concentrated along the coast, which has tended to lead to clashes between the human-built environment and the natural bio-geomorphic systems upon which they are constructed. The poor decisions of the past can perhaps be chalked up to ignorance, as theories of barrier island formation were only developed in the mid-20th century [243], but the practice of developing vulnerable coastal areas continues apace today, and ignorance is no longer a valid excuse [240, 276].

When anthropogenic changes to the barrier island system occur, they can obstruct natural bio-geomorphic processes in ways that can retard ecosystem dynamics and which may undermine the security of human-built structures.¹¹⁶ These consequences are perhaps most obvious when it comes to intervening in natural erosional processes, such as in cases of critical erosion management. This is because the initial manipulation of bio-geomorphic processes can exacerbate deteriorating erosional conditions and thus prompt the need for further measures to ensure infrastructural stability, which causes further degradation and thus repeats the cycle again, *ad infinitum*.

Human manipulation of sandy beach bio-geomorphic processes throughout the globe are implemented in response to a variety of pressures which are manifest at different spatial and temporal scales, ranging from foot traffic to climate change induced sea level rise. One major long-term threat is what is known as coastal squeeze, which occurs when beaches become "trapped between erosion and rising sea level on the wet side and encroaching development from expanding human populations on land, thus leaving no space for normal sediment dynamics" ([281], p. 8). The degradation which results in coastal squeeze is the outcome of a combination of three main types of manipulation of the beach environment: 1) impoundment, which is the direct loss of beach due to construction of, e.g. a rock revetment; 2) passive erosion, where beach loss occurs as a shoreline migrates

¹¹⁶ "The very nature of barrier islands, existing as they do in a delicate equilibrium between sea level, sand supply, and waves and currents, makes them extremely vulnerable to human-created changes. Almost without exception the changes are for the worse, at least as far as the island is concerned, for they cause the delicate island evolution equilibrium to go awry" ([242], p. 3-4).

towards stationary human-built structures; 3) active erosion, where beach loss is accelerated as a result of enhanced interactions between erosion control infrastructure and sediment transport processes (e.g. waves or currents) ([282], p. 22-23).

While the first two ways in which seawalls contribute to erosion are uncontroversial, the last contribution (i.e. active erosion) has been contested. Griggs [282] for example has argued from empirical evidence collected in California that seawalls do not contribute to active erosion or scour, though he provides the caveat that the data set used to draw these conclusions was collected during a time of reduced storm wave activity (p. 28). Kraus and McDougal [283], however, concluded from an extensive literature review in 1996 that the relationship between seawalls and active erosion is more ambiguous, leaving open the potential for seawalls to directly contribute to active erosion, and calling for more careful longitudinal research. In a more general sense, Pilkey and colleagues [240, 284] have long argued for precaution in coastal engineering, suggesting that the burden of proof should be on coastal engineers to demonstrate unequivocally that seawalls do not in fact cause active erosion or other forms of damage to the beach environment, and that they should refrain from constructing stabilization infrastructure in absence of such proof. More recent studies (e.g. [285]) seem to corroborate the suspicions of Pilkey and colleagues that seawalls are in fact broadly detrimental to beach environments.

These three main drivers of beach loss, when considered specifically in terms of barrier island bio-geomorphology, can be viewed as manipulating key components of natural island developmental dynamics, in particular the hindering of bio-geomorphic feedbacks by reducing or removing stabilizing vegetation and by manipulating the systems natural sand budget [270]. Impoundment, for example, involves the placement of infrastructure (e.g. a house or rock revetment) directly in the beach environment. This can result in the direct removal of stabilizing vegetation which, in the absence of a network of roots and foliage provided by beach dune grasses and other plant communities, can increase the rate and severity of dune erosion [286].

The same loss of stabilizing vegetation can occur through passive and active erosion over-time, as the beach area shrinks and the fore-dune is exposed to increasingly higher levels of wave and current energy, exacerbating erosion and thwarting plant community recovery [287]. In addition to the loss of dune vegetation, impounding “locks away” the sand that would normally be available for recovery of an eroded beach, for example after a storm event, which further increases the severity of both passive and active erosion as the squeezed beach becomes increasingly “starved” of the infusion of sand needed for ecosystem recovery. These three factors of impoundment and passive and active erosion interplay and compound, leading to the narrowing and lowering (i.e. squeezing) of

the beach environment over-time (Figure 34). Coastal squeeze has negative long-term ecological effects, in particular on the availability and accessibility of dwelling, feeding and nesting habitat for a variety of species, as well as on the level of species richness and abundance more generally [288].

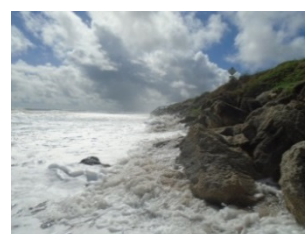
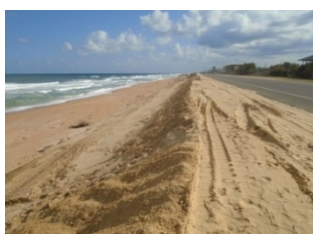
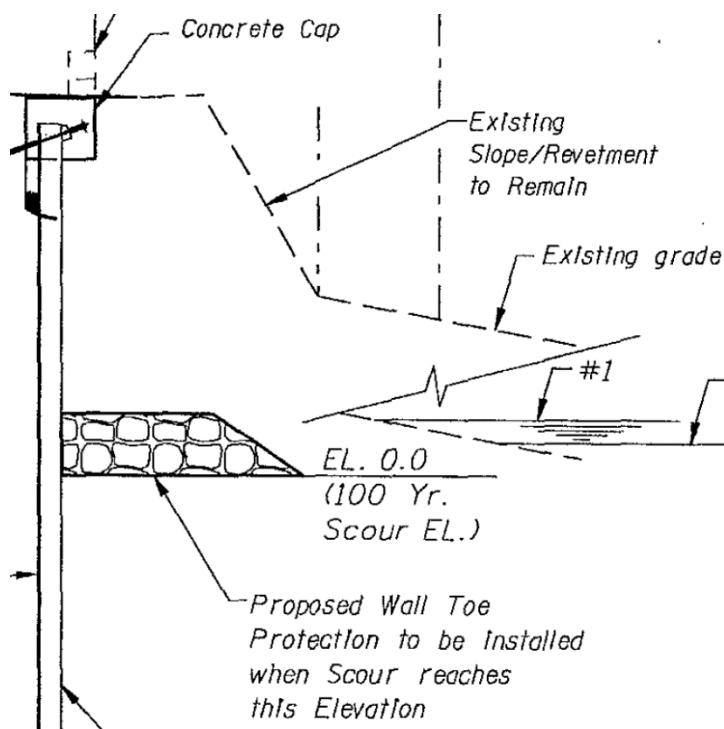


Figure 34:

Top: This detail of a cross-section of a proposed engineered seawall in Flagler Beach includes plans to install a protective “wall toe” when seawall-induced erosion reaches a particular depth. Source: Engineering sketch courtesy of the Florida Department of Transportation, District 5, 2015. **Bottom Left:** A re-constructed dune without replanted vegetation on North SR A1A, Flagler Beach. **Bottom Middle:** The city’s emergency seawall was covered with sand when it was installed (and several times after), but since then the beach has been scoured out by waves and the walls concrete and steel face exposed. **Bottom Right:** This coquina rock revetment along south SR A1A is designed to prevent erosion by trapping sand which would normally replenish the beach when erosion occurred; without it, the beach shrinks over-time. Source: Author’s photos, 2016.

The potential of seawalls to exacerbate erosion and lead to the eventual loss of the beach is well-known to the FDOT; in fact, they design coastal seawall projects to include measures which anticipate this happening [289] (Figure 34). Also, once a seawall is put up, it is very rare for it to be removed: “The emplacement of a seawall or other hard structure is an irreversible act. By gradually removing the beach in front of it, every seawall must eventually be replaced with a bigger (“better”), more expensive one” ([290], p. 47). And, even in the rare cases where a seawall or other coastal stabilization structure is removed, such as in instances of “managed realignment”, there is a serious lack of consistent, quality evidence to suggest that such reestablished coastal ecosystems will be qualitatively comparative [291]. In fact, damages to the local environment in Flagler Beach have already been documented by the Florida Fish and Wildlife Conservation Commission (FWC) and the Florida Department of Environmental Protection (FDEP).

Seawalls and coastal squeeze: the case of sea turtles

During an emergency meeting held by the FDOT in October 2016¹¹⁷, a few days after Hurricane Matthew had struck, the FDOT District 5 Environmental Permit Coordinator reassured concerned citizens and elected officials that any future FDOT projects to reconstruct and reinforce SR A1A would meet all environmental requirements: “As far as the long-term [effects on the environment],” she explained:

we actually have a Biological Opinion in place that’s current, that covers these areas where we are proposing the seawall. So, as long as we follow the conditions within the Biological Opinion, it will be ok from an agency standpoint.

The Biological Opinion (BO)¹¹⁸ she is referring to is a document “stating the opinion of the [U.S. Fish and Wildlife Service] on whether or not a Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.” The FDOT is required to request consultation with the USFWS and to follow its BO when FDOT projects interfere with threatened or endangered species protected under the federal Endangered Species Act. Florida is host to five nesting species of sea turtles, including Loggerhead (*Caretta caretta*), Leatherback (*Dermochelys coriacea*),

¹¹⁷ Some of this argument was originally published on FlaglerLive.com. See: <https://flaglerlive.com/103403/boda-flagler-beach/>

¹¹⁸ See https://www.fws.gov/sacramento/es/Consultation/Biological-Opinions/es_consultation_biological-opinions.htm

Green (*Chelonia mydas*), Hawksbill (*Eretmochelys imbricate*) and Kemp's Ridley (*Lepidochelys kempi*), all of which are either threatened or endangered.¹¹⁹ Any of these species can be found nesting in Flagler Beach, though the most common are Loggerhead, Green and Hawksbill (Figure 35).



Figure 35:

An enclosed sea turtle nest in south Flagler Beach. The posted sign warns beach-goers of the severe penalties for disturbing eggs or hatchlings, as many of the species nesting in the area are protected under state and federal law. Source: Author's photo, 2016.

It is easy to interpret what the FDOT representative quoted above said as meaning there are no problems with the department's strategy for dealing with coastal erosion, such as dumping rocks and building seawalls. However, far from clearing the FDOT of causing any environmental harm, the BO actually documented severe problems with the local beach that have already resulted from the FDOT placing rocks and seawalls, and they concluded that these problems would continue as long as the rocks and seawalls stayed in place.

¹¹⁹ While I here focus specifically on sea turtles as an example, Florida's barrier islands and beach dune communities are home to a variety of other endangered species, including mammals (e.g. beach mice) and shore birds (e.g. piping plovers) (see [257], p. 71).

The BO found that the existing FDOT rock revetment and seawall section amounts to what is known as a “take” of listed sea turtle species. Under the Endangered Species Act, Section 3 (18), “take” means to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct”, which includes obstructing nesting behavior or degrading important nesting habitat.¹²⁰ However, since the FDOT wasn’t directly intending to hurt listed species, the USFWS determined that it counted as an “incidental take”. This was based on the way FDOT rock revetments interfered with essential sea turtle breeding behavior, specifically how they lead to more “false crawls”. False crawls occur when female sea turtles come out of the ocean to lay eggs on the beach but are forced to return to the water without laying because they were unable to find suitable nesting locations or were obstructed in some other way.

For example, after the FDOT extended and rebuilt parts of the rock revetment in southern Flagler Beach during the 1999 hurricane season, the USFWS monitored the effects of the new infrastructure on sea turtle nesting behavior. After the first full year of monitoring, the USFWS found that the new rock revetment interfered with 68 percent of the loggerhead emergences onto the beach in the area and that the number of loggerhead turtle nests in front of the revetment in 2000, as compared to the number of emergences, was significantly lower than in other parts of Flagler Beach. The nesting success rate in front of the revetment was only 25 percent, compared to a nesting success rate of 65 percent for other Flagler Beach areas that year. Typically, nesting success rates lower than 50 percent indicate some type of interference with the ability for sea turtles to nest (see [292], p. 28). Other USFWS studies confirm the negative impacts from hard infrastructure on sea turtle nesting behavior and nest and hatchling success [293].

The potential negative effects of the FDOT’s proposed actions on listed sea turtles identified by the USFWS include:

- behavior modification of nesting females due to the presence of armoring structures resulting in false crawls
- displacement of nesting turtles into nesting habitat that is sub-optimal
- an increase in the physiological cost of nesting
- a possible decrease in nesting activity
- entrapment or mortality of nesting turtles and hatchlings
- washout or inundation of eggs laid seaward of armoring structures. ([292], p. 26)

Despite these well documented negative effects, the USFWS ultimately determined that the FDOT’s rocks and seawalls were “not likely to jeopardize the continued existence of the loggerhead sea turtle, green sea turtle, and leatherback sea turtle...

¹²⁰ See: <https://www.fws.gov/Midwest/endangered/glossary/index.html>

and no destruction or adverse modification of critical habitats are expected.” ([292], p. 34).¹²¹ Local environmental damage was likely, but the request for incidental take was ultimately granted, underpinned by the USFWS’s recognition of the statutory commitment to maintaining infrastructure in the public interest:

“Take” of sea turtles is expected as a result of interactions sea turtles will have with the construction of emergency armoring structures and the modification or replacement of these temporary armoring structures with permanent armoring structures. The State recognizes the need to protect public infrastructure from damage or destruction caused by coastal erosion (Section 161 Florida Statute and Chapter 62B-33 Florida Administrative Code). ([292], p. 5)

None of this is a secret, though it is of course not readily offered up for public consideration. To be fair, the FDOT has in general been forthcoming with the acknowledgement that their preferred approach would not provide for environmental conservation and that the responsibility for beach protection lays with other local, state and federal agencies.

When considering road protection and beach protection strategies, the limits of FDOT jurisdiction as well as the limits of the strategies must be considered. Although there is strong local interest in restoring the beach as well as protecting SR A1A, there may be no single alternative that can accomplish both goals. Road protection strategies alone will not restore the beach. Any beach protection strategies will require coordination by other agencies, including the City of Flagler Beach and Flagler County; as well as approval and permitting by the regulatory agencies ([218], p. 2-12)

****In this chapter I discussed the reasons behind the FDOT maintaining SR A1A in its current location, pointing in particular to their view of the road as the economic bloodline of the region. The FDOT, however, is limited in its coastal management activities to its legal right-of-way, leading the agency to implement hard stabilization infrastructure, including seawalls, as the only viable solution within their capacity. Seawalls however are hotly contested by local residents and elected officials because they interfere with natural barrier island developmental processes, leading to the loss of the local residential beach and endangered species habitat through coastal squeeze. Regardless of these environmental impacts, the FDOT, often echoed by local residents and city, county and state elected officials, insist that saving the road, even at the expense of the beach and dune ecosystem, is**

¹²¹ The BO was published in 2009 when there had not yet been critical sea turtle nesting habitat in Florida. The Department of Interior designed critical nesting habitat for the loggerhead sea turtle in 2014, and it remains unsure whether the FDOT will be made to reinitiate consultation with the USFWS to assess the impact of road stabilization infrastructure.

worthwhile, even essential for sustainable development. How this could be is the subject of the next chapter.

Chapter 5

Economy, Environment and Sustainable Development I

Only after the last tree is cut down;
Only after the last river has been poisoned;
Only after the last fish has been caught;
Only then will you find that you cannot eat money.

-Native American proverb

5.1 From Environmental Crisis to Sustainable Development

As seen in Section 4.1, the FDOT insists that protecting SR A1A in Flagler Beach should be prioritized over environmental conservation because the road is essential for the local and regional tourism economy. The idea that considerations of economic growth should overshadow those of environmental conservation might get the goat of many an environmentalist with a sensitive disposition, but the coherence and consistency of the theory which underpins this position is not so easily dismissed.¹²² In Chapter 2, I discussed the rise of environmental public policy in the United States, which was predominantly focused on controlling the behavior of individual citizens and firms through information campaigns, ethical appeals and targeted regulations. However, the recognition of a deeper tension between economic development and environmental quality increasingly became the focus of nations and international organizations, for example with heated debates over the *Limits to Growth* [119], pushing the environmental question beyond the boundaries of undesirable behavior. It was precisely such structural tensions between environmental quality and economic growth which underpinned the most famous of all formulations of the concept of Sustainable Development (SD), namely that proposed in the 1987 publication of *Our Common Future* [295], also known as the Brundtland Report. This famous formulation is, of course, that a SD “meets the needs of the present without compromising the ability of future generations to meet their own needs” ([295], p. 43).

The Brundtland Report acknowledges that the “unintended consequences” of some forms of economic growth in industrialized countries was causing serious problems for the environment which were in need of remediation, both through improved regulation and through technological innovation:

...where economic growth has led to improvements in living standards, it has sometimes been achieved in ways that are globally damaging in the longer term. Much of the improvement in the past has been based on the use of increasing amounts of raw materials, energy, chemicals, and synthetics and on the creation of pollution that is not adequately accounted for in figuring the costs of production

¹²² My thinking in Chapters 5 and 6 has been heavily influenced by my friend and colleague Turaj Faran, who originally laid out a version of his “typology of sustainable development” in a European Union funded project (GLOBIS) deliverable from which I draw heavily (see [294]). Turaj and I develop this typology and show the internal relationships between its types in more elaborate detail in a forthcoming paper entitled “Paradigm Found? – Immanent critique as a strategy in sustainability studies” being presented at the Association of American Geographer’s conference in New Orleans, LA, April 2018.

processes. These trends have had unforeseen effects on the environment ([295], p. 28).

What made the Brundtland Report so groundbreaking, however, was not the recognition that economic growth through industrialization could lead to environmental degradation, but because it seemed to succeed in combining the post-WWII developmentalist project and the emerging environmentalist project in a way that justified both ([294], p. 2-4). While recognizing the economy-environment tension in the Global North, which could, theoretically, be solved with regulations or efficiency measures, the Brundtland Report recognized that the argument for regulating growth in the name of conservation could not simply be transferred to the Global South. This is because the environmental degradation occurring in the Global South was not a factor of *too much* development, but of *too little*, as those living in abject poverty were forced to engage in environmentally destructive practices, such as deforestation, simply to eke out a living:

Environmental stress has often been seen as the result of the growing demand on scarce resources and the pollution generated by the rising living standards of the relatively affluent. But poverty itself pollutes the environment, creating environmental stress in a different way. Those who are poor and hungry will often destroy their immediate environment in order to survive: They will cut down forests; their livestock will overgraze grasslands; they will overuse marginal land; and in growing numbers they will crowd into congested cities. The cumulative effect of these changes is so far-reaching as to make poverty itself a major global scourge. ([295], p. 28).

From this realization, a true SD which meets the needs of present and future generations seemed to hinge on a particular kind of win-win scenario where development and environmentalism were complementary rather than antagonistic ([294], p. 3). The basic idea was that structural economic changes to countries in the Global South and increased physical and financial investment from the Global North would provide for expanded development which, in turn, would raise people out of poverty and thus remove the need to continue environmentally harmful subsistence practices, conserving the environment: “The point is that the reduction of poverty itself is a precondition for environmentally sound development. And resource flows from rich to poor, improved both qualitatively and quantitatively, are a precondition for the eradication of poverty” ([295], p. 69).

While this limited case offered renewed optimism towards the possibility of resolving the tension between environmental protection and economic development, it seemed insufficient that the only true SD could be premised on such a special circumstance. What about the Global North which, having reached the most advanced levels of industrialization and modernization in history,

continued to degrade many parts of the environment, often on a much more extended scale? The World Bank's *World Development Report: Development and the Environment* ([296], see especially p. 11, Figure 4), published in 1992, for example, pointed out that, while some environmental indicators, such as concentrations of particulate matter or sulfur dioxide, decreased as per capita income grew, other indicators, such as municipal waste per capita and CO₂ emissions per capita, grew exponentially. More recent work regarding what some have called the "great acceleration" (see [297]), a concept capturing the post-1950 rapid decline in many environmental quality indicators and simultaneous growth in many socio-economic indicators, furnishes further evidence regarding the link between economic and industrial expansion and environmental degradation.

Even though the Brundtland Report offered a useful and quickly popularized definition of SD, it failed to solve those residual tensions between economic development and environmental quality which were present outside of the special win-win scenario identified in the report. While some more extreme critics questioned whether SD was even a useful concept [298], among those committed to the concept the question remained whether SD could be generalized to include the developed Global North as well as the developing Global South [299]. And if it was generalized, what exactly would it be that was being "sustained" within and between generations, if SD was to be realized in practice?

The answer to the question of how to operationalize (or even more precisely define) SD after the Brundtland Report incited intense debate, with disputes raging in particular within and between the sub-fields of economics ([120], p. 590). While a few rogue economists were committed to rejecting the sustainability concept outright (e.g. [300]), most jumped on board with the concept in the early 1990s when a "general consensus, especially among neoclassical economists" formed around a more precisely articulated definition of SD, namely "non-declining average human welfare overtime", the logic of which, according to Stern ([301], p. 147), "does not imply a large departure from conventional economics". The formalized approach to SD which was developed out of this definition is known as the Capital Theory Approach, the proponents of which conceptualize human-made and environmental goods and services in terms of manufactured capital and natural capital, respectively. Capital Theory Approach was built on the economic work greatly advanced in the 1970s on economic growth and exhaustible resources ([301], p. 148).

“Weak” Sustainability

Perhaps the most prominent economist to initially take up the SD question was Nobel Laureate Robert Solow [294].¹²³ Solow’s initial steps to advance the problem of SD involved clarifying the ambiguities in its original formulation by employing the logic and concepts of neoclassical economics to form an approach which came to be popularly known as “weak” sustainability (see [301]).¹²⁴ “If sustainability means anything more than a vague emotional commitment”, Solow ([302] p. 167-168) wrote in 1993, “it must require that something be conserved for the very long run. It is very important to understand what that something is: I think it has to be a general capacity to produce economic well-being.” This capacity, in turn, is determined by the total stock of capital available for production.

Because the capacity to produce economic well-being is a factor of the total stock of capital, mainstream economists generally measure development using monetary metrics such as GDP per capita. Aggregate economic indicators of productivity or income offer a way of knowing whether the use of capital in production is contributing to an increase or decrease in over-all social well-being, and thus whether a nation is using its capital stock in a long-term sustainable manner.¹²⁵ As Solow ([302], p. 167) points out, the use of such a national product indicator is not arbitrary: “The very logic of the economic theory of capital tells us how to construct a net national product concept that allows properly for the depletion of nonrenewable resources, and also for other forms of natural capital.” Such a “net national product” (NNP) concept should account for both the conversion or loss of natural capital as well as the maintenance or growth of manufactured capital (and vice versa), so the *net* increase or decrease of total capital stock can be monitored. Once growth in NNP per capita is accepted as the indicator of development (as it represents a measurement of the increase in general capacity to produce social well-being) then the ultimate source of NNP growth is seen as not particularly relevant. Generally speaking, whether we all become richer by harvesting old growth forests or increasing widget production is not of central concern as long as the outcome of productive activity contributes to increases in NNP, and thus aggregate social well-being, in the long run:

¹²³ Robert M. Solow was awarded the “Nobel Memorial Prize in Economic Sciences” (Sw. *Sveriges riksbanks pris i ekonomisk vetenskap till Alfred Nobels minne*) in 1987. See https://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/1987/solow-bio.html

¹²⁴ Solow and his followers never called their approach “weak” sustainability for obvious reasons. A friend of mine, Michael Benson, when teaching or using the “weak” sustainability approach in his work prefers the term “Solow-oriented” sustainability to avoid the negative connotations of the weak label. While Michael’s approach is definitely fairer, I continue to use the “weak” label here because of the popular currency the title currently enjoys in many academic circles.

¹²⁵ For a fair and balanced criticism of the use of aggregate economic indicators as measures of development, see [303].

A sustainable path for the economy is thus not necessarily one that conserves every single thing or any single thing. It is one that replaces whatever it takes from its inherited natural and produced endowment, its material and intellectual endowment. What matters is not the particular form that the replacement takes, but only its capacity to produce the things that posterity will enjoy. Those depletion and investment decisions are the proper focus [of SD]. ([302], p. 168)

In this way neoclassical economics views natural resources as performing the same function as any other kind of capital asset in the economy, the only real difference being that (many) natural resources are non-renewable.¹²⁶ While this position concedes that the use of non-renewable natural resources can only lead to a decline in the over-all stock of natural capital (or at least portions of it), the productive use of natural resources is also seen as contributing to the continued development and growth of the over-all stock of manufactured capital, such as when fossil fuels are extracted and put to productive use by paving roads or producing electricity. In this way, natural capital and manufactured capital are interchangeable in terms of their role in maintaining the capacity for economic production: “Once that principle is accepted”, says Solow ([302], p. 168), “we are in the everyday world of substitutions and trade-offs.”

If the maintenance of capital stock in the abstract is the goal, it matters not what material qualities a capital stock has; only the total exchange-value of that stock is significant. Following this, Solow sees the substitution of natural capital for manufactured capital as a perfectly rational and desirable practice¹²⁷, assuming, of course, that we do so efficiently and the total stock of capital remains the same or increases over time. Since the use of non-renewable resources by current generations is an unavoidable necessity (at least for now), remaining true to the purpose of SD does not mean holding society responsible for endowing future generations with any particular thing, but “rather to endow them with whatever it takes to achieve a standard of living at least as good as our own and to look after their next generation similarly” ([302], p. 168). Solow ([305], p. 181-182) puts it this way:

You have to take into account, in thinking about sustainability, the resources that we use up and the resources that we leave behind, but also the sort of environment we leave behind, including the built environment, including productive capacity (plant and equipment) and including technological knowledge. *To talk about sustainability in that way is not at all empty.* It attracts your attention, first, to what history tells us

¹²⁶ “A pool of oil or vein of iron or deposit of copper in the ground is a capital asset to society and to its owner (in the kind of society in which such things have private owners) much like a printing press or a building or any other reproducible capital asset. The only difference is that the natural resource is not reproducible, so the size of the existing stock can never increase through time. It can only decrease (or, if none is mined for a while, stay the same)” ([304], p. 258).

¹²⁷ “trade-offs and substitutions are not only permissible, they are essential” ([302], p. 170).

is an important fact, namely, that goods and services can be substituted for one another. If you don't eat one species of fish, you can eat another species of fish... That is extremely important because it suggests that we do not owe to the future any particular thing. There is no specific object that the goal of sustainability, the obligation of sustainability, requires us to leave untouched... in making policy decisions we can take advantage of the principles of substitutability, remembering that what we are obligated to leave behind is a generalized capacity to create well-being, not any particular thing or any particular natural resource.

Solow's understanding of SD already contains within it the appropriate strategy for dealing with decisions of whether or not to substitute capitals in any given situation. The decision making logic that follows from Solow's position can be termed economic choice (see [294]), which captures the idea that the market mechanism provides the most effective means by which to make SD decisions. The market mechanism provides the means through which buyers and sellers get information and decide between alternatives, namely via the combination of price signals and rational self-interest (utility/profit maximization). However, SD premised on keeping NNP per capita at the same or higher levels into the future comes with two important caveats, a) current prices have to be adjusted (i.e. discounted) to take into account time preferences and other relevant sustainability considerations and b) it remains "absolutely vital that 'capital' be interpreted in the broadest sense to include everything, tangible and intangible, in which the economy can invest or disinvest, including knowledge" ([302], p. 169)

Understanding NNP per capita, in SD terms, to represent the total stock of a country's capital presupposes the need to assign (accurate) market prices to often non-market goods which constitute the stock of natural capital.¹²⁸ Various means for "getting the price right" of non-market goods have been devised. Familiar and widely used examples of proxy-based pricing techniques include contingent valuation, hedonic pricing and the use of travel costs [306]. Pricing environmental goods can be particularly difficult, and many have argued that widely used techniques to assign monetary value to non-market environmental goods and services may be insufficient to ensure good public environmental policy [307, 308]. Critics argue that in the absence of accurate market prices for environmental goods and services, social benefits received from natural capital stocks are likely to be undervalued or considered "value-less", while ills like environmental degradation are treated as "externalities" and their costs to society are underpriced or ignored [309]. However, these problems are in principle manageable within the neoclassical economic paradigm by improving and employing more accurate

¹²⁸ "It would be a real achievement if it were to become a commonplace that capital assets, natural assets, and environmental assets were equally 'real' and subject to the same scale of values, indeed the same bookkeeping conventions. Deeper ways of thinking might be affected" ([302], p. 167).

techniques, a point I take up further below in Chapter 6. Either way, the whole goal of getting the price right is so that individuals and governments can conduct CBA as means to make economically rational choices between competing alternatives. Of course, the caveat applies that CBA should be conducted subject to “the sustainability constraint of non-declining mean welfare” ([301], p. 147).

“Weak” Sustainability and the FDOT

Returning to the case of Flagler Beach, it is not a long leap of the imagination to identify the concept and strategy of weak sustainability operating in the FDOT’s decision making process and in the content of their project proposals. In particular, the FDOT’s previous and planned project activities involve the substitution of the dune system, which provides protection to infrastructure when intact, by seawalls or other erosion control infrastructure. In this sense, the argument is that in principle a seawall will do just as fine as a sand dune in protecting the road, and in the context of critical erosion in Flagler Beach, likely outperform the available sand dune system. While the FDOT does not aim to put a specific price on the dune system (as, for example, the Army Corps of Engineers has done, discussed more in Section 6.1), it is rather assumed that replacement of the dunes with a seawall (i.e. the FDOT’s preferred alternative) would provide for a larger return on investment in terms of economic growth than without taking such measures. Thus, replacing the sand dunes with a seawall would provide for the maintenance or growth in aggregate well-being by facilitating continued economic activity such that the strategy is in line with a weak approach to SD, even if the local environment is degraded in the process.

Though not always explicit¹²⁹, upon closer inspection it becomes more apparent that the FDOT decision making is in fact significantly infused with the logic of CBA, which guides choices ranging from the most general to the most specific details of its strategy for addressing critical erosion in Flagler Beach. Consider for example that the logic of CBA is what provided the justification for the FDOT’s choice to move from the historically dominant piecemeal approach to erosion control (e.g. dumping rocks and sand as needed) to a permanent solution, a choice which was fundamentally based on reducing the need for costly and continual maintenance.¹³⁰

¹²⁹ An FDOT representative put their position this way during a post-Hurricane Matthew emergency public meeting: “We want a permanent solution so that we won’t have to go through this again, for your sakes and our sakes.” Quote transcribed from a recorded public FDOT Emergency Meeting held in Flagler Beach City Hall, October 13, 2016.

¹³⁰ “State Road A1A within the limits of Flagler Beach... has experienced significant damage from storm induced erosion, over the past 30 years... Previous attempts to stabilize the roadway with rubble revetments have been insufficient to prevent severe erosion during storm events... The

More concretely, in the project development phase the FDOT juxtaposed the estimated cost of \$6,000 per linear foot of seawall, calculated for construction of the permanent solution they had suggested, to the average annual costs of maintaining the eroding portion of SR A1A (i.e. \$1.25 million), emphasizing the potential decreased costs and increased benefits to be realized in the long run through the permanent seawall solution.¹³¹ Furthermore, the use of CBA-based decision making directed the FDOT to adopt not only a permanent solution, but a *seawall* specifically. An early study of the seawall concept conducted in 2006 by the engineering consultancy firm CH2MHILL shows that cost effectiveness and economies of scale were important considerations in the selection of a seawall as the recommended alternative, as well as in the specific design of the seawall system to be installed. Under the section Recommended Alternative, the consultancy firm explains: “Based on the alternatives summary, a steel sheet pile wall bulkhead is the most cost effective solution for the proposed seawall and is recommended for further consideration.” [310]. Beyond the recommendation of the most cost effective type of erosion control infrastructure, the logic of CBA factored into even more detailed decisions regarding the strategy for installation and construction.¹³² Thus, when taken together, these different justifications for choices taken in the name of the FDOT point to the way the logic of CBA has been employed to guide decision making from more general decisions down to much more specific details. This logic makes it rational to not only protect the road in general, but to opt for a permanent, cost effective strategy, including both *what kind* of solution to install specifically and even *how* to install it.

By this point the FDOT appears to be standing on pretty firm grounds. Even as the department knowingly puts forward solutions which would be detrimental to the shifting, dynamic beach environment in Flagler Beach, the logic behind their decision making is well supported by neo-classical economic theory, and can even be convincingly argued to be in line with certain “weak” versions of SD. Parallel with the cost-effectiveness argument, the superiority of the seawall solution over the critical eroded sand dune system or the piecemeal rock revetments in terms of performing its intended function, namely protecting the road from erosional damage, was in some ways confirmed through the test of Hurricane Matthew. At the emergency meeting held by the FDOT less than a week after the hurricane had

average annual cost for maintaining the roadway in the last six years has been \$1.25 million. A permanent solution is desired to eliminate the need for continuous maintenance of the revetments” ([218], Appendix G, p. 2).

¹³¹ “Construction of seawalls in the vulnerable or problematic areas is recommended to stabilize and reduce maintenance costs” ([218], Appendix J, p. 6).

¹³² “It is strongly recommended that installation of the entire seawall be programmed in at least 1000ft long segments over the next 15 years. This will help to minimize the need for extensive monitoring and continued maintenance to protect the wall ends from flanking. It will also allow economy of scale and optimize mobility to help lower construction costs” [310].

passed, a FDOT spokesperson pointed out the fact that the small section of seawall in the city had survived the storm, which they considered to effectively amount to a proof of concept.¹³³

Good afternoon. I first came out here Saturday afternoon and saw what I think a lot of you saw, and the first thing we tried to do was get the road closed to make sure no one, you know, got into one of those washed out areas... What we early on noticed is that [sea]wall held up. Even though there was some washing out at the ends, the actual wall, that concept, withstood Matthew. So, that's the primary direction we are going in in these meetings.

In addition to FDOT representatives, this sentiment was also echoed by some individuals during public comment. A particularly condescending¹³⁴ employee from a Volusia County coastal engineering company, for example, lectured to local officials and residents that, if only they understood the issue adequately, they would see the rationality of the seawall solution.¹³⁵

Don't listen to people and get on the band wagon unless you really understand the hydrodynamics of coastal systems. And I know this is a big word, I know were talking about [other options], but I've seen beaches [erode]... and when the next big surge comes in, all the plants are gone. So, as much as you may not like the seawall, the fundamental question we have to ask is, do you want A1A to be there and to be safe, and do you want your properties to be safe? If not, sure, go with a softer look, what we call a "nicer look", and keep doing it every time we have a category two or three hurricane. Because it's going to happen, whether we like it or not, it's going to happen... and you know what, right now, if you had a wall, you wouldn't be repairing the road. That's the reality.

So, pretentiousness aside, it would seem that the evidence is mounting in favor of the seawall approach, as it appears to be more effective in both physical and cost terms when compared to the piecemeal dumping of rocks and sand or reliance on the critically eroded natural sand dune; in other words, a seawall is fiscally justified and structurally sound. And while the local beach environment is likely to be damaged by the installation of hundreds of feet of seawall, and even some endangered species will be affected [311], the economic benefits to be realized by protecting the road, it is assumed, will out-way the environmental and financial costs paid. Even if the benefits do not accrue directly to local residents, they will

¹³³ Quote transcribed from a recorded public FDOT Emergency Meeting held in Flagler Beach City Hall, October 13, 2016.

¹³⁴ After this public meeting adjourned, the Mayor of Flagler Beach told me she was surprised residents did not "run him out of town".

¹³⁵ Quote transcribed from a recorded public FDOT Emergency Meeting held in Flagler Beach City Hall, October 13, 2016.

provide for improvements in the aggregate welfare of society over-all, and thus can be considered in line with at least weak versions of SD.

5.2 From “Weak” to “Strong” Sustainability

At this point it would be reasonable to suggest that the story we have been following thus far has arrived at a sensible stopping point. This is because the FDOT, with the support of some residents and elected officials, had proposed an economically justified critical erosion management strategy that appears to be in the social interest and, even with potential environmental consequences, can be considered a *sustainable* solution. But here we are, on another page, with the story, stubbornly, continuing to unfold.

As we will see, the City of Flagler Beach is anything but enthusiastic about the idea of seawalling their local beach. But why, even with the consistent theoretical underpinning and empirical corroboration, is the FDOT solution not accepted with open arms? In Section 4.2, I laid out the various ways that seawalls can interfere with and be detrimental to barrier island beach ecosystems, but then proceeded to “solve” this problem in principle by way of neo-classical economics and the concept of capital substitutability; so why all the fuss? Do those citizens, elected officials and even coastal scientists who continue to resist seawalls as a viable erosion management strategy simply not understanding the issue (or the economics)? Or, are there deeper, more fundamental reasons behind their persistent resistance?

Solow’s suggestion that capital be interpreted “in the broadest sense to include everything, tangible and intangible, in which the economy can invest or disinvest, including knowledge” ([302], p. 169) lays at the heart of the idea of substitutability. But what makes “capital” so fluid that it can transform into everything from tractor-trailers to college educations? The answer, of course, is exchange-value, which establishes qualitative equivalence between all commodities; but commodities also have use-value.¹³⁶ The tendency of economists ranging from Ricardo to Solow and beyond to place the use-value category squarely outside the purview of economic analysis is based in the idea that political economy (or economics) is fundamentally interested in the *social* component of production and exchange, i.e. the exchange-value component, and as a result material quality (i.e. use-value), the realm of “natural” science, is not considered a relevant category for economic analysis (see [65], Chapter 3). Instead, in economic analysis the use-

¹³⁶ “As use-values, commodities differ above all in quality, while as exchange-values they can only differ in quantity, and therefore do not contain an atom of use-value” ([58], p. 128).

value of commodities, as Rosdolsky ([65], p. 81) put it, “appear as a simple presupposition of their exchangeability.”

This exclusion of use-value from consideration is consistent with the treatment of the (capitalist) economy as an ahistorical system (cf. [9], Chapter 4)¹³⁷, and the categories such as “capital” of which it is comprised as universal.¹³⁸ Marx noted how economists defined capital generically as the “raw materials, instruments of labour, and means of subsistence of all kinds, which are employed in producing new raw materials, new instruments, and new means of subsistence” ([7], p. 28), a definition which conceives capital as a *thing* which facilitates production (rather than a particular form of *relation*) ([65] p. 184).¹³⁹ As a result, the difference between what makes something simply a means of production, and what makes it *capital*, is never differentiated.

However, an historical materialist approach to political economy would tend to view capitalist economic relations as representative of a definite stage of historical development of society, with its own unique categories which do not equally apply outside of the capitalist system (see [315], p. 65-70). From this perspective, a commodity is transformed into capital only under a particular set of social relations (see [65], p. 183-185), in particular those relations specific to the capitalist mode of production which employ commodities not simply for furthering production, but production for exchange and the realization of surplus value. Marx ([7], p. 28) put it this way:

¹³⁷ In the introduction to *Grundrisse*, Marx ([312], p. 87) rails against the tendency (or intention) of economists of his time to “encase” specific economic relations and concepts “in external natural laws independent of history, at which opportunity bourgeois relations are then quietly smuggled in as the inviolable natural laws on which society in the abstract is founded”.

¹³⁸ In a similar but different vein to that of Marx several decades earlier, at the turn of the 20th century economist Torsten Veblen levied criticism against his contemporary mainstream economic science and its tendency to exclude history and development from their theoretical models and empirical analyses, aiming instead to construct universal “natural laws” which would apply anywhere and everywhere as they did in, for example, physics. In contrast, he argued that, at the time, economics had missed out on a major shift which had taken place in many sciences towards an evolutionist paradigm, that is, towards an aim to explain the developmental processes and cumulative causation which underpin socio-economic change, rather than being content with the collection and collation of empirical facts. Railing against the ahistorical, deductive method still dominant in economics today, Veblen argued that the “outcome of the method, at its best, is a body of logically consistent propositions concerning the normal relations of things - a system of economic taxonomy. At its worst, it is a body of maxims for the conduct of business and a polemical discussion of disputed points of policy” ([313], p. 384).

¹³⁹ Costanza and Daly ([314], p. 58) in many ways confuse the idea of capital even more severely than Solow when they suggest a “more functional definition” of capital as “a stock that yields a flow of valuable goods or services into the future.” This definition, however useful for the purposes it has been employed, similarly hides the historical specificity of capital as a particular political-economic category.

A [man] is a [man]. Only under certain conditions does he become a slave. A cotton-spinning wheel is a machine for spinning cotton. Only under certain conditions does it become capital. Torn away from these conditions, it is as little capital as gold by itself is money, or as sugar is the price of sugar.

So, a beach is a beach. Only when set in particular social relations does it become natural *capital*. However, the conditions under which a collection of use-values is transformed into capital, and thus an abstract, qualitatively homogenous mass of exchange-value, do not annihilate the material content of the commodities which comprise that capital in actuality. Marx often emphasized the centrality of the exchange-value¹⁴⁰ for understanding capital. However, as Rosdolsky ([65], p. 74) notes, Marx clarified that while use-value is “independent of the determinate economic form” (i.e. exchange-value) of commodities under capitalism and thus “lies outside the sphere of investigation of political economy”, it none-the-less becomes a relevant category “when it is itself a determinate form”.

An example¹⁴¹ of when use-value becomes determinate in economic relations comes from considering the relation of fixed capital to the process of capital circulation. Fixed capital (such as transport infrastructure or a natural beach), Rosdolsky ([65], p. 85) reminds us, only circulates as value “to the degree that it is used up or consumed as use-value in the production process”. The material qualities of fixed capital, for example durability or perishability, determine the temporal duration within which fixed capital can “continue to perform its function within the repeated production processes of capital.” In this way, material quality (i.e. use-value) enters the equation as a “form-determining moment”.

Importantly, specific capitals (whether fixed or mobile) may only be able to be productively consumed (and thus realize their use-values¹⁴²) in relation to other, qualitatively different capitals. In such a scenario, the mutual self-reliance between two capitals (such as manufactured and natural capitals) would make them

¹⁴⁰ “Capital consists not only of means of subsistence, instruments of labour, and raw materials, not only of material products. It consists just as much of exchange values. All products of which it consists are commodities. Capital, consequently, is not only a sum of material products, it is a sum of commodities, of exchange values, of social magnitudes. Capital remains the same whether we put cotton in the place of wool, rice in the place of wheat, steamships in the place of railroads, provided only that the cotton, the rice, the steamships- the body of capital- have the same exchange value, the same price, as the wool, the wheat, the railroads, in which it was previously embodied. The bodily form of capital may transform itself continually, while capital does not suffer the least alteration” ([7], p. 29).

¹⁴¹ Rosdolsky ([65], p. 86) also offers this example: “The role of use-value is seen most clearly in the production process of aggregate social capital... the reproduction of which the problem is not merely the replacement of value, but also the replacement of material, and consequently everything depends on the material shape, on the use-value of the value-product”.

¹⁴² “...the use-value of things is realized only in their consumption” ([70], p. 226).

complements of one another rather than substitutes. Complementarity¹⁴³ of capitals amounts to the relationship where usefulness (i.e. consumption) of one capital is predicated on the existence of a separate pool of capital which differs *qualitatively* (i.e. in terms of its use-value). As Costanza and colleagues ([320], p. 95) have put it:

The complementary nature of natural and human-made capital is made obvious by asking: what good is a sawmill without a forest? A refinery without petroleum deposits? A fishing boat without populations of fish?

The contradictions stemming from the assumption of the near perfect substitutability of capitals are logical as well as practical. As Ecological Economist Herman Daly has pointed out, if near perfect substitutability of capitals is really the case, it should in theory work *both ways*, but here the logic runs into trouble:

One way to make an argument is to assume the opposite and show that it is absurd. If manmade capital were a near perfect substitute for natural capital then natural capital would be a near perfect substitute for manmade capital. But if so, there would have been no reason to accumulate manmade capital in the first place, since we humans were already endowed by nature with a near perfect substitute. But historically we did accumulate manmade capital – precisely because it is complementary to natural capital ([321], p. 51)

Taking Daly's argument in the other direction, we find this theoretical contradiction leads to important practice contradictions. If manufactured and natural capitals are in fact near perfect substitutes, differing significantly only quantitatively in terms of exchange-value, then we should be able to survive just as well on manufactured capital as on natural capital. But, as the well-known Native American proverb about eating money suggests, this is a seriously problematic assumption.

Of course, pointing to the importance of use-value is not particularly novel. A colleague recently pointed out to me, for example, that Aristotle recognized this problem over two millennia ago. When discussing the differences between necessary house-holding and unnecessary wealth accumulation (i.e. *oikonomia* and *chrematistics*, respectively, see [322]) in his famous *Politics*, Aristotle invokes the fable of King Midas to show that monetary wealth (a symbol of pure exchange-

¹⁴³ Daly's use of the term "complementarity" is quite different from that invoked by Niels Bohr which I have referred to in other published work (e.g. [316]). While Daly's use invokes an economic relation between capital types which only realize their usefulness in relation to each other, Bohr's use is epistemological and is meant to denote "a relation between mutually exclusive descriptions predicated upon theoretically incommensurable abstractions" ([317], p. 1036; also see [318] and 319, p. 179b).

value) is not the same as or a substitution for food or other means essential to human biophysical or social reproduction (a symbol of use-value).¹⁴⁴

... riches is assumed by many to be only a quantity of coin, because the arts of getting wealth and retail trade are concerned with coin. Others maintain that coined money is a mere sham, a thing not natural, but conventional only, because, if the users substitute another commodity for it, it is worthless, and because it is not useful as a means to any of the necessities of life, and, indeed, he who is rich in coin may often be in want of necessary food. But how can that be wealth of which a man may have a great abundance and yet perish with hunger, like Midas in the fable, whose insatiable prayer turned everything that was set before him into gold? ([323], Part IX)

Herein lays the fundamental difference between weak sustainability, with its focus on substitutability of capitals, and strong sustainability and its focus on complementarity of capitals [321]. While the first line of thinking arrives at the conclusion that it is unproblematic to assume that natural capital can be converted into (or substituted by) manufactured capital without affecting productive capacity, the latter line of thinking leads to the idea that the maintenance of at least some natural capital stock is a necessary *precondition* for the continued usefulness of (some forms of) manufactured capital and to the continuation of productive activity in general. Three main reasons for differentiating natural and manufactured capital put forward by advocates of this “strong” sustainability approach can be summarized as:

1. Manufactured capital is not independent of natural capital. The latter is often needed to make the former.
2. Natural capital fulfills other economic functions, including basic life support; it is multifunctional to an extent not shared by manufactured capital.
3. Because of the above, it is not always possible to substitute manufactured capital for natural capital. ([324], p. 201)

¹⁴⁴ Marx makes a similar point by reference to Midas in the Chapter on Money in Grundrisse ([312], p.233-234) : “Money in its final, complete character now appears in all directions as a contradiction, a contradiction which dissolves itself, drives towards its own dissolution. As the *general form of wealth*, the whole world of real riches stands opposite it. It is their pure abstraction – hence, fixated as such, a mere conceit. Where wealth as such seems to appear in an entirely material, tangible form, its existence is only in my head, it is a pure fantasy. Midas. On the other side, as *material representation of general wealth*, it is realized only by being thrown back into circulation, to disappear in exchange for the singular, particular modes of wealth. It remains in circulation, as medium of circulation; but for the accumulating individual, it is lost, and this disappearance is the only possible way to secure it as wealth.”

Under this strong version of SD, once the limitations of capital substitutability are acknowledged and the potential for complementarity of capitals accepted, the idea then becomes to maintain not just an aggregate stock of over-all capital, but to maintain both manufactured capital *and* natural capital at the same time, or rather *separately*. Daly, again drawing on the example of fisheries (seemingly a favorite among ecological economists), put the point this way:

Weak sustainability would suggest that the lack of fish can be dealt with by building more fishing boats. Strong sustainability recognizes that more fishing boats are useless if there are too few fish in the ocean and insists that catches must be limited to ensure maintenance of adequate fish populations for tomorrow's fishers. ([325], p. 103)

What does this recognition imply for addressing a more specific problem like coastal erosion in Florida?

Natural capital and beach tourism in Florida

It is well-known that Florida, the “Sunshine State”, was historically endowed with all sorts of beautiful natural features. But in what ways do these constitute natural capital? One answer, I hope to show, is that they can be consumed as capital in the production of tourism commodities.

As explained in Section 1.3 above, since the turn of the 21st century by far the most dominant sector in what economic historian Stronge ([53], see specifically Chapter 15) has called Florida's “Sunshine Economy” is the tourism-retirement sector, which collectively makes up nearly three quarters of the state's entire economic base. The Orlando Sentinel recently reported that over 110 million tourists visiting the state in 2016 alone, produced \$109 billion in economic impact ([326], also see [160]). The number of tourists visiting the state has increased substantially over the last 15 years, a trend which has likewise been reflected in increases in the number of jobs in the tourism industry as well as in tax revenue collected from tourism spending ([327], p. 6). As FloridaTax Watch has put it: “Tourism is [Florida's] number one competitive advantage... [it] provides the most jobs of any industry in the state and provides a significant amount of tax revenue for cities, counties and the state” ([328], p. 14). In recent years, tourism-based consumption has accounted for roughly 1 of every 4 dollars collected in tax revenue in Florida, while tourism-based industries directly employ over 1 million people in the state.¹⁴⁵

¹⁴⁵ See: <http://www.visitflorida.org/about-us/what-we-do/tourism-fast-facts/>

The growth in tourism in Florida is reflective of a wider development of the tourism industry around the globe, which Fletcher [330] argues is indicative of the expanding roles the tourism industry is playing in providing opportunities (or “fixes”) for capital investment as the rate of profit in other more traditional industries is waning, as well as providing fresh horizons for the extension of capitalist markets. What exactly it is that attracts millions of tourists to Florida annually is important to understand, particularly regarding the relationship between economic well-being and environmental quality. While attractions such as Walt Disney World often come to mind when Florida is mentioned as a tourism destination, and indeed are a major draw for many tourists, the state’s coastal environment, what the Center for Competitive Florida has called “Florida’s natural competitive advantage” [328], in fact plays the largest role in attracting visitors to the state. Far from an industry “fad”, ecotourism has become a significant part of the state’s mainstream tourism industry ([331], p. 11). Beach-based tourism in particular has been marked as the largest contributor to the “attractiveness” of Florida as a tourism destination (Figure 36). A study conducted by Visit Florida, the state’s leading PPP tasked with developing the tourism industry, found that 40% of all U.S. visitors to Florida in 2011 reported beach and waterfront activities as among their main reasons for visiting the state ([328], p. 4).

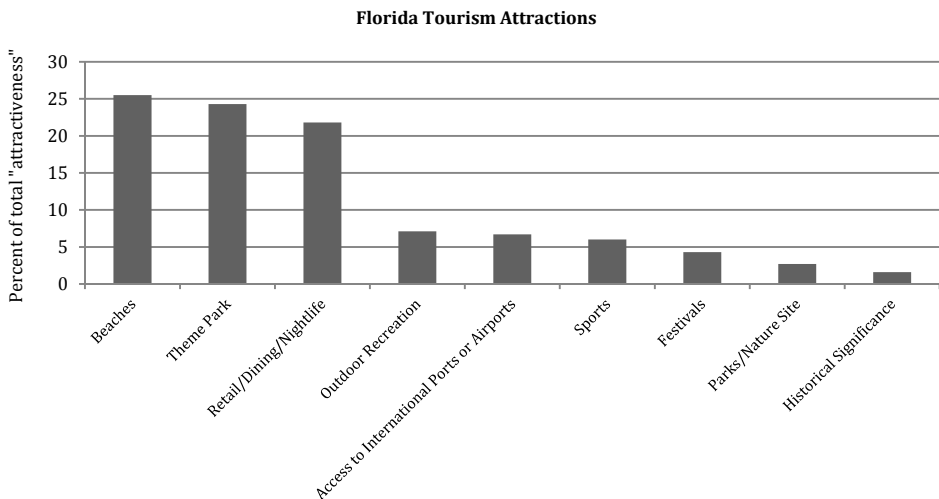


Figure 36: Florida’s natural and man-made features and their respective attractiveness to tourists. Source: [329], p. 9, Table 1.

The Florida Office of Economic and Demographic Research has noted that “beaches are the most important feature of Florida’s brand and have the strongest effect in terms of attracting tourists”, with spending on beaches producing a

notably high return on investment compared to other industries [329]. Because of this heavy reliance on the state's natural endowment of attractive sandy beaches, the degradation of the state's coastal environments is seriously detrimental to the continued viability of one of the state's most crucial industries. Visit Florida perhaps put it in the most straight forward terms: healthy beaches = high revenues [332]. The centrality of beaches in Florida's tourism industry is also reflected at less aggregate scales, with many coastal city governments relying heavily on beach-based tourism for public revenue generation, for example through local sales or other specialty taxes, as in the case of the previously mentioned Flagler County TDC "bed tax".

In the same way, the continued maintenance of at least a minimum of beach environment in Flagler Beach, following the logic of capital complementarity and thus strong sustainability, becomes a necessary precondition for the productive consumption of SR A1A as manufactured capital. As a result, the continued maintenance of the productive capacity of the economy, which we previously identified, via Solow, as the goal of SD, becomes reliant on the maintenance of *both* SR A1A *and* the local beach environment. Along these same lines, the manufactured capital in the form of transportation infrastructure in Flagler Beach is only useful in terms of providing access to a different, complementary pool of natural capital in the form of the beach environment. Saving the road at the expense of the beach undermines the purpose of the road in the first place. Thus, we could similarly ask, as Costanza and colleagues have regarding fishing boats and sawmills, what good is SR A1A without a beach?

Capital complementarity in Flagler Beach

On the 24th of March, 2011, the Flagler Beach City Commission put forward and unanimously passed Resolution 2011-15, A Resolution of the City of Flagler Beach Opposing the Construction of Proposed Florida Department of Transportation Seawalls [sic] Along the Beaches of Flagler Beach, which formally rejected the FDOT's proposed seawall plans. The reasoning behind the city's opposition was laid out in a series of statements outlining concerns and positions on a variety of environmental, social and economic issues. The city's argument boils down to this: the FDOT wants to build seawalls, but seawalls ruin the beach (as we already known). The City Commission is responsible for taking care of community well-being, and the loss of the beach, even if economically justified, would unacceptably reduce citizens' quality of life. Furthermore, the loss of the local beach is not economically sound, as, rather than being worthwhile because of attracting tourism, it undermines tourism, which relies on a healthy beach environment. Here is an excerpt:

WHEREAS, the Florida Department of Transportation is planning construction of seawalls along the Atlantic Coast of Flagler Beach; and

WHEREAS, the City Commission of the City of Flagler Beach is charged with responsibility to protect the health, safety and welfare of the residents of and visitors to the City of Flagler Beach; and

WHEREAS, the beaches of Flagler Beach are critically important to the economies of Flagler Beach and other jurisdictions located in Flagler County; and

WHEREAS, the construction of seawalls along the beaches of Flagler Beach would negatively affect the quality of life for the residents of and visitors to the City of Flagler Beach as well as endanger or substantially impair the nesting grounds of sea turtles and indigenous species; and

WHEREAS, seawalls are not conducive to the sound economic growth of Flagler Beach; and

NOW, THEREFORE BE IT RESOLVED BY THE CITY COMMISSION OF THE CITY OF FLAGLER BEACH, that the City Commission opposes the construction of the currently planned seawalls along the Atlantic Coast of the City of Flagler Beach.

The criticism advanced by the Flagler Beach City Commission against the FDOT proposed seawall is grounded in a rather profound realization that even the likes of Robert Solow seemed to neglect. In particular, rather than solely considering the total stock of capital in terms of exchange-value, the city's criticism brings into focus the neglected importance of use-value, i.e. the individual *qualities* of capital which make them useful in the over-all process of commodity production, and the potential for complementarity between capitals that these qualities create.

In 2016, the Flagler County TDC warned¹⁴⁶ that “based on studies of tourism budget cuts in other states, the U.S. Travel Association predicts that with a 2 percent reduction in travel, Florida would lose \$2.2 billion in travel spending, 28,000 in Florida jobs and \$225 million in tax revenue”, insisting that “now, more than ever, it's important to appreciate and support the positive economic impact tourism has on the Palm Coast and Flagler Beaches.” Like many coastal counties in Florida, a large part of the attractiveness of Flagler County is its miles of beach front. The centrality of the county's beaches in drawing tourists and residents is represented by the county branding itself as *Palm Coast and the Flagler Beaches*. The Flagler County Planning and Zoning Director, in an interview in 2015

¹⁴⁶ See <http://www.travelmediapressroom.com/palm-coast-flagler-county-florida-continues-reap-benefits-tourism/>

(Interview 4), went as far as to label maintaining access to beaches, for residents as well as tourists is the biggest challenges facing the county in coming years:

FCPZD: We like to think we had a lot of [beach access]... but that was back when there were 20,000 people in the county. Now that we are up to 100, and maybe even potentially up to 150 or 200 thousand here in 40 to 50 years, I think that is gonna be the hardest challenge, maintaining that public access. And not just for residents alone, certainly for tourism, continuing that focus, and being able to balance the issues of everyone, I think that's the biggest challenge.

The City of Flagler Beach in particular, which was a finalist in the “coolest small towns in America” competition held by Budget Travel [208] in 2013, is a strong attraction for tourists in the county. And people, of course, come to Flagler *Beach* for its beach. A survey conducted by researchers and students from Daytona State College in 2013 found that 68% of the nearly 430 tourists surveyed said they would not come to Flagler Beach if it had no beach ([200], p. Appendix C1). Clearly, the continued existence of high quality beaches, like Florida in general, is crucial to the maintenance of the city's and county's tourism economy.

This recognition of the central importance of the local beach environment to economic stability in the city and county is also echoed by business owners who rely directly on beach-based tourism for their livelihoods. In the aftermath of Hurricane Matthew, the question of what the future of the city and county beaches would look like dominated public conversation. The FDOT's indication that their preferred approach to reconstructing the damaged portions of SR A1A was to install seawalls led some local businesses to point out that maintaining the road at the expense of the beach would ultimately be counterproductive, for as tourists may come to the city *on the road*, they come to the city *for the beaches*.¹⁴⁷

Flagler Beach is, we're here for tourism. And there are a lot of hotels and Inns and motels along A1A and right now, I have to tell you, right now, so far I have lost six reservations because of the debris on the beach... if you put up a seawall, [at high tide] you won't have a beach, you don't have a place to put chairs or blankets out. And if you end up getting a seawall up there, you are essentially going to be putting out of business every lodging establishment in Flagler Beach that their guests are depending on going out to that beach. Because if there is no sand for them to put their chairs out, they're not here to just look at the beach, they're here to be able to lay on it. So that is critical for all the people who live here... So please, please, not only clean up the debris, but a seawall is just absolutely the worst thing we could ever do.

¹⁴⁷ Quote transcribed from a recorded public FDOT Emergency Meeting held at Flagler Beach City Hall, October 13, 2016.

In addition to the effects on individual business owners, it is worth reiterating that the limited capacity for Florida's local governments, both city and county, to raise public revenues often means that funding for environmental management is necessarily linked to tourism flows, as is the case with the Flagler County bed tax which provides the only revenue stream for the county's beach management fund. Consider, for example, the previously mentioned fact that Flagler County commissioners unanimously agreed to raise the county's bed tax rate from 4% to 5% in order to increase the collection of funds for repair of the county's beaches after Hurricane Matthew [212].

This direct connection between tourism and the public finances available for maintenance of the local environment, which plays a large role in attracting those tourists in the first place, further demonstrates the fundamental need to sustain the health of the beach environment as a *condition* for economic stability. If the quality of beaches in the county is compromised, then fewer tourists will visit the county, which in turn would lead to reduced public revenue flows into the funds available for environmental management. This could then lead to further environmental degradation, and so on *ad infinitum*. Furthermore, a loss of tourism tax revenue would not only reduce the capacity of the county and its cities to maintain the beach environment, but could have serious repercussions for the operations of local government more broadly. As the Flagler County Public Safety Director remarked in an interview in 2015, if Flagler County loses tourism business, it loses tax, and if it loses taxes, then "it's back on the tax payers for residential [services], and if they get to a point where they are depending on nothing but residential tax dollars, they will defunct. They've got to have that business income" (FCPSD, Interview 5).

Local environment and quality of life in Flagler Beach

Resolution 2011-15 passed by the Flagler Beach City Commission introduced above points to several issues of concern for the city's elected officials. The environmental problems with seawalls have already been established in Section 4.2, and the economic concerns have just been discussed above, but the social considerations remain. These social concerns are of course of central, practical concern for elected politicians who are tasked with maintaining the quality of life of their constituents, namely the citizens of Flagler Beach. In fact, their job depends on it. However, it should be noted from the outset that these social concerns do not, technically speaking, amount to an immanent criticism of the neo-classical economic strategy, but they are significant tensions arising from the FDOT's proposed strategy none-the-less and are of major practical and political relevance regarding decision making within Flagler Beach.

Resolution 2011-15 states clearly that seawalls, by harming the local environment, would be detrimental to local residents' quality of life. In order to establish more concretely what the significance of a healthy beach environment is to local residents, I conducted a citizen survey, in collaboration with the City of Flagler Beach¹⁴⁸, to inquire about the general public opinion regarding a variety of beach management issues, including public prioritization of beach management problems, levels of public awareness of and participation in beach management activities, the desirability of various routes of communication between local government and citizens regarding beach management information, and citizen perspectives on management responsibility (see Appendix 1 for supplementary information).

The results of the survey were clear. Residents care, a lot, about their local environment. Out of 384 responses, the over-whelming majority, a full 90%, consider a healthy beach "Very Important" to their quality of life, with another 9% considering it "Somewhat Important". Less than 1% of respondents found a healthy beach environment "Not Important" to their quality of life. This sentiment was echoed in open comments as well, where citizens expressed their concerns and priorities regarding what they see as the most significant characteristics of their home town. Here are a few different examples:

I feel that the city needs to adopt an attitude of being the cleanest beach town & focus on protecting our most amazing and prized assets. Nature.

Preservation and health of the beach is absolutely crucial to our quality of life in Flagler Beach, including wildlife.

A1A must be moved sooner rather than later. Eventually the ocean will take the road regardless of what is done.

Main problem with erosion in Flagler Beach [is] because dunes were leveled for the road! Replant dune vegetation! Forget the view – Rock revetments look terrible and are not natural. Wouldn't need them if dunes were rebuilt!!!!

To corroborate these sentiments even further, in the same survey residents were asked to rank various issues regarding priorities for coastal management. While environmental quality indicators, such as cleanliness, erosion control, vegetation and wildlife conservation topped the list of priorities, economic considerations, which are of course the major motivating factor for the FDOT's strategy, were at

¹⁴⁸ A policy document entitled "Beach Management in Flagler Beach- An over-view of citizen perspectives" was produced from these survey results in 2015, submitted and presented to the Flagler Beach City Commission, and subsequently formally adopted as an appendix to the city's existing Beach Management Plan.

the bottom of the list, with tourism being ranked dead last with only one-in-four respondents considering it a “High Priority” (Figure 37).

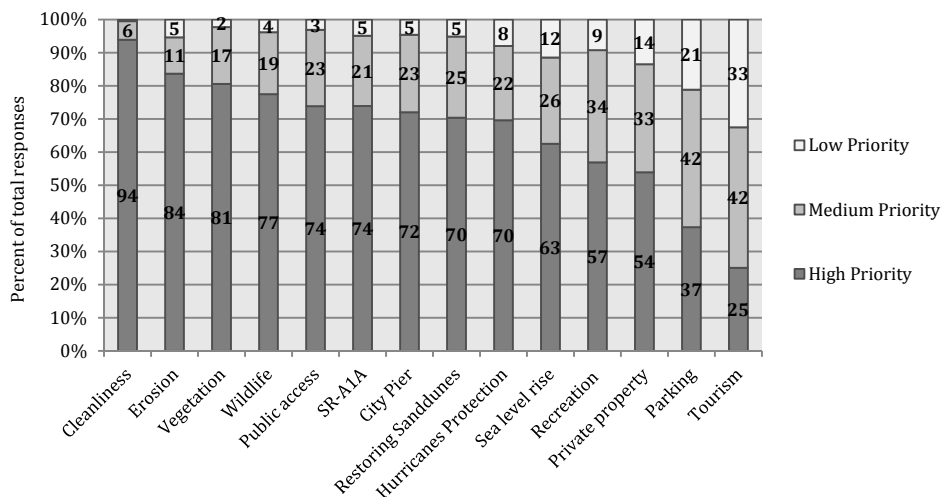


Figure 37: Flagler Beach citizen prioritization of beach management issues (n = 396). Author’s data, also published in [333].

In fact, again in open comments, several residents pointed to tourism as being among the *detrimental* factors regarding quality of life in the city, with many preferring instead to reduce tourism and the congestion and pollution that they see as being connected with it. A couple examples:

Leave the beach alone to seek its own levels and get rid of the tourists, the traffic, the drunks, the crowds and trash.

Too much traffic. Less tourists would be better for residents. Businesses should be for us not tourists.

While such anti-tourism sentiments may reflect the priorities of a certain group of local residents, they do not negate the fact that tourism is of crucial importance to business-owning residents and for the coffers of city and county government (see Section 3.1). However, in Resolution 2011-15, city elected officials point out that the loss of the beach environment via the installation of seawalls is “not conducive to the sound economic growth of Flagler Beach”. Here the city points to what Roy Bhaskar ([334], p. 21) might call an “Achilles’ heel critique”, that is, “a critique of a system of thought on the very point where it is believed to be, and believes itself to be, strongest”. The crux of the weak sustainability approach to development is the idea of capital substitutability, and in the context of Flagler Beach this translates into the idea that preserving tourism infrastructure, in particular SR A1A,

even at the expense of losing the beach, is economically justified by way of maintaining tourism flows. In other words, the natural sand dune (natural capital) can simply be substituted by a seawall (manufactured capital). However, as the city points out and I develop further below, upon closer inspection this assertion is contradictory, as tourism, both in Flagler Beach and Florida more broadly, is closely tied to the quality of the beach environment.

From capital substitution to capital complementarity

The reader will recall that the essence of capital is twofold; it is composed of both use-value and exchange-value. Substitutability focuses on exchange-value exclusively, with the particular material qualities of the capital not factoring into the logic of total stock of capital. In other words, all else being equal, changes solely to the material qualities of capital do not affect the stock of capital.¹⁴⁹ The FDOT argues for the substitution of the natural capital, namely the sand dunes in Flagler Beach, with manufactured capital, namely the seawall, the ultimate goal being the maintenance or expansion of the over-all stock of capital via the maintenance or expansion of important industries, in particular tourism. Under the logic of substitutability, it should not matter if the capital being employed to further the production of tourism commodities takes the form of a natural dune or a concrete wall, as long as the capitals function in production, i.e. maintenance of tourism commodity production, is maintained.

But it is here that we can identify a serious confusion which leads us to reconsider what the *use-value* of the natural capital actually is. The FDOT sees the dune system simply as an extension of transportation infrastructure which provides stability, and thus a concrete wall would do just as well. But the beach environment itself has an important use-value that plays a crucial and particular role as fixed capital input for the production of a tourism commodity. By (implicitly) reducing the use-value of the beach environment to its role in the maintenance of tourism infrastructure, the FDOT has failed to see that the production of exchange-values through the tourism industry relies on the use-value of the beach environment as a commodity, and not solely as a piece of supporting infrastructure. The beach does not support the consumption of another tourism commodity, *it itself is the object to be consumed*. While the road is important for giving tourists *access*, it is only a *means* which facilitates another end, i.e. the “consumption” of the beach environment as a commodity. The productive use-value of SR A1A is thus only realized in relation to the use-value of the beach environment, rather than the beach

¹⁴⁹ “...the bodily form of capital may transform itself continually, while capital does not suffer the least alteration” ([7], p. 29).

environment only being useful as an extension of tourism transportation infrastructure. In this way, the Flagler Beach City Commission's adoption of Resolution 2011-15, as well as the calls for maintaining environmental quality coming from tourism marketers and local business owners, all point to the same issue, namely the *complementarity* between natural and manufactured capital contra the assumption of their near perfect substitutability.

In addition to rejecting the seawall proposal, Resolution 2011-15 notes that "alternatives to seawalls exist that will effectively protect SR A1A without the damaging effects to the environment and economy that seawalls will cause". While the city alludes to the existence of more desirable alternatives, the resolution itself offers no details of what these alternatives might involve. Still, the shift in attention from criticizing the FDOT's seawall proposal towards more desirable alternatives recognizes that, as a Flagler Beach resident wrote in an editorial at the time, "It's not enough to say no to a seawall in Flagler Beach" [335], alternatives must also be proposed.

When thinking about possible alternatives to seawalls which would provide for both protection of SR A1A and the maintenance of a high quality beach environment simultaneously, the objective, biophysical reality of the situation on the ground in Flagler Beach is central. Currently, SR A1A is literally in the same location as the sand dunes, i.e. the road is *on top of* the sand dunes, a condition which precludes the possibility of their simultaneous maintenance. It is *impossible* to have both SR A1A and a healthy sand dune system in the same place, at the same time, as physical bodies in space-time are mutually exclusive, in line with what Hägerstrand ([336], p. 333) has called the "finitude of space and time". A Flagler Beach elected official recognized this problem, and explained it to me this way (Interview 2):

FBCC: So, let's talk about the dunes for a minute... there are people that actually, in this community that think that the beach rebuilds itself and the beach goes away, and the beach rebuilds itself, and the beach goes away.

Me: Regardless of whether A1A is there or not?

FBCC: Correct. Not only that, they might, it might come and go, but the height of our beach, our [beach] walk down... that has changed drastically over the last few years... I mean, even with Google Earth you can go back and see that this beach is not gonna rebuild itself. There's no dune system in place to help the beach rebuild itself.

Me: Yeah, you need all the sand behind the fore dune as well, no?

FBCC: Yes you do, and what's on top of it? A1A. Concrete. So, nobody, nobody is that stupid, that they're not gonna realize "maybe we didn't build high-rises on the east side of A1A, but we built A1A".

So, if we are now convinced that the simultaneous maintenance of both SR A1A and the local beach environment is necessary for sustainable coastal development in Flagler Beach, the question remains *how* this can be accomplished. The obvious solution seems to be the decoupling of the road and sand dune system in space-time, and instead to have both the road and the sand dune existing at the same time, but in *different spaces*. Perhaps relocation of SR A1A is the answer to the city's coastal management woes; however, the economic choice approach to decision making which underpins "weak" sustainability would not point to this more rational (even economically) solution to the city's erosion problems.

Political choice and its limits

By now it has hopefully become clear that the capacity to produce economic well-being in Flagler Beach, like the county and state more broadly, relies to a significant degree on the availability of natural capital, in particular high quality beaches. Following this recognition, the approach to erosion control management in Flagler Beach needs to move away from a narrow interest in the protection of infrastructure to the more challenging task of protecting *both* coastal tourism infrastructure *and* the beach environment which is itself the tourism attraction.

This realization is grounded in the "strong" approach to SD which recognizes the complementary relationship between manufactured capital and natural capital and thus requires the separate maintenance of these capital stocks rather than allowing for their aggregation and substitution. Importantly, the strong sustainability approach, when carried to its logical conclusion, demands that little to no net substitution between manufactured capital and natural capital be permitted because of absolute limits to growth imposed on the economic system by the earth's ecological carrying capacity, insisting that society must pursue non-growth oriented (i.e. steady-state) economic arrangements instead. Of course, if the goal is to explicitly refrain from growing the economy, then the logic of economic choice would be insufficient as a decision making tool. Instead, the reliance on political choice, or the democratic rule of the majority, has been suggested as an alternative decision making strategy capable of generating support for strong sustainability (and thus steady-state). But can steady-state and political choice really deliver the goods?

Because stocks of natural capital constitute at least some of the necessary preconditions for continued economic production, the finitude of natural resources

puts absolute limits on the capacity for the economy to grow, leading strong sustainability advocates such as leading ecological economist Herman Daly to the conclusion that the only way to achieve SD in the long-run is by relinquishing the goal of quantitative *growth* and replacing it with qualitative *development*. Daly ([325], p. 100) put the matter clearly:

Growth is widely thought to be the panacea for all the major economic ills of the modern world... Relying on growth in this way might be fine if the global economy existed in a void, but it does not. Rather the economy is a subsystem of the finite biosphere that supports it. When the economy's expansion encroaches too much on its surrounding ecosystem, we will begin to sacrifice natural capital (such as fish, minerals and fossil fuels) that is worth more than the man-made capital (such as roads, factories and appliances) added by the growth. We will then have what I call uneconomic growth, producing "bads" faster than goods—making us poorer, not richer. Once we pass the optimal scale, growth becomes stupid in the short run and impossible to maintain in the long run.

For Daly and many other ecological economists, the logical conclusion of strong sustainability is to pursue a "steady-state" economy, which Daly ([337], p. 1) defines as "a system that permits qualitative development but not aggregate quantitative growth. Growth is more of the same stuff; development is the same amount of better stuff (or at least different stuff)". Without getting into the debates about exactly *how* steady-state economies might work (see Daly's take on it here [338]), the basic idea is that deliberate changes, through policy, practices and technology, are made to the metabolism of capital, producing less-resource intensive products with longer turn-over rates while reducing input of labor-power, the purported benefits of which would be higher quality products and more leisure time. Furthermore, in order to address pre-existing inequality and poverty under steady-state economy, substantial redistribution of *wealth* (as opposed to income) is said to be essential ([338], p. 103). Such redistribution should be guided by the intention to enhance quality of life rather than simply increasing material possession.

The idea of natural limits to economic growth and the possibility of a steady-state economy has been considered by economists such as Malthus, Smith and Ricardo, but John Stewart Mill was the first to welcome the idea as progress over current conditions¹⁵⁰; however, J.S. Mill himself recognized that steady state (what he, like Smith et al., called the "stationary state") was impracticable at any scale other than the international, as the decision to cease economic growth in isolation

¹⁵⁰ "I cannot, therefore, regard the stationary state of capital and wealth with the unaffected aversion so generally manifested towards it by political economists of the old school. I am inclined to believe that it would be, on the whole, a very considerable improvement on our present condition" ([339], Book IV, Chapter VI, §2).

from one's neighbors would put a country at serious (potentially dangerous) disadvantage, and until the time that people recognized the need for and proceed to implement steady-state, they were better off continuing to "struggling for riches" than allowing society to "rust and stagnate"¹⁵¹ ([294], p. 14). The realization of steady state in actuality, thus, seems undesirable in the absence of its universal adoption. This point is particularly pertinent in the context of neoliberalism and entrepreneurial governance under which governments are exposed to increasingly intense pressure to inter-spatially compete [151].

Another serious problem for achieving steady state, as Faran ([294], p. 14) notes "is that the driving forces of economic growth are the impersonal forces of the market. Growth is in the nature of things, given the market institutions and the institution of private ownership". This means that, if steady state is to be made politically possible, it would have to rely on either "harsh political intervention, which few people would regard as desirable" or on "a transformation of culture and basic values of a large majority of the population" (ibid). Accepting that coercive political intervention is not likely to garnish support, the remaining approach requires that substantial efforts be made to try and instill in citizens values [322] which would lead them to reject the growth paradigm¹⁵² and to politically opt (i.e. vote) for steady state. The idea seems to be that, by engaging in sustained, reasoned public debate the adoption of appropriate social values combined with the power of the greater argument would win out and citizens would choose strong sustainability solutions [322].¹⁵³ In the context of the United States, the current atmosphere of

¹⁵¹ "That the energies of mankind should be kept in employment by the struggle for riches, as they were formerly by the struggle of war, until the better minds succeed in educating the others into better things, is undoubtedly more desirable than that they should rust and stagnate. While minds are coarse they require coarse stimuli, and let them have them. In the meantime, those who do not accept the present very early stage of human improvement as its ultimate type, may be excused for being comparatively indifferent to the kind of economical progress which excites the congratulations of ordinary politicians; the mere increase of production and accumulation. For the safety of national independence it is essential that a country should not fall much behind its neighbours in these things" [339].

¹⁵² Faran ([294], p. 14, makes an interesting observation in this regarding, pointing out that "If the strategy is for cultural change to pave the way to political choice of zero-growth, then, despite difference in analyses, Strong Sustainability finds its strategic allies in all the (often marginal) schools of thought in the SD debate, like Deep Ecology, whose main aim is to bring about a change in discourse or cultural attitudes that stop emphasizing economic growth and material gains".

¹⁵³ Daly ([322], p. 357) puts the point this way: "Citizens should not trust economists with these increasingly difficult choices. Neoclassical economists have an unfortunate tendency to reduce all value to the level of personal, individual taste, matters about which consensus is neither necessary nor desirable. It is good to avoid conflict whenever possible. But if there are true values by which certain individual preferences can themselves be judged good or bad, and if citizens know and hold those values, then it would be good if they asked more aggressive questions of chrematistic bottom liners... Of course, if citizens themselves have no values that transcend personal preferences, if they too blush at any concept of objective value and reduce all value to personal taste, no matter how refined and cultivated, then we might as well leave it to the economists".

toxic partisan politics (see e.g. [340]) might lead many Americans to suggest outright that the prospect of establishing shared values among a majority of citizens which would be conducive to the adoption of steady state seems naïve or utopian, a criticism which Daly ([325], p. 102) anticipates, and answers thusly:

Because establishing and maintaining a sustainable economy entails an enormous change of mind and heart by economists, politicians and voters, one might well be tempted to declare that such a project would be impossible. But the alternative to a sustainable economy, an ever growing economy, is biophysically impossible. In choosing between tackling a political impossibility and a biophysical impossibility, I would judge the latter to be the more impossible and take my chances with the former.

Beyond the practical challenge of changing the values of the majority of citizens, liberal democracy¹⁵⁴ itself has been criticized as a severely limited approach to collective decision making. “In the liberal view”, David Miller ([343], p. 75) reminds us, “the aim of democracy is to aggregate individual preferences into a collective choice in as fair and efficient a way as possible... Each person’s preference should be accorded equal weight.” However, the possibility of arriving at a rational, *socially*-beneficial outcome through a decision making process predicated on individuals acting in terms of their private interest has been criticized by the likes of Rousseau, Marx, Weber, Habermas, and others.¹⁵⁵ Amartya Sen ([345], p. 10), for example, has said that majority rule can be “a terrible decision procedure” for making social choices, calling it “not only nasty and brutish, but also short in consistency.” Not only do the utilitarian underpinnings of majority

¹⁵⁴ Alex Callinicos [341] makes the convincing argument that what is problematic with liberal democratic rule is not so much the *democratic* part, which is compatible with socialism, but the *liberalism* part with its emphasis on individualism and optimism of market institutions. See also [342].

¹⁵⁵ For example, Samuel Huntington, in his book *The Third Wave- Democratization in the Late Twentieth Century*, summed up the problems with democratic majority rule this way: “To some people democracy has or should have much more sweeping and idealistic connotations. To them, “true democracy” means *liberté, égalité, fraternité*, effective citizen control over policy, responsible government, honesty and openness in politics, informed and rational deliberation, equal participation and power, and various other civic virtues. These are, for the most part, good things and people can, if they wish, define democracy in these terms. Doing so, however, raises all the problems that come up with the definitions of democracy by source or by purpose. Fuzzy norms do not yield useful analysis. Elections, open, free, and fair, are the essence of democracy, the inescapable *sine qua non*. Governments produced by elections may be inefficient, corrupt, shortsighted, irresponsible, dominated by special interests, and incapable of adopting policies demanded by the public good. These qualities may make such governments undesirable but they do not make them undemocratic” ([344], p. 9-10).

rule not guarantee benefits to those who might need them the most¹⁵⁶, but problems in the representativeness of outcomes arising from factionalism, conflicting interests and other forms of social conflict all undermine the validity of liberal democratic majority rule as an adequate procedure for ensuring the public good.¹⁵⁷

Strong sustainability argues for the separate maintenance of natural and manufactured capital. Furthermore, while weak sustainability conflates SD with the maintenance or growth of NNP per capita, strong sustainability recognizes that absolute *natural limits* to growth which become increasingly threatening as natural capital is depleted, eventually requiring that we stop converting natural capital all together and instead pursue steady-state economic arrangements ([321] p. 53). In the context of solving the critical erosion problem in Flagler Beach, the need to maintain both natural and manufactured capital has led some to suggest relocation of SR A1A. But, as we will see, the practical implications of relocation in the city are likely to put negative pressure on the local economy and potentially be detrimental to the quality of life of citizens, and convincing people to bear these sacrifices as part of a transition to a steady-state economy is a hard bargain.

Strong sustainability advocates, or Herman Daly at least, are generally not naive about the potential repercussions of such a monumental switch in the logic of the dominant economic system in terms of social organization, access to resources and economic distribution that steady state implies. Such changes will undoubtedly have very real consequences for people and property and as a result many are understandably skeptical of or resistant to the idea. The citizens of Flagler Beach, for example, could be asked to accept (or be convinced) that the reductions in property values and tourism traffic (or whatever repercussions ensue) are necessary sacrifices in ensuring the maintenance of local natural capital (i.e. beaches), and instead of focusing on financial wealth, they should focus on how their lives can be *qualitatively* enriched. But even a cursory consideration of the lingering effects of the 2007 recession would help clarify why at least some citizens might think it a lousy idea.

¹⁵⁶ Sen ([345], p. 10) offers this example: “taking the most deprived person in a community and passing on half her share of the cake divided between two richer persons would be a majority improvement, but scarcely a great welfare-economic triumph.”

¹⁵⁷ Far more than a problem of representative outcomes, some critics such as Perry Anderson argue that the liberal democratic one-person-one-vote system plays an essential role in the maintenance of the hegemony of the ruling-class. Democracy works to mask the underlying class differences in capitalist society, giving the impression that all citizens are equal in their vote while, through this supposed equivalence, robbing the exploited citizenry of their ability to legitimately call foul play: “The economic divisions within the ‘citizenry’ are masked by the juridical parity between exploiters and exploited, and with them the complete separation and non-participation of the masses in the work of parliament. This separation is then constantly presented and represented to the masses as the ultimate incarnation of liberty: ‘democracy’ as the terminal point of history. The existence of the [democratic] State thus constitutes the formal framework of all other ideological mechanisms of the ruling class” ([346], p. 28).

Problems with strong sustainability in Flagler Beach

Knowing that political choice comes with serious theoretical challenges regarding both the capacity of majority rule to deliver a socially-beneficial outcome, as well as the likely impossibility of maintaining a steady-state economy at less-than international (or at least inter-municipal) scales, additional questions remain regarding the concrete possibilities for, or constraints on, pursuing a strong sustainability solution in practice in Flagler Beach. The reader will recall that the situation on the ground in Flagler Beach is such that the A1A is currently located directly on top of the natural sand dune system, precluding the possibility of simultaneous protection. One obvious solution to this practical problem would be to decouple the road and dune structure by relocating the road to a different site. If the road were moved then the possibility of maintaining at the same time both the beach environment, no longer imprisoned under the road, and the road itself, no longer threatened by erosion, becomes much more plausible.

The need to relocate coastal infrastructure has long been a central argument advanced by those coastal scientists and practitioners who are critical of mainstream coastal management practice. Among the most well-known critics of business-as-usual coastal development is Dr. Orrin Pilkey, Professor Emeritus of Earth and Ocean Sciences at Duke University and founder and Director Emeritus of the Program for the Study of Developed Shorelines. Pilkey and colleagues have long argued against the construction of hard stabilization infrastructure and promoted relocation as the only viable long-term sustainable approach to beach management [240, 284, 290, 347]. For Pilkey, the question of modern coastal management is less a question of our technical capabilities and more a question of social prioritization:

If the highest priority is to save the buildings, then the shoreline must be held in place or *stabilized* with something hard and fixed, like a seawall... If saving the beach for tourists, turtles, birds, fishers, and future generations is paramount, then retreat is the best option. ([348], p. 118)

The suggestion to relocate SR A1A as a “best option” for addressing Flagler Beach’s erosion problems has had its proponents over the years, both among certain government agencies as well as local residents (as we will see, most elected officials and business owners, particularly in Flagler Beach, have tended to balk at the idea). For example, back in 2006 the USFWS, while conducting an environmental review of the FDOT’s proposed seawall plan, stated: “The U.S. Fish and Wildlife Service would recommend reviewing other routes other than A1A, to increase the safety from wave action and evacuation along this highly erosive

shoreline”. ([218], Appendix G, p. 4). However, the most numerous voices supporting the idea of relocating SR A1A have come from citizens themselves.

In 2007, during a public hearing held by the FDOT, citizens were given the opportunity to speak or submit written comments on a proposed seawall project, and some, even at this early stage, recommended relocating SR A1A along the same lines as the USFWS, saying for example: “The seawall will make the beach disappear. Make an alternate route. Delete SR A1A and we will take care of the beach front” ([218], p. 6-5, Table 6-2). While this is not by any means a dominant position, it has continued to play a role in the debate over what is the most appropriate strategy to address the critical erosion problem in the city in the last decade. For example, after the City of Flagler Beach had rejected the FDOT’s seawall project by passing Resolution 2011-15, some citizens raised the idea of relocation as an alternative in the comments section of an editorial published in the local newspaper at the time. One citizen remarked:

Seems to me that the best option is to quit trying to overcome the power of the Atlantic Ocean and reroute A1A several blocks west of the beach for about a half mile past the point of erosion... The owners of [some local businesses] won’t agree with this but it surely won’t matter to the turtles or the whales. In fact the turtles would likely have a bigger better beach to use as a hatchery. The overall impact to tourism in Flagler Beach would be minimal, except of course to the merchants immediately west of the washout, but look at it this way... One good Hurricane and those guys are toast anyhow. [335]

Another citizen added:

Eventually, we’re going to have to give up [on SR A1A]. It’s an Ocean, not a swimming pool. [335]

More recently, in the aftermath of Hurricane Matthew, the potential for relocation to be considered as a viable alternative was again raised in public commentary. Take for example this statement made by a local resident during the public comment portion of the FDOT’s post-Hurricane Matthew emergency meeting on October 13, 2016:¹⁵⁸

I’m a little concerned about the seawall, just to echo [the elected official’s] statements earlier; there will be a massive sand loss. I’m worried about what our beach will become because of that. And, you know, what do we value in this community? Do we value the orange sand? Do we like the walks on the beach? Why did we move here? One of the terribly controversial things I’ve been saying lately is

¹⁵⁸ Quote transcribed from a recorded public FDOT Emergency Meeting held at Flagler Beach City Hall, October 13, 2016.

that we need to move A1A. But, it's really not that controversial if you've lived here over the last 40 years, it's been a constant conversation. So, I think that it's probably an avenue we need to discuss; it's an option we need to review. What would that look like for our community?

While supported by some, the idea of relocating SR A1A, as this citizen pointed out and we will see in more detail below, remains highly controversial in Flagler Beach. However, the idea itself is not without precedent. In fact, SR A1A has been relocated on numerous occasions within Flagler County and elsewhere over the years, either at the request of private property owners or in response to the road being threatened or damaged by coastal storms (Figure 38).



Figure 38:

Left: Looking North along a section of Old SR A1A in Washington Oaks State Park, Flagler County. The land owner at the time requested that this section of SR A1A be relocated further to the east in the 1950s in order to divert traffic around the property.

Right: Looking South along a section of Old SR A1A near Matanzas Inlet in Flagler County. This section of SR A1A was relocated further to the west after portions were severely damaged by Hurricane Dora which struck the area in 1964. Author's photos: Left, 2015; Right, 2016.

So, what is it about the idea of relocating SR A1A in Flagler Beach that makes it so controversial? While the idea of relocation is relatively straight forward theoretically (just move the road from here to there), the practical constraints imposed by the concrete context throw up barriers to its actual implementation. In Flagler Beach, the physical geography of the barrier island upon which the city is located comes with serious limitations regarding where it is even possible to relocate the road. Because the island is so thin (less than a mile across at its widest point), and separated from the mainland by the Intracoastal Waterway, there are really only two options available for relocating the road. The first option is to reroute SR A1A off the barrier island completely, which would involve SR A1A bypassing, at least in part, the City of Flagler Beach. The second option is to reroute SR A1A on the barrier island, which would involve SR A1A passing through residential areas of the Flagler Beach community.

The first option, rerouting SR A1A off the island and around Flagler Beach, would certainly address the problem of coastal infrastructure threatened by critical erosion, and could also provide for the restoration of the natural beach environment. However, taking SR A1A out of Flagler Beach would undermine the purpose of our search for solutions thus far, as the prospect of a sustainable approach to the city's critical erosion problem rests on the ability to maintain both the necessary benefits of SR A1A and the quality of the local beach environment; in other words, this doesn't solve the problem, it only evades it. Removing the road from the equation would only serve to hurt the city's tourism economy, even if the beach itself was improved in the process. The reader may recall, for example, the comments made by a Flagler County TDC representative that the city and county significantly benefit from what she called "accidental tourists" who "just stumble upon" the city while driving the scenic highway A1A in route to other destinations (FCTDCMD, Interview 7). Or this comment left by a local business owner in response to my suggestion in a local newspaper editorial that relocating SR A1A should continue to be considered as a viable option:

To propose continued examination of a relocation of A1A is shortsighted to say the least. If you do that, you might as well shut every single business down in town, ruining incoming tax dollars, decimating the entire tax base of the town, destroy property values, and change a whole lot of peoples' lives for the worse. At that point Flagler Beach will have changed into a place that does not align with the city's published vision ([311], Comment 1).

In addition to these justified economic concerns, rerouting the road around Flagler Beach would likewise cause serious problems for city and county emergency response officials whom heavily rely on SR A1A for evacuation purposes. The Flagler County Public Safety Director explained the predicament to me in an interview in 2015 this way (Interview 5):

FCPSD: ...imagine a scenario when there is no A1A, with no red lights, no stop signs, and now you're having all of that traffic funnel through surface streets to [State Road] 100, and only 100... because there's no [other access to the mainland]... [If] A1A leaves, you're forcing that community, just about in its entirety, to shift itself to 100, which from a planning assumption and evacuation, is a nightmare that will just never work.

So it seems that the first option, rerouting SR A1A off the island and around Flagler Beach, even if the FDOT were to support the idea, would be counter-productive. If we reject the first option, then the second option, rerouting SR A1A on the island, *through the community*, is the only option left available if relocation remains the goal.

The idea of the FDOT suggesting relocation of SR A1A at all may seem unlikely in light of the agency's commitment to maintain transportation infrastructure in its current location (see Section 4.1), but the possibility none-the-less remains. If that unlikely scenario were to ever become reality, city and county officials have on various occasions vowed to contest such a decision. Take for example this hypothetical scenario described by the Flagler County Public Safety Director in an interview the year before Hurricane Matthew hit (Interview 5):

Me: I was talking to the [Flagler Beach] mayor and she kept referring to the “big one” meaning the big storm... and if that were to happen... and A1A were to wash out... does the community have an adequate strategy for dealing with the loss of such an important artillery road?

FCPSD: I would say absolutely [because] if this were to happen in a catastrophic event, then [federal and state] funding becomes available... so then... we would be looking at rebuilding, redoing, whatever we had to do to get [A1A] back in place as to where we were [before the storm]. Do I think the state may try to make a case or maybe even the [Federal Highway Authority]... might say “you know what, instead of rebuilding [SR A1A], we need to move it over here”, they would probably make a play for that, but again it comes back to local government. We have to put our flag in the sand and say “no, we need this road, and it's here for not only tourism reasons, that's just a small part of it, it's here for business infrastructure, personal safety, public safety, of the entire community of Flagler Beach”... I think that you have to take a holistic approach and, in a storm... we'll get [A1A] back, we're gonna have to fight for it, I still see us having to fight, but I'm firmly committed that we'll get that roadway back. It may look different, but we'll get it back. It may be on stilts but.... (laughing) you know what I'm saying.

Well, the “big one” did come in the form of Hurricane Matthew, and just as the Emergency Manager had suggested, the possibility of relocating SR A1A was laid on the table, and elected officials and city residents heavily disputed the proposal. More specifically, relocation of the road west of its current location within Flagler Beach was included among a series of potential approaches proposed by the FDOT as permanent solution options. Of the six possible approaches presented, which had price tags ranging from \$10 million to \$222 million, four involved the construction of nearly 5.2 miles of seawall to sure up SR A1A (at least partly) in its current location; however, two of the approaches involved different options for rerouting the road into existing side streets, one involving the expansion of a side road into a two-lane highway, and the other involving turning two side streets into one-way corridors corresponding to north and south bound SR A1A traffic ([350]; see Figure 39 below).



Figure 39: Two of the six total options proposed by the FDOT as permanent fixes after Hurricane Matthew, both of which include relocating the entire road east of its original location as indicated by the highlighted yellow thoroughfares. The left option involves splitting SR A1A into two, one-way (north and south bound) corridors, while the right option involves relocating the road as a single, two-lane corridor. Source: [349].

While the idea of relocating SR A1A may seem reasonable in principle, the suggestion by the FDOT that relocation was an option was met by strong criticism from elected officials and residents. The Flagler Beach City Manager unequivocally rejected the idea as a viable option:

...during past workshops, the option was presented to divert traffic to our local roadways to alleviate the need to rebuild two lanes on SRA1A. Let me assure you: this is not an option. The state cannot proceed with such a plan without the city's approval, and the cost-benefit is not there [351].

The rejection came in the wake of severe disruption in the community because of Hurricane Matthew. The storm forced emergency diversion of A1A by the FDOT along a 1.3 mile section of the road into local side streets, directing both north and south bound A1A traffic into residential neighborhoods. As many residents began to return after the storm, they came home to increased volumes of traffic outside their homes, and local business owners had lost much needed access points along the recently demolished section of A1A. Local residents and businesses were upset, expressing their frustration at local meetings to pressure elected officials to get A1A back to where it was. One affected resident, for example, told FDOT representatives at an October 2016 emergency meeting:¹⁵⁹

We are really grateful that you all came out, we are grateful that you are working so quickly, and analyzing it well. As you can see [my T-shirt], I'm a turtle fan so I hope you take that into account. But, in terms of the Central Avenue, my concern is that that is a narrow road. It's not designed for a lot of two way traffic. I walk two dogs, and it is not safe. In just trying to get them up to A1A and the sidewalk, it's harrowing, because of the big trucks one way, the other cars going the other way.... It is really difficult, even just crossing the street to get mail is difficult now.

Beyond personal comfort and safety, other concerns were also being raised by local residents and business owners potentially affected by relocation of SR A1A. One local resident, for example, expressed concern about local businesses being shutting down:¹⁶⁰

I guess you're gonna hear from a lot of us on Central Avenue. It's really awful. I live... right in the heart of that mess... right now there are a lot of businesses [along A1A] that will go out of business without their traffic.

¹⁵⁹ Quote transcribed from a recorded public FDOT Emergency Meeting held at Flagler Beach City Hall, October 13, 2016.

¹⁶⁰ Quote transcribed from a recorded public FDOT Emergency Meeting held at Flagler Beach City Hall, October 13, 2016.

Others residents were concerned about property values and quality of life, such as this resident who commented on an opinion piece I published in the local newspaper:

Well where do YOU live now? Certainly not in Flagler Beach on ONE of those roads away from A1A. I purchased a residential house on a residential street NOT on A1A or on any “highway” and I want to keep it that way. If they end up making Central and Daytona one way HIGHWAYS with the traffic that A1A currently has our property values will SINK let alone the accidents that will happen to people, children, animals and vehicles from the increase of vehicular use ([311], Comment 4).

From these exemplary expressions of public opinion, it is hopefully becoming clear that the preservation of SR A1A in its current location is of central concern to Flagler Beach residents and elected officials. Just to drive the point home, 3 of every 4 respondents ($n = 396$) from the citizen survey mentioned previously (see Section 5.2) said saving SR A1A was a “high priority”, while only 5% said it was a “low priority”. In addition to these personal perspectives, it is important to recognize how the loss of economic productivity and revenue (either through reduced tourism flows or sunken property values, or both) that could result from relocating SR A1A would put the city at a competitive disadvantage compared to other municipalities in the state which continued to make decisions predicated on economic growth. In the context of the competitive pressures to which municipalities are subjected, and the entrepreneurial orientation they increasingly must adopt to stay afloat in the spreading sea of inter-spatial competition, the possibility of transitioning towards a steady-state economy at the municipal or county level appears hopelessly unfeasible. If others did not follow suit, capital investment would continue to flow, just not into Flagler Beach.

Thus, relocating SR A1A, rather than being a silver-bullet solution, amounts to a whole mess of other problems, both theoretically in terms of the possibility of steady-state and the reliability of majority-based political choice, as well as the practical problems created by moving the road from its current location into residential areas. Not only is moving the road considered by many to be socially unacceptable in terms of public safety and quality of life, it is potentially damaging to the local economy by reducing access to local businesses and suppressing property values. These last two concerns are particularly troubling from the perspective of local government, as tax revenue generated by tourism spending has increasingly become a core means to fund government activities, while taxes on property values provide by far the largest contribution of revenue to public coffers. Given that both Flagler County and Flagler Beach lost roughly half of their taxable property value between 2007 and 2010 as a result of the financial crisis (see

Section 2.3), the possibility of further reducing property values in the name of environmental protection is an understandably unattractive prospect for many.

Furthermore, even if officials in Flagler Beach were willing to accept the risk of these potential losses, it is important to remember that city officials do not have a completely free hand in decision making when it comes to state-controlled transportation infrastructure. This fact is of particular significance during states of emergency, such as after Hurricane Matthew, when the response to the emergency situation plays out according to the structure of the emergency response system, of which the FDOT plays a significant role in Florida (see Section 2.2). In Flagler Beach post-Hurricane Matthew, the FDOT's emergency recovery efforts involved prioritizing the rapid reconstruction of SR A1A largely in its original position, with the full support of the Florida Governor [237]. This had the effect of both removing the possibility of directly relocating the road to another site, while also dramatically reducing the likelihood of relocating the newly constructed road in the future.

Regardless of the level of difficulty in achieving such a change of political heart through public debate¹⁶¹, the strong sustainability approach suffers from other theoretical and practical limitations. So, in the final analysis, while it seems clear that relocation of SR A1A would indeed solve the residual environmental problems left over from the weak sustainability (i.e. seawall) approach to erosion management, and would even provide for a protected road, it would only accomplish these outcomes at the potential expense of the local economy and citizen quality of life. And the logic of political choice is such that these consequences would very likely lead to a majority rejection of the relocation option.

****I began this chapter by reviewing the way problems of environmental degradation have been linked to issues of economic growth through the concept of**

¹⁶¹ I have been somewhat involved in public debate in Flagler Beach over what the pros and cons of certain strategies are and what the most promising avenue for addressing Flagler Beach's erosion problems might be, including relocation of A1A. This has predominantly been through engagement in forums along the lines of what Habermas ([352], p. 51-56) called the "world of letters", in particular correspondences through local news media outlets. See:

FlaglerLive, 2017 – *Why a Seawall in Flagler Beach Could Harm Sea Turtles and Violate the Law*: <https://flaggerlive.com/103403/boda-flagler-beach/>

Palm Coast Observer, 2017 – *Flagler Beach needs to plan for sea level rise*: <https://www.palmcoastobserver.com/palm-coast-observer-10-26-17>

Palm Coast Observer, 2017 – *Flagler Beach needs to weigh seawall and other A1A options carefully*: <http://www.palmcoastobserver.com/article/opinion-flagler-beach-needs-to-weigh-seawall-and-other-a1a-options-carefully>

Daytona Beach News Journal, 2017 – *Good, bad and ugly of beach-building*: <http://www.news-journalonline.com/opinion/20170125/chad-boda-good-bad-and-ugly-of-beach-building>

Daytona Beach News Journal, 2017 – *Flagler's beach could die as seas rise*: <http://www.news-journalonline.com/opinion/20170524/chad-boda-flaglers-beach-could-die-as-seas-rise>

SD. With neo-classical economists such as Robert Solow developing the idea further, a strategy predicated on the theory of capital substitutability, which came to be known as “weak” sustainability, would allow for environmental degradation and the loss of natural capital it entails as long as the total stock of capital available to the economy was maintained or increased over-time. In Flagler Beach, the FDOT proposed an erosion control strategy underpinned by this idea, but the loss of local environmental quality in the city pointed towards serious limitations in the logic of substitutability. Instead, residents, elected officials and industry leaders alike all pointed to the fact that the majority of Florida’s (and Flagler Beach’s) economy relies on high quality beaches which must be maintained if tourism is to continue in the future. The “strong” sustainability approach which emerged from this realization emphasizes capital complementarity rather than substitutability, which in Flagler Beach has been translated into suggestions to relocate sections of SR A1A threatened by critical erosion. The likely impossibility of economically justifying relocation meant the strategy would need to be adopted through a majority vote, in other words a political choice strategy which in its turn was shown to be riddled with theoretical and practical limitations. The following chapter develops an erosion control solution which provides a rational and viable solution to this yet-unsolved erosion quagmire.

Chapter 6

Economy, Environment and Sustainable Development II

It's a lovely low-key beach environment.
Great for walking, bird and dolphin watching.
- Flagler Beach resident, 2016

6.1 Critical Erosion and Critical Sustainability

In Flagler Beach, the strong sustainability-oriented suggestion to relocate SR A1A, while it could potentially provide for both ecological conservation and infrastructure stability, faces severe political resistance by both elected officials and residents. This is because of the potential unintended consequences the practical implementation of relocation would have in terms of disrupting the daily lives of citizens, depressing property values and putting negative pressure on local businesses. But any improvement on the relocation strategy would need to provide the benefits offered by the strong sustainability approach to critical erosion management while avoiding or addressing these significant residual political and economic shortcomings. The idea here would be to identify a strategy which maintains enough of the local dune system such that it continues to facilitate economic productivity, namely by protecting SR A1A from coastal hazards *and* providing a recreational beach for tourism without resorting to relocation.

In terms of SD it would probably be most accurate (and generous) to characterize the approach that follows as a sort of “critical sustainability” [353, 354]. This approach builds on a conceptual position laying somewhere between the two extremes of weak sustainability, which assumes nearly perfect substitutability, and strong sustainability, which insists on maintaining the total stock of natural capital intact, as Stern ([301], p. 151) explains:

though it is possible to substitute between natural and artificial capital, there are certain stocks of “critical natural capital” for which no substitutes exist. A necessary condition for sustainability is that these individual stocks must be maintained in addition to the general aggregate capital stock... there are lower bounds on the stocks of natural capital required to support the economy, in terms of the supply of materials and energy and in terms of the assimilative capacity of the environment, and that certain categories of critical natural capital cannot be replaced by other forms of capital.

In this way, critical sustainability basically amounts to a stronger version of weak sustainability [354], incorporating the insights of strong sustainability to a certain degree, but not so far as to lead to the promotion of steady-state economic arrangements. The resulting modification to the assumption of substitutability necessarily involves identifying to what degree natural capital needs to be preserved in order to sustain economic productivity. Once this critical level of natural capital is identified and secured, the remaining natural capital that is not deemed critical would be subject to rational economic calculation and substitution the same as any other capital asset. Along these lines, the Florida Office of Economic and Demographic Research ([329], p. 2) emphasize the limits to the

benefits received from increases in beach quality passed a critical level, investment beyond which will not necessarily contribute to increased tourism in Florida:

If the state were to increase its investment in beaches, it does not necessarily mean that the ROI will increase or that Florida would gain additional tourists. Maintaining the beaches at a level of high quality is important, but once the beaches have reached that level, there are diminishing economic returns to beach investment. This is because additional spending on beaches that are not in need of maintenance will attract little to no additional visitors. Similarly, if the state were to reduce or eliminate funding for beaches, the result would not necessarily be an immediate reduction in tourism. Rather, any reduced tourism would likely occur over time, if at all, depending on the degree of erosion to Florida's beaches.

What the precise level of critical natural capital should be set at is “an empirical question” ([301], p. 151), with indicators and appropriate methods aimed at identifying thresholds of “ecological criticality” becoming increasingly sophisticated (e.g. [355]). In absence of such knowledge, critical sustainability oriented policies are inclined to resort to the precautionary principle or some safe minimum standards to regulate economic activity.

Beach re-nourishment to the rescue?

What would critical sustainability mean practically in Flagler Beach? We have already established why leaving SR A1A where it is would lead to the deterioration of the natural beach through processes of coastal squeeze (see Section 4.2). This means that having our sandy cake and eating it would have to include a *periodic replenishment* of lost beach sand to the extent that it remained attractive to tourists and residents and continued to protect SR A1A from coastal hazards. If seawalls and relocation won't do, and in the absence of major changes to natural sediment supply, perhaps Flagler Beach can geo-engineer its way out of its debacle.

Over the last several decades coastal managers in the United States, and Florida in particular, have increasingly turned to a form of coastal engineering known as beach re-nourishment¹⁶² as the go-to solution for a variety of coastal erosion challenges ([240], Chapter 4)¹⁶³. As Pilkey and Dixon ([347], p. 75) explain:

¹⁶² There are a variety of interchangeable terms used for this coastal engineering technique, including beach replenishment, nourishment and re-nourishment, which all refer to the same type of geo-engineering technique involving the movement of sand from a source location to a receiving beach.

¹⁶³ Other kinds of erosion control strategies exist, including jetties and breakwaters, artificial reefs, undercurrent stabilizers, etc., some which at various points over the years have been proposed to Flagler Beach decision makers. Some of these, such as jetties, have been used historically elsewhere, but have been shown to have similarly problematic impacts on local environments as seawalls, including accelerating erosion. Others, such as undercurrent stabilizers, are experimental,

From the sunny beaches of California, east to the rocky shores of Maine and south to Florida, sand is being pumped and trucked onto beaches in hopes of maintaining broad expanses of sand to attract tourists and protect buildings from storm waves. Generally accepted as more aesthetically pleasing and less environmentally damaging than hard stabilization structures such as seawalls, beach replenishment - bringing new sand to a dwindling beach - has been growing in popularity since the early 1960s as “the solution” to beach erosion.

While originating as a predominantly state or local affair, beach re-nourishment has increasingly “evolved into a federal activity” ([358], p. 9) as the need for more and bigger projects grew (see also [359]). According to data collected by the Program for the Study of Developed Shorelines¹⁶⁴, at least 60% of all recorded re-nourishment projects since 1960 have been federal projects. Republican Senator Tomas Coburn, head of the 111th Congress’ 2009 Congressional Oversight and Investigation Report *Washed Out to Sea*, which looked into the history of federal expenditures on re-nourishment, has documented this increasingly active and important role played by the federal government in such geo-engineering projects:

Between 1920 and 1929 only two beach nourishment projects were listed in a federal database of these projects. In contrast, 131 projects were listed between 1992 and 2001. Coastal communities and states that recognized the benefits of maintaining beaches for their local economies initially paid, at least in large part, for these types of projects on their own. However, Congress has continued to play a larger role in funding these projects, to the extent that now up to 65 percent of the total costs are borne by federal taxpayers throughout the 50-year time commitment of these non-sustainable projects. ([358], p. 10-11)

This increasing interest from public authorities in funding the maintenance of coastal environments can be explained in political economic terms.¹⁶⁵ That is,

marginal or have even been proven ineffective. Accomplished coastal scientist Orrin Pilkey, for example, has published a whitepaper [356] compiling evidence and arguments against an experimental technology which gained popularity in Flagler Beach between 2004 and 2014. The relationship with Holmberg Technologies and their experimental technology was ended in rather dramatic form, with the Flagler Beach City Commission unanimously voting to sever ties and the city mayor saying “shame on you” to the company owner and CEO on public record [357]. Either way, none of these alternative technologies is still being seriously considered as viable options in Flagler Beach.

¹⁶⁴ The Program for the Study of Developed Shorelines is hosted by Western Carolina University and has collected the most comprehensive dataset of federal, state, local and private re-nourishment projects in the United State that I am aware is available. Find access to the database here: <http://beachnourishment.wcu.edu/glossary#downloads>

¹⁶⁵ Many on both the right and left of the political spectrum have accused the Army Corps of having many of its re-nourishment projects approved on political bases, with federal representatives securing national public funds for local projects which benefit only a small number of constituents and politicians. For example, small-government conservatives like those at the CATO Institute have labelled the Army Corps “a pork-barrel machine” for this reason [360].

simply put, the increasing importance of the coastal environment for continued economic production and capital circulation, both in Florida and elsewhere in the U.S., puts further pressure on governments to ameliorate any deleterious environmental conditions which might impede economic activity.¹⁶⁶ Much of this federal support has been directed at Florida, which has played an increasingly significant role in the national economy since the mid-20th century and relies heavily on the existence of high quality beaches for much of its economic activity (see Section 5.2).

Recognizing this increasing federal intervention and its significance for coastal management, Pilkey ([290], p. 41) predicted in the early 1980s that beach replenishment would be “the wave of the future for all the Florida shore”. Since then, coastal population densities in the state have nearly doubled ([362], p. 11, Table 6), while the number of miles of critically eroded coastline has more than doubled [130]. Following these trends, the average annual number of re-nourishment projects, volume of sand used, and cost per project in the state have all roughly doubled in the same time period (Figure 40). All of this is to demonstrate the increasingly significant role played by the re-nourishment strategy in managing coastal environments in the U.S., and Florida in particular, backed to a substantial degree by the federal government itself. Such federal intervention has provided the capacity for many county and local governments to undertake coastal re-nourishment projects on spatial and temporal scales which would otherwise make them financially prohibitive. In the U.S., these federal projects are managed by the Army Corps of Engineers, the premier federal agency responsible for projects related to the nation’s coastal and water resources.¹⁶⁷

¹⁶⁶ As Ted Benton ([361], p. 213) has remarked “the conditions of production include infrastructures of various kinds, agricultural land, and workers themselves, as well as naturally 'given' conditions such as pollution-sinks, material and energy resources, and other broadly ecological conditions... [the degradation of which] generates pressure for state intervention to repair and restore degraded or destroyed conditions to enable further capital accumulation.”

¹⁶⁷ Other sources of funding, such as grants from the Federal Emergency Management Agency (FEMA), may be used to cover some of the costs of re-nourishment projects as well.

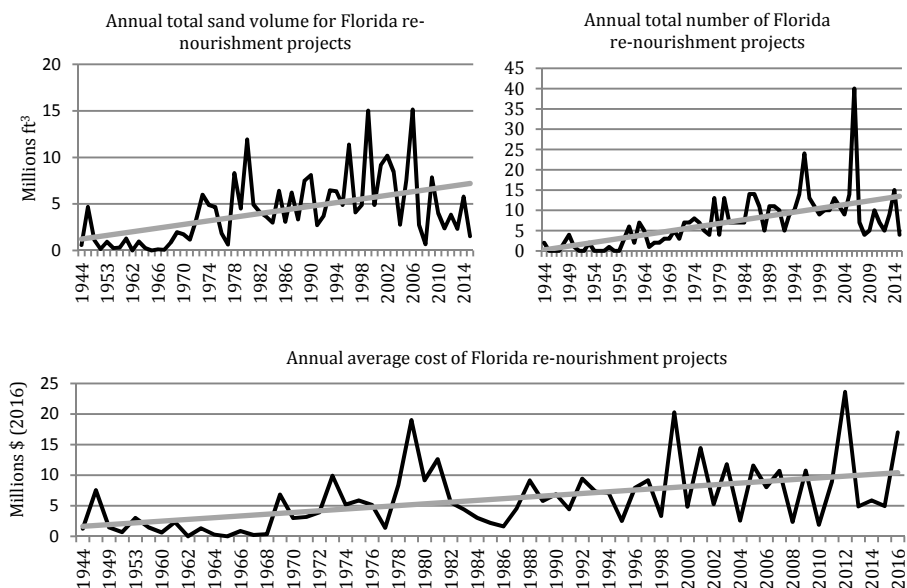


Figure 40: Changes in cost, volume and number of Florida re-nourishment projects. Black lines indicate annual variability while grey lines indicate linear trends. Source: Program for the Study of Developed Shorelines.

The USACE is practically synonymous with water and coastal resources management in the United States, though, as their mission statement suggests, they are responsible for a wide variety of peace and war-time engineering services.¹⁶⁸ Central among these services is environmental management, so much so that the USACE calls itself “the nation’s environmental engineer” [363], though some less sympathetic observers suggest the agency is “notorious for its obsession with waging war on nature” ([8], p. 81) rather than managing it. Among its coastal activities, relevant to the immediate topic of interest, the USACE include:¹⁶⁹

- Beach fills and nourishment to protect against storm surge and wave-generated erosion;
- Construction of shore structures, such as sea walls, breakwaters, and revetments, to protect against flooding and erosion; and
- Best practices and management, like regional sediment management

¹⁶⁸ See <https://www.army.mil/info/organization/unitsandcommands/commandstructure/usace#org-about>

¹⁶⁹ See <http://www.saj.usace.army.mil/Missions/Civil-Works/Shore-Protection/>

In the development of specific projects, the USACE undergoes an established process of project option development and evaluation. All USACE projects should go through five phases in their lifetime: 1) reconnaissance, (2) feasibility, (3) pre-construction engineering and design, (4) construction, and (5) operation, maintenance, repair, replacement and rehabilitation, with projects typically planned on 50 year time scales.¹⁷⁰ Generally speaking, the USACE makes decisions by employing a standardized process of CBA, the institutionalization and routinization of which was “the distinct achievement of twentieth-century Army engineers” ([364], p. 150). Like the FDOT discussed in Section 5.1, the USACE relies on CBA calculations to motivate its selection of which projects to fund and how to design them. They do so, however, in many ways in a much more explicit way than the FDOT. Far more than a strategy for choosing projects, the adoption of CBA by the USACE, as historian Theodore Porter emphasizes, has worked to “structure relations within bureaucracies and helped define the form of their interactions with clients and competitors” ([364], p. 175), allowing more effective management of the often bitter political conflicts over how best to allocate the country’s financial and natural resources. “The historian of bureaucracy”, Porter ([364], p. 149) explains:

does not portray the Army Corps at the center of an administrative ruling class, but in a scene of utter disunity and savage infighting. This, I argue, is the appropriate context for understanding the pursuit of uniform cost-benefit methods. That form of economic quantification grew up not as the natural language of a technical elite, but as an attempt to create a basis for mutual accommodation in a context of suspicion and disagreement. The regime of calculation was imposed not by all-powerful experts, but by relatively weak and divided ones.

Over time, the USACE has grown in size and importance, while CBA has been formally institutionalized in federal natural resource management policy through the adoption of the Flood Control Act of 1936 [365]. Today, CBA is standard procedure in USACE project evaluation and talked about as a sort of institutionalized common-sense. For example, the USACE Economic Primer, one of a series of National Economic Development (NED) Manuals used for planning guidance, justifies the use of economic choice based decision making this way:

It is the Corps of Engineers, after all. Why do economics? Because the Corps is a steward of taxpayer money and must determine which projects are good investments for the nation. Engineering science alone is not enough. The Corps... must follow a path of economic efficiency to reach engineering remedies. ([366], p. 1)

¹⁷⁰ Of course, infused with each of these steps, as Pilkey and Dixon ([347], p. 10) remind us, is “politics, politics and more politics”.

This “path of economic efficiency” is ensured by CBA, a multi-stage process of valuation and assessment aimed at maximizing utility in the outcomes of individual or collective decision making [367]. Maximizing utility requires the quantification and comparison of all relevant costs incurred and benefits accrued as the result of a single project or policy, or across a series of alternatives. When the USACE is calculating the benefits and costs of beach nourishment projects, the primary categories include ([358], p. 9):

- Benefits
 - prevention of physical damages and associated land loss
 - reduction in maintenance costs of existing protection works
 - reduction of emergency costs to residences, businesses, and governmental entities
 - increased recreational usage, and where appropriate, relief of overcrowding for existing recreational usage
- Costs
 - expected costs of construction
 - the present value of periodic maintenance and nourishment costs
 - any external costs such as environmental costs associated with mitigation

In calculating these costs and benefits, one fundamental requirement is that “all [benefits and costs] thought to be relevant are measured in the same units, otherwise they cannot be added together (aggregated), either across people or over time” ([306], p. 15). This equivalency unit is typically though not necessarily monetary, the idea behind monetary metrics being that it provides an adequate representation of social utility (see [303], p. 67-70). The USACE, for example, evaluates its project outputs in terms of “maximizing increases in the net value of the national output of goods and services, expressed in monetary units” ([366], p. 4). For goods and services that already have market prices, these can simply be used in calculating costs and benefits. When non-market goods and services are concerned, which is often the case with environmental assets, then a variety of techniques such as contingent valuation, travel costs or hedonic pricing are used to assign a monetary value to them. Furthermore, since benefits and costs must be measured in present values to provide an adequate, contemporary economic basis of comparison for decision-making purposes, the use of discounting of future values is common practice.

Because CBA calculations fundamentally rely on quantification of *net* benefits, the need to “predict the future” arises for when projects have temporally dispersed impacts, as environmental projects often do [348]. In such cases, environmental project planners in the USACE and other agencies aim to predict future changes to earth systems, as well as attempting to accurately quantify these changes and translate them into monetary values. For this purpose, USACE project planners,

like many others, turn to quantitative earth systems model predictions which incorporate a variety of information inputs into a mathematized model of the system concerned in order to simulate possible system changes [368, 369]. These system changes can then be related to economic functions so that future maintenance and damage costs resulting from environmental factors, such as erosion, can be calculated.

Critical natural capital and the Flagler County Hurricane and Storm Damage Reduction Project

In Flagler County, the USACE began developing a concrete re-nourishment project, known as the Flagler County Hurricane and Storm Damage Reduction Project, to protect SR A1A and provide recreational and environmental benefits once a feasibility study was permitted by House Resolution 2676 adopted May 22, 2002 ([193], p. ES-1).¹⁷¹ The timing is not random, but in line with their CBA-focused decision making process which requires that projects, in order to be justified, must provide for a benefit to cost ratio of at least 1:1 ([358], p. 9). Similar to the FDOT, CBA has heavily influenced USACE decisions regarding re-nourishment in Flagler County from the general interest in a project, down to the detailed design specifics.

Historically the USACE has reviewed Flagler Beach's erosion problems on numerous occasions, beginning in the early 1980s, but a lack of valuable property, weak tourism flows or insufficiencies in other required factors meant the USACE was historically unable to secure federal interest in providing coastal protection in the county (Table 2). Interest in a potential project was not approved until after the economic boom experienced by the county in the late 1990s and early 2000s (see Section 2.3) when economic activity had substantially increased, leading to both an increased federal interest in investing in the project as well as an increased ability for local government to act as co-sponsor. Once interest was secured in 2002, the Army Corps began developing a proposed project that they claim is economically, socially and environmentally justified; that is, one which meets "the Federal objective to contribute to national economic development" while also being "a sustainable plan" ([193], p. 215).

¹⁷¹ The House Resolution read: "Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, that in accordance with Section 110 of the Rivers and Harbors Act of 1962, the Secretary of the Army is requested to review the feasibility of providing shoreline erosion protection, hurricane and storm damage reduction, and related purposes to the shores of Flagler County, Florida".

Table 2:

Summary of prior Federal coastal protection studies in Flagler County, all undertaken by U.S. Army Corps of Engineers, Jacksonville District. Source: [193], p. ES-1; 1-8.

Study Name	Date	Description	Status
Flagler County, Florida. Beach Erosion Control and Hurricane Protection Reconnaissance Report	Aug. 1980	The report emphasized continuous erosion and substantial expenditures by both private citizens and local governments for restoration of private and public lands following erosion and storm damage. Economic justification considered future development of the county and a plan of study for developing non-structural alternatives for erosion control and storm protection was recommended.	Further Federal study was never approved.
Section 14 Study, Flagler Beach, Flagler County, Florida	Nov. 1982	In response to a request for emergency Federal assistance from Flagler County, a Section 14 Study was undertaken to investigate the feasibility of building a stone revetment along state road A1A in Flagler Beach to protect a 2,200 foot long section of the road from being undermined by storm induced erosion.	Based on lack of financial support from the non-federal sponsor, no Federal project was adopted
Flagler County, Florida Shore Protection Study Reconnaissance Report	May. 1988	This report investigated the practicality of initiating a Federal feasibility study on shoreline protection for Flagler County, Florida. The report looked at the County's entire 18 miles of shoreline, but focused on the Flagler Beach area. The report concluded that there was no Federal interest in further study for those beaches at that time.	The report, which compared the average annual costs and benefits of a storm damage reduction project, found that such a project at the time was not economically justified.
Reconnaissance Report, Section 905(b) Analysis, Flagler County, Florida, Shore Protection	Mar. 2004	This report represents the most recent effort to assess the needs for hurricane and storm damage protection along the coast of Flagler County. Following the previous reconnaissance report in 1988, as erosion along the shoreline continued, the population in Flagler County greatly increased as well as the amount of development along the coast.	The study concluded that there is strong Federal interest in initiating a feasibility phase study based on the likelihood that a Federal project may be justified and implementable.
Project Inspection Report: Flagler County, Florida Federal Shore Protection Project	Aug. 2008	The brief Project Inspection Report summarizes the general conditions of the beaches along the Marineland, Painters Hill, Beverly Beach, and Flagler Beach study reaches. This inspection report documented beach erosion along the Flagler County shoreline which was caused by Tropical Storm Fay. Tropical Storm Fay affected Florida's mid and north Atlantic coasts from August 20-22, 2008.	N/A
Flagler County Hurricane and Storm Damage Reduction Project Draft Integrated Feasibility Study and Environmental Assessment	Jan. 2014	The purpose of this study was to assess the feasibility of providing Federal Hurricane and Storm Damage Reduction (HSDR) measures to portions of the Flagler County shoreline. Shoreline erosion in the Flagler County study reaches threatens oceanfront infrastructure, including National Scenic Highway SR A1A, and over 1,476 structures having a combined estimated structural and content value of approximately \$340 million.	Tentatively Selected Plan identified and submitted for federal funding to initiate project design and construction phase.

Once a critically eroded area is identified as of potential national interest, a feasibility study is undertaken by the USACE which further analyzes the specific context. The feasibility study involves the application of two sets of evaluative

criteria, the first being basic requirements which justify public expenditure, such as adequate public access, and the other being financial justification via CBA. The USACE feasibility study in Flagler County was compartmentalized into four broad project reaches, Marineland, Painter's Hill, Beverly Beach and Flagler Beach (see [333], Figure 1), which corresponded to critically eroded areas identified by the FDEP [130]. Each reach was evaluated separately for their eligibility and projected benefit-cost ratio, as all reaches must be justified independently according to USACE policy. The feasibility evaluative process is complete when what is known as the "Tentatively Selected Plan" (TSP) is identified. USACE policy dictates that the TSP should also be the federally preferred NED Plan which is at its core a policy of economic prioritization ([366], p. 4):

[NED objectives] guide federal water resource planners in their choice of solutions to problems. Choice is the fundamental business of economics. Economics is the science of allocating resources based on rational choices. The objective of NED is to maximize increases in the net value of the national output of goods and services. Within the Corps, this is done by comparing the difference in the value (benefits) produced by the project to the value of the resources (costs) required to produce those goods and services or construct the project. Benefits are increases in the net value of national outputs (goods and services) and vary by type of water resource project. The costs (opportunity costs) are the costs of the resources required or displaced to achieve the plan, such as concrete and steel for building a floodwall. The NED objective is maximizing the difference between monetized benefits and costs.

The specific problems the USACE claims to be addressing in Flagler County closely mirror those economic, environmental and social issues we have thus far been considering, including effects from storms including 1) erosion, storm surge (inundation), and wave attack causing damage to coastal structures and infrastructure; 2) natural beach habitat of nesting sea turtles, benthic invertebrates, and shore birds being lost to coastal erosion; 3) shoreline erosion decreasing beach width, threatening recreational and tourism opportunities ([193], p. 4-4).

In construction terms, the TSP consists of a 10 foot seaward extension of the existing fore-dune which is meant to lengthen the existing sand berm and entire active beach and dune profile seaward along 2.6 miles of critically eroded shoreline in Flagler Beach (Figure 41). Initial construction would involve the dredging of over 300,000 yards³ of sand from a "borrow site" 7 miles off shore. And with an assumed erosion rate of -1.5 feet per year, the project would require periodic re-nourishment of sand to occur on average every 11 years (5 times in total) to reconstruct the eroding dune. This 10 foot dune extension, and its periodic reconstruction, represents the critical natural capital identified by the USACE as essential for maintaining economic productivity along this critically eroded coast.



Figure 41:

Left: Looking South along SR A1A in Flagler Beach showing actual conditions without USACE project in January, 2014. **Right:** Conceptual rendering of post-project conditions created by the USACE showing the proposed 10 foot dune extension. Sources: Left, Author's Photo, 2014; Right, image courtesy of Flagler County Engineering Department.

This specific re-nourishment project was not the only possible action considered. A variety of non-structural (such as relocation) and structural (such as seawall) alternatives were evaluated in the early stages of the planning process. In order to identify the TSP, all of the 20 management measures (and their nearly 40 unique combinations) originally considered were put through an initial preliminary screening process which qualitatively evaluated the likelihood of each alternative meeting project objectives. In a second round of preliminary screening, the alternatives which remained after the first screening were then subjected to a comparative CBA (see Figure 5-1 in [193], p. 5-7). Particularly noteworthy, when it came to rejecting relocation of SR A1A as a viable alternative, the reasons invoked by the USACE were the same as those considered in Section 5.2, namely that “getting consensus on this type of project would pose a significant political challenge. Regardless of the cost, relocating A1A would not be a practical alternative, and would not be acceptable to residents and local governments” ([193], p. 5-26).

An economically, environmentally AND socially justified alternative?

According to the USACE, the TSP for periodic re-nourishment in Flagler Beach represents a plan that “maximizes net benefits while protecting the nation’s environment and is socially acceptable” ([193], p. 3-18). In other words, the TSP is suggested to be economically, environmentally and socially justified. In terms of the project’s economic justification, which also represents the primary goal of the project over-all, the USACE has calculated a cost-benefit ratio of 1.76 for its TSP over a 50 year project lifetime, far exceeding the one-to-one return on investment which represents the threshold of economic acceptability. The project is projected

to collectively provide for a 95.5% reduction in future infrastructure damages, amounting to \$852,000 in average annual net benefits. These calculations involve applying a 3.5% discount rate; alternative calculations using a 7% discount rate were also included in the feasibility study (see [193], Chapter 6).

Furthermore, while the total project costs, which are projected to be \$43.5 million, would put re-nourishment beyond the financial reach of Flagler Beach or Flagler County, the project would also involve a cost-sharing agreement between federal (55%, \$23.8 million) and local sponsors (45%, \$19.6 million), the local sponsor being Flagler County (see [193], Chapter 6). Such cost-sharing greatly expands the possible scale of re-nourishment from the perspective of local sponsors, as the revenue collected by Flagler County government would be insufficient for both initial construction and maintenance (though, as a local newspaper pointed out, it falls far short of addressing all of the county's erosion concerns [370]). Flagler Beach, with their even smaller public purse, while arguably the most immediate benefactors of the project, are also the least capable of paying for it. As a city commissioner told me in a personal communication, this is why the city explicitly asked the county to take over the project as the formal co-sponsor to more convincingly demonstrate the capacity for local-sponsorship, the idea being this would increase the chances of securing federal co-funding.

Following the criteria adopted by the USACE, the proposed Flagler County re-nourishment project can be convincingly shown to be economically justified; however, as the Corps themselves emphasize, the project is also intended to be environmentally sound:

In addition to being the NED plan and meeting the Federal objective to contribute to national economic development, the TSP is also consistent with the Environmental Operating Principles because it is a sustainable plan that has taken environmental issues into consideration ([193], p. 215).¹⁷²

Taking environmental issues “into consideration” in practice means the USACE basically aim to maintain current environmental quality, the idea being that future without project conditions would lead to continued erosion and likely spark the installation of hard erosion control infrastructure like seawalls by private property

¹⁷² The Corps Environmental Operating Principles are ([193], p. 136): “Foster Sustainability as a way of life throughout the organization; Proactively consider environmental consequences of all Corps activities and act accordingly; Create mutually supporting economic and environmentally sustainable solutions; Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments; Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs; Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner; Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.”

owners and the FDOT, causing further damage to the beach through coastal squeeze.¹⁷³ In addressing environmental concerns, the USACE is required to abide by relevant national environmental regulations and must receive the go-ahead from relevant environmental agencies prior to engaging in project activities. For example the USFWS granted the USACE an updated Biological Opinion in 2015 [371], broadly clearing their coastal management activities from any environmental wrong-doing.¹⁷⁴ In contexts where environmental damage is seen as “unavoidable”, the Corps is required to attempt to minimize or mitigate damages as far as possible ([193], p. 4-6). Beyond permitting processes, at the policy level the USACE approach to environmental mitigation is guided by a core set of environmental quality considerations.¹⁷⁵

However, selecting the NED plan is of central importance, and because of this the project benefits related to maintaining environmental quality are considered “incidental” to the primary goal of damage reduction, meaning that they happen as a matter of course, but are not a primary objective or success criteria. The USACE states that “the TSP maximizes NED benefits by reducing storm damages, and provides incidental environmental and recreational benefits” ([193], p. 6-15). As this quote suggests, the incidental benefits coming from maintaining environmental quality also include increased recreational opportunities, which in turn have further economic ramifications. For example, after the USACE had identified the TSP, it proceeded to calculate the potential incidental recreational benefits, which were “estimated to be \$1,696,452, or \$72,326 in average annual terms” (see [193], p. 6-3). However, while these projected incidental recreational benefits have some significance, the Army Corps is legally restricted from pursuing projects solely or

¹⁷³ “The majority of existing environmental and historic resources... are not predicted to significantly change during the 50 year period of analysis of the future without project condition. A major stressor in the future without project condition will be the continued erosion of the berm and dune system and projected responses from property owners. The beach berm and dune width will be reduced and there will be an increase in shore armoring as structures are threatened by coastal storms. The projected reduction in berm width is most likely to adversely affect sea turtles and shorebirds” ([193], p. 3-23).

¹⁷⁴ Being cleared of wrong-doing, of course, does not mean there are no detrimental impacts on the environment. Instead, like the FDOT discussed in Section 5.1, the USFWS acknowledges the potentially negative impacts of USACE project activities, such as impacts on endangered sea turtle nesting behavior and habitat, but concludes that the resulting impacts are within the realm of acceptability, as long as the USACE attempt to mitigate damages to some reasonable degree.

¹⁷⁵ The USACE states that “The [Environmental Quality] account is a Federal objective, but as an evaluation criterion it is inclusive of the planning objective to maintain environmental quality and the planning constraint to avoid environmental impacts to natural resources ([193], p. 5-7, 5-8). The Environmental Quality (EQ) criteria considers ecosystem restoration, water circulation, noise level changes, public facilities and services, aesthetic values, natural resources, air and water quality, cultural and historic preservation, and other factors covered by the National Environmental Policy Act (NEPA).

primarily for recreational purposes.¹⁷⁶ When it comes to environmental considerations, in the final analysis the most important thing is that any potential environmental damage is permitted by USFWS and other environmental agencies, which it has been.

Beyond these economic and environmental justifications, the USACE also suggests their TSP is “socially acceptable”. While the precise meaning of this is never articulated in the feasibility study, the project’s social acceptability can be considered in at least two important ways. First, the project does not involve relocation of SR A1A and thus avoids many of the political challenges associated with the strong sustainability approach. As a result, the project is much less likely to stoke the same level of political resistance and in this way is more socially acceptable. The second social justification is in terms of those public safety considerations highlighted by local government officials, namely that SR A1A is an essential corridor for emergency response and evacuation. While the road would remain in its existing location, the 10 foot dune extension would provide sufficient protection, allowing the road to maintain its emergency functions. As the Flagler County Public Safety Director explained to me in a 2015 interview, the with-project conditions scenario would represent a significant improvement on current conditions regarding road protection (Interview 5):

FCPSD: So even if I [only] gained 10 feet back on the ocean side, I keep my corridor plus I give the residents an additional... buffer... I have to do all my planning assumptions based on historical values, and the historical values say that I need to prepare for category 2 on the edge of category 3 [hurricane]. Well that bluff system, that small little bluff system that in some locations along our shores is anywhere from 3 feet to 8-9 feet [wide], is critical to protecting houses, its critical to protecting infrastructure... I will say as the emergency management director in a ... local coastal county, that mitigation of our coast lines is our, that is our first line of defense.

So the TSP for Flagler County, which identifies a certain amount of natural capital to maintain over a 50 year project period, seems to be economically justified while also providing incidental social and environmental benefits. In this way, the USACE offers a geo-engineering fix which seemingly provides both for road protection and environmental benefits, though it is partial in that it does not cover all critical erosion in the county [370]. However, accepting this partiality, the project does seem to maximize the return on investment of public funds through its

¹⁷⁶ The Federal government does not participate in any work in separable recreation benefits being realized such as constructing a beach only for recreational purposes (and not hurricane and storm damage reduction purposes)... Recreation is not considered to be high priority output or primary project output under current Department of Army policy (ER 1105-2-100 section 3-4.b(4)(a)) (see [193], p. 4-7).

reducing of projected damage to coastal infrastructure, while also avoiding social disruption and maintaining an acceptable level of environmental quality. Taken at face value, these benefits suggest that the critical sustainability approach provides the best solution thus far considered for dealing with Flagler Beach's critical erosion problem.

6.2 Sustainable Development beyond Governance and Economics

As the best alternative currently on offer, the Flagler County Hurricane and Storm Damage Reduction Project maintains just enough natural capital to provide maximum economic benefits, while still providing for incidental social and environmental benefits expected to come as a matter of course. It will probably not surprise the reader, however, to learn that criticisms have been launched against the USACE and its use of CBA, both in Flagler County and in the U.S. more broadly. In particular, three main criticisms have been levelled by critics against the USACE in the context of the Flagler County project (see [333]) which are in many ways reflective of and grounded in more general criticisms of CBA as an evaluative procedure for public environmental policy; namely that CBA is inaccurate, exclusionary and negligent of distributional considerations (for these general criticisms, see e.g. [308, 309, 372]). Overcoming these limitations, as we will see, involves the adoption of an alternative decision making procedure, namely social choice. In this section I discuss the logic and strategy of this social choice procedure; however, the operationalization of this superior alternative will be taken up in Chapter 7 below.

Issues with monetary environmental evaluation

General criticisms levelled against CBA regarding accuracy, inclusiveness and distributional considerations can have important implications regarding project implementation and outcomes. The issue of accuracy, to start, can be problematic in terms of the reliability of projections regarding what the final project benefit-cost ratio will be (and thus whether the project is actually economically justified), as well as in terms of the expectations created among project recipients. Coastal scientist Orrin Pilkey ([373]; for replies see [374, 375]) for example accused the Army Corps in the 1990s of being the "fox guarding the hen house", showing that a combination of self-monitoring and a reliance on price accounting as the only criteria for project evaluation has allowed them to claim near universal success in

their beach nourishment activities. Under such criteria even perfectly successful projects can simultaneously come with the loss of important environmental quality benefits which may be expected by citizens but incidental to formal project objectives. This is because the damage reduction benefits from re-nourishment may still be realized if, for example, a local beach disappears but the sand remains offshore and continues to protect coastal infrastructure by reducing wave energy, of which there are historical examples [376]. While project promoters may be keen to emphasize the hoped for incidental environmental benefits to gain public support for project activities, as long as the total project costs and sand volume accounting still proceed as planned, even the complete loss of environmental benefits could be consistent with an accurate and successful project by accounting standards.

Similar problems could be found in the USACE's Flagler County project. In public outreach materials, the benefit-cost ratio and project re-nourishment intervals are presented as definitive, with practically no indication of their potential for change; indeed, the USACE project materials tend to boast of the "predictive capabilities" of the cutting-edge models employed rather than emphasizing their potential for divergence with reality ([377], cited in [333] p. 8). However, as a local newspaper pointed out in 2016¹⁷⁷, the averaged intervals presented to the public by the USACE are likely to be tentative. The USACE, of course, recognizes this as well, but tend to downplay or ignore it in public communications. As an indication, in the entire 290 pages of the publically available Flagler County project feasibility study, the possibility of changes to projected costs, volumes and timing is indeed mentioned, but only once:

Based on these [modeling] parameters, the expected renourishment interval is 11 years, defined by the average time between renourishments being triggered over 100 iterations of a 50 year life cycle simulated by Beach-fx. *In reality, this interval could vary depending on the timing of erosion and storm events* ([193], p. 6-7), emphasis added.

In addition to questions of accuracy, the CBA technique has been generally criticized as prone to exclude important environmental and social concerns, a problem which stems in particular from the reductionism implicit in the need to convert relevant concerns into monetary metrics [309]. The USACE in the Flagler project has similarly been accused of excluding or marginalizing other real concerns held by community residents and elected officials. One Flagler Beach commissioner, for example, expressed her frustration with what she saw as state

¹⁷⁷ "Storms will alter the figures: more or less sand could be needed, more or less frequent re-nourishments could result. That's assuming the rising seas projected to devour substantial parts of Florida's shoreline, because of global warming, don't make the project obsolete before its 50-year lifespan" [370].

and federal agencies pursuing their own agenda while ignoring the concerns of local residents (Interview 2):

FBCC: I'll tell you, um, in my opinion, the people that are making decisions at the offsite, meaning the Corps, the FDEP, the [FDOT], do not care what the local community wants. And that is my biggest problem... they will make us over come every obstacle known to man without sitting down with us.

In a more direct way, the need to convert relevant concerns into monetary metrics has posed practical challenges for some Flagler County officials working with the USACE on the project to ensure public concerns are incorporated as project goals. For example, one Flagler County Project Engineer who worked closely with the USACE project for years expressed her frustration with the exclusionary procedure this way (Interview 8; quoted in [333]):

FCE: sometimes we would try to press the importance of some [issues] and...it just didn't fit into the model you know, so yea we were kind of frustrated in some ways by that. [We told the Army Corps] 'you don't understanding, we can't lose the beach', you know, that's all we kept telling them.

Beyond causing frustration, the more damning possibility regarding these criticisms is that, if those concerns which had previously been excluded were to be quantified and incorporated into the CBA, there is a very real possibility that the benefit-cost ratio would change such that the project would no longer be considered economically justified, though a strengthening of economic justification is likewise possible.

Adding to these concerns of accuracy and inclusiveness, problems of fairness in the interpersonal and temporal sharing of costs and benefits can and have been raised against the underlying utilitarian focus of CBA which, as Amartya Sen ([303], p. 57, see also [378]) has put it, has “no interest in – or sensitivity to – the actual distribution of utilities”, nor a concern with other significant social concerns like freedoms, rights and liberties. As long as over-all utility is increased, then a given scenario is considered justified by these standards, even if the dispersal of costs and benefits is extremely skewed [345]. In Flagler, some have argued that the city and county are given an unfair cost burden by being expected to contribute financially to the feasibility study (over \$3 million over 10 years or so, see [379]) as well as providing approximately 35% of total project costs, all the while benefits are being accrued largely at the state and federal levels. One elected official complained in 2014 about the city having to foot the bill for the feasibility study without the guarantee of a federal project, and without any immediate benefits accruing to the city from the money spent (Interview 2):

FBCC: absolutely. So what do you do, you spend \$2-3 and a half million to get a \$13 million dollar project that you pay [for] over and over again every 8-10 years... Boy, that sounds like a great... return on my investment. This project has drug on for so long it's no longer, it's not cost effective. It's stupid. And every single dollar has gone straight to the Army Corp. No one else has benefited from this \$3.5 million [feasibility study]. The Army Corp, or whoever they sub their testing out to, that's it! There's no product. There's no end product. I don't believe there will ever be one.

Beyond this kind of immediate frustration, the truth of the matter is that the FDOT is formally set to accrue 93% of all damage reduction benefits ([193], p. 3-21,22; see also [380]), while co-sponsorship is formally organized between local and federal levels.¹⁷⁸ Furthermore, while these damage reduction benefits reduce the FDOT's cost of infrastructure maintenance, the USACE itself is concerned with an even more aggregate level, evaluating its project outputs in terms of "maximizing increases in the net value of the *national output of goods and services*, expressed in monetary units" ([366], p. 4), meaning that the maximization of project benefits is explicitly and exclusively concerned with the federal level, despite expectations of significant cost-sharing from state and local public funds.

Flipping this distributional criticism on its head, fiscal conservative critics such as Senator Tomas Coburn have accused the U.S. Congress of "prioritizing beach pork over national needs" [358] by supporting beach re-nourishment projects with federal funds, arguing that other national infrastructural needs are more pressing and should take priority. Coburn suggests in a letter to taxpayers which opens his congressional oversight report that while "taxpayers are not surprised when they learn how Congress wastes billions of dollars on questionable programs and projects each year" they still may be shocked to know that "Congress has literally dumped nearly \$3 billion into beach projects that have washed out to sea", adding that hundreds of millions of dollars every year in federal funds are appropriated to ensure that "coastal towns benefitting from lobbying and political influence on Capitol Hill maintain picturesque beaches for property owners and tourists" ([358], p. 1). Taken together, the question of distributional fairness can look very different at local or national levels, with similar intergenerational corollaries [381].

¹⁷⁸ The possibility of the FDOT subsidizing local co-sponsorship costs is there. In particular, "State funds for erosion control projects are available from Florida's Ecosystem Restoration and Management Trust Fund (Section 161.091, Florida Statutes). The fund provides money for erosion control projects consistent with the Strategic Beach Management Plan. The state can pay up to 50% of the actual non-Federal cost of restoring a critically eroding beach, while the local government in which the project occurs must provide the balance of the funds (Section 161.101, Florida Statutes). The level of state funding is directly related to the amount of public beach access and parking located within the project area." ([193], p. 4-11). However, the USACE project is not formally reliant on state financial support.

Problems with accuracy and inclusiveness can pose serious practical challenges to CBA practitioners, and it is very well possible that more accurate and comprehensive calculations, which account for a wider range of costs and benefits, could change (either positively or negatively) whether a given project is considered economically justified. However, as I have argued elsewhere [333], as theoretical challenges to the legitimacy of economic choice as a general technique, these criticisms may not be as powerful as they might initially seem. While improving the coverage and accuracy of CBA calculations could affect economic justification, issues of inaccuracy and exclusiveness are not inherent in economic choice, but instead may be related to the faulty or limited application of CBA tools. Criticisms of accuracy and comprehensiveness can be remedied by *improving* valuations techniques used in economic choice exercises and *extending* them into previously neglected areas of concern.¹⁷⁹ This improvement and extension of monetary valuation has been the objective of, for example, much academic work in environmental economics focused on quantifying the exchange-value of a wide variety of so called “ecosystem services” (e.g. [383-385]).¹⁸⁰

When it comes to issues of distribution, while the financial and political implications pointed out by critics are socially significant, a generous view on CBA would point out that such criticisms aim to hold CBA practitioners accountable to distributional considerations which do not actually pose problems from the perspective of economic choice and were not necessarily promised to begin with.¹⁸¹ Indeed, CBA, as a fundamentally *utilitarian* approach, is explicitly predicated on maximizing *aggregate* utility, arguably placing the “problem” of distributional equity beyond the realm of significance. In other words, the focus on maximizing aggregate utility means the distribution of that utility can be considered irrelevant. Even so, there is also the possibility to incorporate such distributional value judgments through some sort of weighting procedure (see [367], p. 958-961). Taken together, because these criticisms can be theoretically

¹⁷⁹ Among the most oft cited examples in academia is the study by Balmford et al. [382] which puts a price on “wild nature” around the globe as means to justify its conservation, arguing that doing so would provide a benefit-cost ratio of “at least 100:1”.

¹⁸⁰ In the specific context of beach re-nourishment, some, for example Smith et al. [386] who conceptualize re-nourishment in terms of what they call a “dynamic capital accumulation problem”, have attempted to construct complex models capable of connecting coastal geomorphology to processes of economic evaluation.

¹⁸¹ As Drèze and Stern ([367], p. 955) have argued, “One can imagine four ways of apparently avoiding the use in cost-benefit analysis of judgements concerning distribution across households. First, one can attempt to identify actual Pareto improvements. Secondly, one can seek potential Pareto improvements. Thirdly, one can use criteria which are not based on household welfare. Fourthly, one can argue that distribution can be ignored in cost-benefit analysis because, if it is a problem, it should be dealt with using policy instruments other than public projects. An alternative and rather more fierce version of this fourth case is that the distribution of income is not an appropriate concern for the government”.

managed, they do not seem to require abandonment of the CBA technique, but only, at most, its improvement.

Even if we assume that the USACE project in Flagler Beach is economically justified, there are still uncertainties and practical obstacles to actually re-nourishing the beach related to limited federal funds and inter-municipal competition. In particular, moving the project forward fundamentally relies on the availability and allocation of adequate federal co-funding. Flagler Beach is but a drop in the bucket of hurricane battered cities, all hoping to be selected to receive some of the limited available federal design and construction funds. Take for example the fact that New Orleans is still receiving federal grants from Hurricane Katrina, which hit the city in 2005 and was the costliest hurricane in U.S. history; New York and New Jersey are still receiving federal grants from Hurricane Sandy which hit the area in 2012, and was the second costliest hurricane in U.S. history; Other areas in Florida and elsewhere in the south eastern U.S. continue to recover from Hurricane Matthew which impacted the area in 2016, while the 2017 hurricane season, including Hurricane Harvey in Texas, Hurricane Irma in Florida and Hurricane Maria in Puerto Rico, are all currently commanding federal political and financial attention.¹⁸² In April, 2016, even before Hurricane Matthew impacted Flagler County, the project manager for the USACE project (quoted in [370]) put the problem of funding competition this way:

We're living in the land of no [funding] earmarks... those have since passed, so all the project appropriations have been passed down to the Office of Management of Budget and the assistant secretary of the Army, so she gets thousands of requests for projects, beach projects, California, all over the country, and there's only so much money to go around. So essentially, they put restrictions on these [projects].

In this sea of competition with other needy municipal fish, where many city governments both command much larger public treasure chests and require larger levels of federal support, getting the Flagler County re-nourishment project funded would require substantial, effective lobbying at the federal level.¹⁸³ Recognizing this, Flagler Beach and Flagler County long maintained a paid relationship with the K Street lobbying firm Marlowe and Company, dubbed by USA Today in 2007 as “the Sand-a Claus of beaches” because of their aggressive lobbying for the

¹⁸² See <https://www.hudexchange.info/programs/cdbg-dr/cdbg-dr-grantee-contact-information/#all-disasters>.

¹⁸³ A local newspaper noted how “in the U.S. Army Corps’ calculation, a beach is worth re-nourishing if it protects very costly real estate values like high-rises and masses of population. That’s just not the case in Flagler Beach, whose pretty beaches and *lack* of high rises is held against it in that cost-benefit calculus”, with the Flagler County Administrator adding “the [beach management funding] programs that are out there aren’t really out there unless you’re a very expensive, high-rise area that has a huge cost-benefit ratio” [379].

procurement of federal beach re-nourishment funds for local projects [387]. But even with lobbying, other problems at the federal level exist. A local newspaper noted in 2016, for example, that Flagler County has had issues with stable congressional representation for years, with the most recent congressional representative being tagged as “new... powerless... ineffective and... largely uninterested in advocating for his district” due to more national political ambitions [370].

But nature is less concerned with the niceties of coastal management politics, and while debate may have slowly proceeded in the halls of congress, Hurricane Matthew literally transformed the context under consideration in Flagler Beach both physically and financially, setting in motion a regressive diversion in theory and practice. In the wake of the devastation wrought by the hurricane, the USACE re-nourishment project, which had been in the pipeline for over 12 years and already cost local, county and state government over \$3 million in studies, was taken off the table. The reason for not pursuing the project further was that the changes in project conditions meant it was no longer economically justified from a federal perspective, and that the FDOT, which was the primary benefactor of the USACE project anyway, would be better off implementing their own permanent solution which they had long been willing to fund.¹⁸⁴ Furthermore, local government officials were under dramatically increased pressure to implement an erosion control solution after hundreds of thousands of cubic feet of dunes had been lost in Hurricane Matthew, as temporary fixes were proving extremely problematic [388, 389]; all the while the probability of securing federal funds seemed to be rapidly dwindling [214]. In the end, whether the county “abandoned” the Army Corps project, or vice versa, the result has been, as a local newspaper put it, “the whole effort has been wasted, the whole plan has been shelved” [379].

In place of re-nourishment, county officials, in collaboration with the FDOT, propose what a local newspaper framed as “an even broader plan for a more permanent fix: rebuilding the dunes for good” [214]. However, “rebuilding the dunes for good” in practice basically amounts to resorting back to what in the course of this analysis have shown themselves to be inferior ideas. In the absence of a federal project, the situation in Flagler Beach returns to default conditions, meaning the FDOT are again the primary agency responsible for decision making

¹⁸⁴ The USACE Headquarters had raised concerns previously that the Flagler re-nourishment project, of which 93% of damage reduction benefits would accrue to the FDOT, should instead be funded by the FDOT, who had consistently expressed their willingness to make substantial financial contributions to any road stabilization project. The lobbying firm Marlowe and Company in 2014, however, warned city and county officials to keep quiet about the FDOT potentially paying into the project, recommending that “discussions of the FDOT and the Florida Department of Environmental Protection financial contributions should only be raised later... when the project has been approved by the Chief of Engineers” in order to increase the chances of securing federal funds [380].

in critically eroded areas, and they still plan to construct seawalls¹⁸⁵ when necessary to ensure the roads structural integrity [390, 391]. This “more permanent fix”, which has been dubbed by local press as a “wall of dunes”, would involve the covering of this stability infrastructure with sand dredged up from an off-site source at the cost of between \$20 and \$40 million plus annual maintenance costs potentially in excess of \$500,000, with funding for the project to be provided by the FDOT, FDEP and the Flagler County TDC [214, 390].¹⁸⁶

Because sand deposited in front of a seawall is prone to rapid erosion, and indeed Flagler Beach has experienced this exact scenario historically (see Section 4.2), local citizens, business owners, elected officials and others¹⁸⁷ have moved to organize a sort of “adopt-a-dune” style plan aimed at planting and monitoring dune vegetation, officially dubbed the “Flagler Beach Green Dunes Project” [392]. The main goals behind this community project, which has been given the green light by the FDOT, are to discourage foot traffic on the dunes, stabilize deposited sand, beautify the recreational beach and reduce the rate of erosion in the long-term [197]. Many officials recognize that this scenario is not ideal; however, the lack of other immediately available alternatives have forced them to try and make the best of the situation [390]. A Flagler Beach City Commissioner summed up the situation this way in an email communication in May, 2017:

FBCC: The problem now is it appears the USACE project is a bust. Go figure, when the big storm did what they said it was going to do they are nowhere to be found. We are going to have to work with the FDOT on a dune system and make it part of the "holding up of the road". Everything is so complex. We are going to move forward with planting in the FDOT right-of-way.

Collective decision making and the possibility of social choice

In absence of a federal project, the City of Flagler Beach finds itself in a familiar position, with the FDOT planning to build walls that support what a local newspaper called “a new, not much improved A1A” [391], and local government

¹⁸⁵ I am here including reinforced rock revetments or any permanent structure aimed at holding the line against erosion.

¹⁸⁶ Questions about the likelihood of the FDEP actually providing the funding for sand renourishment in Flagler County have been raised by some local critics, with some suggesting that “while there is certainty that the transportation department will spend the money to rebuild its road, there is much less certainty that the environmental agency will make the tens of millions of dollars necessary to ensure the rebuilding of the beaches to the scale necessary” [379].

¹⁸⁷ I have personally been active in supporting the city’s development of a re-vegetation plan. In particular, I drafted a policy document summarizing the scientific literature on vegetation and sand dune systems and offering practical guidelines for planting, maintaining and monitoring re-vegetation in Flagler Beach. The process is ongoing at the time of writing.

and residents taking on more responsibility under increasing constraints to try and mitigate as far as possible environmental degradation resulting from coastal squeeze. This most recent turn of events could perhaps, if one is feeling generous¹⁸⁸, be considered a form of “participatory governance” (see e.g. [395]), though it is in many ways a last resort for local residents and officials rather than a model intentionally aimed at enhancing democratic participation in environmental management. While there is general recognition that environmental quality concerns remain beyond the “purview” of the FDOT [391], the city’s re-vegetation strategy, if done effectively, has some potential to reduce the local rate of erosion.

The FDOT erosion control strategy, even with the added benefits of vegetation, would however remain significantly vulnerable to coastal hazards and would almost certainly require full re-construction after major storms; that is, if the city wants the underlying seawall to remain covered with sand and vegetation. Perhaps more damning to the approach in the long-run is that it does not incorporate any procedure for adapting to climate change induced sea level rise, which evidence suggests will not only lead to ever-increasing costs of erosion control, but likely to the functional loss of most sandy beaches along developed shorelines by the middle of the 21st century in the absence of wide-spread infrastructural retreat and/or ecosystem restoration [240, 273, 274, 276].¹⁸⁹

Despite these seemingly gloomy prospects, the fact that, in the absence of a major federally co-funded re-nourishment project, citizens and elected official are still trying to find ways to address their environmental quality concerns points to the need for over-coming the limitations of existing procedures for public environmental evaluation. Even if conserving the beach is not considered economically justified, people obviously still care for the environment, and are even willing to spend their own private funds and unpaid labor (Figure 42; also see [392]) to improve what ultimately is a public good, meaning such beach improvements will be “enjoyed in common rather than separately by one consumer only” ([303], p. 269). While the USACE incorporate such environmental concerns in their evaluation of the Flagler re-nourishment project, they are constrained to doing so through monetary metrics (for example damage reduction or incidental recreational benefits).

¹⁸⁸ Another, less generous perspective might frame the situation as yet another example of the individualization of responsibility under neoliberalism dressed up as a “local fix” to more systemic problems (see e.g. [393, 394]).

¹⁸⁹ I have made this exact point publically in a short editorial published in the Daytona Beach News Journal. Available at: <http://www.news-journalonline.com/opinion/20170524/chad-boda-flaglers-beach-could-die-as-seas-rise>



Figure 42:

More than 100 Flagler residents volunteered to clean up dangerous debris and trash left behind on the beach by Hurricane Matthew in early November, 2016. Such a collective display of non-monetary environmental values lends credibility to the idea that considerations in social evaluation should extend beyond exchange-value. Photo courtesy of Linda Provencher, 2016.

The incorporation of environmental quality concerns through monetary quantification is, however, quite problematic, not least because the price (and thus the social value) assigned to a particular environmental good or service is dependent on the existing level of economic development, meaning environmental goods and services will have different prices (and thus different values) in different places and times. The major implication, put bluntly, is that the richer one is, the more they can value the environment, and vice versa. For example, contingent valuation methods, such as the willingness of people to pay a certain financial cost or accept a certain financial benefit related to a particular environmental project, are ultimately a function of individual or household income (see [306], Chapters 3 and 4), an issue which fundamentally leads to geographic and temporal variability in the value assigned to environmental assets. Low-income locations will assign lower values to the environment in monetary evaluation exercises, both in terms of willingness and ability to pay, simply as a result of their socio-economic condition. The same imbalance in monetary environmental valuation applies to differences in environmental accounting between developed and developing countries (see [306], Chapter 8); trees are worth less in Swaziland and more in Sweden, so to speak.¹⁹⁰

¹⁹⁰ In the now infamous 1992 “Summers’ memo”, the chief economist of the World Bank, Lawrence Summers, expressed his support for this logic, stating, as The New York Times [396] noted at the

This applies to other valuational techniques as well.¹⁹¹ The influence of uneven development and wealth inequality in many ways underpins the fact that re-nourishment projects tend to happen in richer communities, which also tend to be those communities with political clout, funding for lobbying and co-sponsorship, and expensive enough assets to economically justify federal expenditures [397].

From this, it seems that the informational requirements of CBA as a tool, and economic choice more broadly, are such that many important, non-monetary values held by citizens regarding environmental protection cannot be adequately incorporated into the evaluative process. If the monetary value placed on the environment is a factor of the general level of economic development of a city/country, and thus an unreliable indicator of the actual values people may hold towards the environment, then one way to over-come this tension would involve considering the values people actually hold *directly*, rather than indirectly via their translation into monetary metrics. These values may of course still be, at least in part, economic, but it is likely to include many other values that have little to do with money. As Sen ([398], p. 34) has noted:

To see people only as buyers and sellers leaves out some vitally relevant information about people in relation to the environment. The attempt to get at their citizenship roles through making them imagine that they are buying non-existent objects (as “contingent valuation” tries to do) is neither a terribly cogent, nor a particularly useful, way of getting at the missing information.

In Flagler Beach, it is clear that people care about the environment for a variety of reasons, some of which are related to income and tourism, but many others which are related to other factors affecting quality of life (see Section 5.2). In order to escape the need to treat citizens as only “buyers and sellers”, as economic choice must do, consideration of the environment could instead proceed in such a way that environmental goods and services are *decommodified*; that is, that environmental concerns are de-coupled from the exchange-value metric and instead are considered directly in relation to the variety of values people actually have for caring about environmental protection. A promising alternative to the problems of informational constraint found in economic (and political) choice comes from the

time, that “A given amount of health-impairing pollution should be done in the country with the lowest cost, which will be the country with the lowest wages”, adding “the economic logic behind dumping a load of toxic waste in the lowest-wage country is impeccable and we should face up to that”.

¹⁹¹ For example, in addition to contingent valuation, other methods of environmental valuation are likewise ultimately a function of pre-existing wealth, for example hedonic pricing which uses real-estate prices to assign monetary values to environmental goods and services (see [306], Chapter 5), with higher real-estate prices translating into larger environmental values (e.g. higher damage reduction benefits), while project construction costs may not be dramatically different.

area of social choice, in particular the work produced by the Nobel Prize winning economist Amartya Sen.

Any decision making procedure adopted in the pursuit of SD can be understood in terms of its informational basis, meaning “the information that is needed for making judgments using that approach and - no less important - the information that is “excluded” from a direct evaluative role in that approach” ([303], p. 56). Economic choice relies exclusively on monetary metrics, forcing decision makers to collapse all value considerations into exchange-value. Political choice, on the other hand, focuses on majority rule through free and open elections, with “the aggregation of independently formed preferences” ([343], p. 55, footnote 1) forming the choice procedures informational basis. While this might allow for the direct expression of personal preferences and values, and does not require transformation of values into exchange-value, the information considered can only really reveal majority preference, but little else, and can potentially lead to perverse social outcomes. For example, Sen ([345], p. 10) has notes how “taking the most deprived person in a community and passing on half her share of the cake divided between two richer persons would be a majority improvement, but scarcely a great welfare-economic triumph.” On more technical grounds, the possibility of consistent political choice was undermined by Kenneth Arrow’s “impossibility theorem” which famously showed how, under certain rule and informational conditions, no non-dictatorial electoral/voting procedure based on individual preference ranking could be devised that would lead to consistent social decisions (see [399]).

Addressing the shortcomings of majority rule decision making procedures have been the focus of much of the work on social choice theory after Arrow (for a useful summary, see [400]). Amartya Sen in particular has pointed out that the “impossibility” identified by Arrow’s famous theorem was a result of self-imposed informational constraints rather than an inherent limitation of social evaluation itself (see [303], p. 250-252). Sen instead advances an approach to social choice predicated on the expansion of informational considerations and operationalized through an inter-personally reasoned agreement on a range of evaluative weights. In this approach, value pluralism and human reason provide the bases for collective decision making; that is, the reasons people actually hold for preferring one alternative over another form the informational basis to be considered in social decisions, while the human capacity for interpersonal reasoning (what Sen calls “reasonableness”, see [401]) provides the foundation for social comparison. This interpersonal, deliberative component of social choice is an unavoidable necessity resulting from widening the net of consideration in such evaluative exercises and the related need to socially rank the significance (i.e. weight) of all these various concerns:

it is crucial to ask, in any evaluative exercise...how the weights are to be selected. This judgmental exercise can be resolved only through reasoned evaluation. For a particular person, who is making his or her own judgments, the selection of weights will require reflection, rather than any interpersonal agreement (or consensus). However, in arriving at an “agreed” range for social evaluation, there has to be some kind of a reasoned “consensus” on weights, or at least on a range of weights. This is a “social choice” exercise, and it requires public discussion and a democratic understanding and acceptance. ([303], p. 78-79)

Such a shift to a social choice procedure would imply, for example, that those issues which have thus far been problematic in the evaluation of alternative solutions to Flagler’s critical erosion problem, such as inadequate political participation [238], transparency concerns [333], and other non-monetary reasons people have for wanting to conserve the local environment, should be incorporated into the evaluative process as valid considerations directly; that is, without reference to their contribution to monetary metrics, even though some form of monetary CBA may still remain one of many relevant considerations. This expanded basis of information would then be ranked in a democratic process of assigning evaluative weights, the results of which would provide an evaluative framework for collectively deciding between competing alternatives ([303], p. 76-81).

The possibility of social evaluation being grounded in an interpersonal agreement on weights presupposes a certain conceptualization of the human condition, namely that human beings are agents with the capacity to participate meaningfully in the world around them, rather than the purely market-rational, needy consumers often assumed in economic analyses [345, 402].¹⁹² But limiting one’s view of reason to the maximization of individual utility perverts the reciprocal relationship between individual and society¹⁹³, and impedes understanding of the potential for and role of the rational participation of the free individual in producing the social collectivity ([303], Chapter 12; see also [253]). “The basic question that is raised by such a market-oriented approach”, argues Sen ([398], p. 23):

¹⁹² “... we also have to go beyond the role of human beings specifically as ‘consumers’ or as ‘people with needs’, and consider, more broadly, their general role as agents of change who can – given the opportunity – think, assess, evaluate, resolve, inspire, agitate, and, through these means, reshape the world” ([402], p. 7).

¹⁹³ Ritchie ([403], p. 72-73), over a century ago, perhaps put it best: “Of course each of us, if we had been making the universe, might have made his own individual self the center of it; but logic teaches us that we cannot think the universe rightly from our individual point of view, and life teaches us that we must not live it from our individual point of view. If we try to do so, to any very great extent, our neighbors may be obliged to shut us up in an asylum or to hang us, in the interest of something that is greater than the individual self. And so we find that the real individual is not the individual in isolation from and in distinction from all other individuals, but is a synthesis of the universal and particular self.”

is whether this view of the individual as an operator in a market best captures the problems of environmental evaluation. An alternative view is to see the individual as a citizen – an agent who judges the alternatives from a social perspective which includes her own well-being but also, quite possibly, many other considerations.

In the final analysis, while we should of course avoid assuming that all citizens and decision makers try constantly to promote some selfless "social good", the movement from economic choice to social choice requires that we "escape... the 'low-minded sentimentalism' of assuming that everyone is constantly motivated entirely by personal self-interest" ([345], p. 15).

Sustainable coastal development from the perspective of freedom

If one accepts the need for expanding the size of the informational pool from which considerations to be included in social evaluative exercises are drawn, and that an inter-personal deliberative procedure for assigning weight to these variable considerations is likewise accepted, the question remains as to what the supposed *ends* of these social decisions should be. In other words, even if a decision procedure is informationally rich and participatory, how are we to judge the *outcomes* of these social decisions? Sen tells us it is "indispensably important" to have an adequate understanding of "the kind of information we need to examine in order to assess what is going on and what is being seriously neglected" ([303], p. 286), but what would then be the appropriate metric for monitoring progress in SD?

Previously considered approaches to SD, that is, the weak, strong and critical varieties, each aimed in their own way to maintain or expand the general capacity to produce well-being, seen in terms of stock of capital and generally measured in terms of per capita wealth [301]. Sen, however, points out that, as Aristotle knew, "wealth is evidently not the good we are seeking; for it is merely useful and for the sake of something else", that something else being "the things it allows us to do – the substantive freedoms it helps us to achieve" ([303], p. 14). When it comes to the means and ends of development, the question for Sen is not so much the level of income individuals are able to command, but whether or not people have the substantive freedoms, that is, *capabilities*, to actually pursue lives they have reason to value.¹⁹⁴ The substantive freedoms that may be relevant are diverse, and can fall into five distinct but complementary categories: (1) political freedoms, (2)

¹⁹⁴ To substantiate this point, Sen often refers to example cases where higher levels of human development, for example higher literacy rates, better gender equality, and superior health functionings, have been achieved at relatively lower levels of economic development (i.e. GDP), among his favorite examples being the southwestern Indian state of Kerala, see for example ([303], p. 21-24).

economic facilities, (3) social opportunities, (4) transparency guarantees, and (5) protective security, each of which will command varying degrees of significance in concrete situations (see [303], p. 10). The perspective of a sustainable *human* development is both operationalized through, and measured in terms of, the progressive expansion of individual capabilities; in other words, Sen's focus on capability expansion recognizes both a *constitutive* and an *instrumental* role for freedom in SD ([303], Chapter 2).

This shift in focus away from maximization of economic metrics towards the expansion of substantive freedom has significant implications for the practice of social choice as an evaluative procedure. "Seeing development in terms of the substantive freedoms of people", Sen ([303], p. 33) tells us, "involves the need to assess the requirements of development in terms of removing the unfreedoms from which the members of society may suffer", with the removal of the most pressing and urgent unfreedoms (e.g. freedom from starvation, bodily harm, forced marginality, etc.) taking priority over other unfreedoms which may be less urgent, but no less significant in terms of the process of development. The idea is not so much that these less pressing unfreedoms should be ignored, but that they should take their place as priorities as more pressing unfreedoms are resolved. The significance of this implication cannot be over-stated, and I will return to it in Chapter 7 below.

While the adoption of a social choice procedure which is informed by the perspective of freedom could still involve considerations of monetary benefit-cost ratios, it would also need to take account of the consequences (both intended and unintended, see [303], p. 254-261) of the choice procedure itself, as well as the potential project outcomes, on the substantive freedoms of the people involved. This means that, while the criticisms levelled against the USACE in Flagler County regarding CBA being inaccurate, exclusionary and negligent may be significant in terms of their impact on monetary valuation, from the perspective of freedom these same criticisms take on a new significance. For example, the informational restrictions inherent to the economic choice procedure has constrained the political freedoms of residents to participate in the process of determining what evaluative considerations will be included and excluded in the decision making process, and what weight each of these considerations will be given, even though local residents will be most directly impacted by project outcomes (see [333] for further examples).

The significance of having the freedom to participate in the selection of evaluative criteria is related to both the constitutive role of political freedom in the process of development (removing political unfreedoms *is itself development*), and in the instrumental role of political freedom in producing sustainable social outcomes (removing political unfreedoms *facilitates* further development). This significance is, furthermore, independent of any particular individual's income

level; just because an individual is financially well-off does not mean they are unable to be deprived of important freedoms.¹⁹⁵ In addition to the consideration of the consequences of choice procedure and outcomes on human freedom in the here-and-now, the focus on freedom has important intergenerational implications in the context of SD. In particular, as Faran ([294], p. 20) notes, a freedom-based approach to SD provides a justification for, indeed established the requirement of, environmental conservation here-and-now as a means of preserving the freedom of future generations.¹⁹⁶

...once we accept the ends of development as freedom, we are obliged to prioritize a series of targets as choices that are socially justified; among them removal of capability deprivation... securing basic needs to all members of society, gender equality, universal health and education, entitlement to some productive asset, etc. Bringing in the perspective of [SD] adds to this list intergenerational equality; not only leaving adequate productive assets to future generations, but taking responsibility for nature and environment in such a way that future generations have the same freedom regarding the environment (Nature) as we have.

It seems clear that accepting the extension of human freedom as the means and ends of SD would require decision makers and engaged citizens to widen the reach of what is considered relevant information in a decision making process. This means moving from a sole focus on a monetary (or any other singular) metric to the variety of reasons people have for pursuing lives they have reason to value, as well as what substantive freedoms are set to be impacted by collective decisions. Furthermore, this informational expansion itself requires a different kind of procedure for making collective choices, namely social choice. This is because the process of choosing which of the many valid considerations in a given choice exercise will receive a certain level of priority (weight) is a social question, not an individual one; that is, if the intention is to avoid the authoritarian rule of some designated “expert” or “leader” and to focus on human *freedoms* as opposed to only *needs* ([402], p. 10).

¹⁹⁵ “Even a very rich person who is prevented from speaking freely, or from participating in public debates and decisions, is deprived of something that she has reason to value. The process of development, when judged by the enhancement of human freedom, has to include the removal of this person’s deprivation” ([303], p. 37).

¹⁹⁶ Sen put the point this way “To use a medieval distinction, we are not only patients, whose needs demand attention, but also agents, whose freedom to decide what to value and how to pursue it can extend far beyond the fulfilment of our needs. The question can thus be asked whether environmental priorities should be seen in terms also of sustaining our freedoms. Should we not be concerned with preserving – and when possible expanding – the substantive freedoms of people today ‘without compromising the ability of future generations’ to have similar, or more, freedoms?” [404].

Progressing from an economic choice to a social choice decision making procedure, predicated on the idea of development as capabilities expansion, does not immediately provide a concrete strategy for addressing the critical erosion problem in Flagler Beach. It does, however, provide a superior process by which such a strategy can be identified. The social choice procedure is superior because it can account for the informational considerations of economic (and political) choice without suffering from its necessary reductionism. The choice process, furthermore, is transformed from merely a tool for deciding if development is justified to a foundational, *constitutive* component of SD itself. The focus on freedom, furthermore, provides and a strong justification for both prioritizing the least-well off (in terms of capabilities) *and* environmental conservation in SD processes.

Accepting the necessity of moving from economic choice to social choice, however, does not guarantee its actualization. Social choice is not going to implement itself. Instead, social choice will have to be practically adopted and implemented *intentionally* if its benefits (relative to economic and political choice) are to be realized. It should be obvious that the market does not provide a mechanism by which to implement and support a freedom-based social choice procedure, as the market mechanism is necessarily restricted to exchange-value considerations. Government, too, cannot be relied on to provide the mechanism for achieving social choice, either because certain government entities lack the right to make such decisions (such as in Flagler Beach), or because bureaucratic, instrumental rationality is prone to balk at “messy” processes. As Sen ([303], p. 79) has put it:

There is an interesting choice here between “technocracy” and “democracy” in the selection of weights... A choice procedure that relies on a democratic search for agreement or a consensus can be extremely messy, and many technocrats are sufficiently disgusted by its messiness to pine for some wonderful formula that would simply give us ready-made weights that are “just right.” However, no such magic formula does, of course, exist, since the issue of weighting is one of valuation and judgment, and not one of some impersonal technology.

If the market or government cannot be relied on to bring about the necessary changes to decision making, then the burden of establishing a freedom-based social choice procedure unavoidably falls to civil society, the only segment capable of acting beyond the confines of formal government and the market economy to shape values in society and direct its development.

******I began this chapter by identifying an alternative erosion control strategy, namely beach re-nourishment, underpinned by a “critical” approach to SD. That is, a strategy which acknowledges that economic production relies on the existence of

at least a minimal pool of critical natural capital. With the USACE in support of such a strategy, the situation was looking pretty promising. However, even the highly sophisticated economic choice decision making approach which the USACE is obliged to employ was shown to have severe informational and practical constraints. These constraints restricted the formal incorporation of important social and environmental considerations, as well as providing the eventual justification for the retraction of a decade-long planned re-nourishment project after Hurricane Matthew changed project conditions in Flagler Beach in 2016. Building on these inadequacies, with a little help from Amartya Sen, I then identified an alternative procedure and approach to SD, namely social choice, capable of overcoming the informational constraints native to both economic and political choice. This shift also established the rational basis for the prioritization of both those persons with the highest degree of capability deprivation *and* conservation of the natural environment in collective decision making for SD. But in establishing this superior alternative choice procedure, it also became obvious that this approach would not implement itself. And because formal political processes and reliance on market rationality would not provide the justification for social choice, the mechanism capable of realizing it in practice will have to come from somewhere else.

PART THREE:

Pathway to Social Change

Chapter 7

Government, Economy, Civil Society

Snöflingor är ett av naturens bräckligaste ting,
men se bara vad de kan göra när de håller ihop.
- Okänd¹⁹⁷

¹⁹⁷ “Snowflakes are one of nature’s most fragile things, but just see what they can do when they stick together”- Unknown (Author’s translation)

7.1 Achieving Social Choice

The previous chapter established the necessity of moving to a social choice procedure grounded in the perspective freedom; that is, SD as the progressive removal of unfreedoms within and between generations. From this, the following chapter has two primary purposes: 1) it gives the case study of critical erosion in Flagler conceptual closure, and points towards the kinds of future actions which would need to be undertaken if the social choice alternative were to be realized in practice; 2) it also works to push social choice scholarship further by identifying a mechanism for the realization of social choice, pointing in particular to the role of civil society in pressuring state and market actors to make the necessary social-institutional adjustments. While recognizing their immensely important contributions, Amartya Sen and his collaborators have thus far neglected to provide a theoretical (let alone institutional) basis for the operationalization of social choice; this chapter provides a modest contribution towards establishing such a basis. The theoretical perspective presented here, however, departs significantly from the intellectual tradition within which Sen has developed his work.¹⁹⁸

The operationalization of social choice in coastal management would depend on the presence of three basic requirements, namely 1) the production of an adequate evaluative framework; 2) adhering of participating individuals and agencies to appropriate norms of behavior and reasoning; 3) the installation of supporting institutions (see [333]; also see [303], p. 249). The first of these, an adequate evaluative framework, was established in Section 6.2 as being predicated on the expansion of informational considerations beyond income or voting to the plurality of values held by those involved, and the subsequent weighting of the resulting pool of considerations through a process of public deliberation. This latter aspect further requires that individuals engage in evaluative processes as agents with the capacity to be interpersonally reasonable¹⁹⁹ rather than patients narrowly interested in having their individual needs met.²⁰⁰ Finally, ensuring the capacity for citizens to

¹⁹⁸ The theoretical foundations for the operationalization of social choice are more elaborately developed in a forthcoming paper by Faran, O’Byrne and Boda entitled “Sustainability and Sen’s Social Choice – An appreciation and appropriation” being presented at the 2nd International Conference in Contemporary Social Sciences at the University of Crete, Rethymno, June, 2018.

¹⁹⁹ Sen makes the distinction between rationality (reasoning with one’s self) and reasonableness (reasoning with others) ([405], p. 197; originally cited in [406]), arguing that the latter is a more compatible reasoning mode with a social choice approach to making collective decisions, in particular the idea that “a reasonable action is one that can be sustained in the light of the need to provide *impartial* reasoning” ([406], p. 9).

²⁰⁰ The bedrock of Sen’s approach to social choice is his theory of ethics (rather than the idea of participation itself), in particular the ability of participants to present “ethically objective” arguments to be considered by other participating individuals in the evaluative process. Sen in particular emphasizes the centrality of “rational non-rejectability” of reasons offered up in social

participate in such a deliberative process, as well as ensuring the legitimacy of and adherence to decision outcomes (including the prioritization of both the least-well-off in terms of capabilities *and* environmental conservation), requires the production and maintenance of supporting institutions. This would involve, for example, changing incentive and other regulatory structures which impede the practice of social choice, such as the institutionalized requirement to prioritize CBA metrics in many public coastal management projects.

The evaluation of the various solution strategies considered in Part II above, and the resulting organization of these competing strategies from worst to best in terms of their theoretical and practical adequacy for addressing the Flagler erosion problem (see Chapter 8 below), has at the same time demonstrated a shift in the mechanism capable of bringing about the variety of competing possible strategies. Relying on the market mechanism through economic choice, for example, while providing the justification for seawalls and re-nourishment, was shown to be informationally limited in a way that would never, indeed could never, provide the justification for the adoption of the kind of freedom-based social choice shown to be a promising alternative in Section 6.2. Relying on government legislative action through the traditional political choice process, too, was limited to the individually focused logic of majority-rule, which also showed itself to be in need of the broadening of considerations that social choice provides. In other words, the limitations of government and the market to solve the complex problem of critical erosion in Flagler Beach seem to have been reached, and thus cannot be relied on, at least not under existing conditions, to provide the mechanisms capable of realizing the adoption of freedom-based social choice in practice.

Both economic and political choice has failed to address the residual contradictions in the Flagler case above. The next logical place to look for the capacity to resolve these contradictions is civil society, as it is a source of political agency capable of exerting pressure on government and market institutions (usually getting to the latter through the former) outside of the normalized courses of

choice exercises, meaning the arguments offered in a social choice exercise should be accepted as reasonable by other participants, even if those persons disagree with the point of the initial argument (see [404], Chapter 9). However, as we (Faran, O'Byrne and Boda) argue in a forthcoming paper entitled "Sustainability and Sen's Social Choice – An appreciation and appropriation", in Sen's case the possibility of such ethical objectivity and thus the criteria of rational non-rejectability in social choice exercises relies in no small part on the acceptance of liberal *market optimism*, an assumption which obviously does not hold for all rational individuals (not least among those within the socialist tradition). In place of Sen's ethical objectivity, we suggest that Gramsci's concept of Hegemony can offer an alternative way of understanding and addressing the plurality of values in public decision making, where the agreement reached in the process, e.g. via broad participation of those affected by such decision, can only be regarded as one set of values gaining the hegemonic position over a rival set of values. And this, in turn, would rest on the pressure of a social movement, the essential condition for any hegemonic struggle.

individual action. This means that, through engaging in collective action, civil society organizations promote, often successfully, their shared interests even if these interests are, for example, deemed undesirable from the perspective of economic growth, or are practically impossible to fulfill through the established means of political reform. An example from Flagler Beach can help to demonstrate the difference between the mechanism of social change realized through civil society groups and those mechanisms stemming from formal government institutions or the market.

Civil society and collective action: The rise and fall of Save Flagler's Beach

While many agencies have been involved in the decades long debate over coastal management in Flagler Beach, one local organization, named Save Flagler's Beach (SFB), stood out in particular as perhaps the sole civil society group to be intimately involved in the environmental conflict over the years. SFB, a group the town mayor described as a "very, very, very vocal group of just local citizens" (FBM, Interview 1), was founded around 2004. Over the course of nearly ten years, SFB sustained an extended campaign of vocal opposition to a variety of proposed erosion control strategies in Flagler Beach and Flagler County. The central claim made by SFB participants was that the strategies being proposed would not be effective. A marginal technology trademarked as an "Undercurrent Stabilizer" by Holmberg Technologies, Inc.²⁰¹, they insisted, would lead to the most effective restoration of the dunes and vegetation, thus providing the desired environmental, recreational and economic benefits (see e.g. [407]). The group explicitly directed their opposition, for example, at the seawall extension proposed by the FDOT and the re-nourishment project proposed by the USACE [408].

In a personal communication (FBR, Interview 9), one of the founding members of SFB explained how the group's lobbying efforts were coordinated primarily by two local residents, who then had around a dozen active volunteers engaged in outreach and other activities within the community. She also described the various techniques used by the group to promote their interests, what social movements scholar Charles Tilly [409] might call the "repertoire of contention", which involved maintaining a website²⁰², attending and speaking at public meetings, visiting and holding speeches at churches and women's clubs and petition drafting and submission. All of these activities focused on promoting the Holmberg system

²⁰¹ See <http://www.erosion.com>

²⁰² The Save Flagler's Beach group disbanded in 2013 after the rejection of the Holmberg proposal (see [410]), and as a result the group stopped funding and maintaining the website saveflaglersbeach.com, which is no longer active.

while vilifying other proposed projects. The SFB group also provided informational packages promoting the Holmberg system to decision makers, which reportedly included not only local elected officials, but the office of Florida Governor Rick Scott specifically (FBR, Interview 9).

Early on, SFB sought to increase its credibility through the incorporation of a diversity of local residents as group supporters and participants, recruiting for example members from local churches and women's groups, as well as gaining the trust and support of several local elected officials. One Flagler Beach commissioner self-reported having "become very familiar with Holmberg's technology" and having spent "copious hours with the Save Flagler's Beach group" (FBCC, Interview 2). SFB often had a prominent presence at public meetings and project workshops, where SFB volunteers and other supporters of the Holmberg system publically questioned the desirability of USACE and FDOT involvement while further promoting the Holmberg technology [411]. SFB members were also very active in the online comment sections of local news reports related to beach management in general and the Holmberg system in particular.

The persistence of SFB demonstrated a strong commitment to its cause, with group members fiercely contesting any criticism brought against the Holmberg system and continuing to push for adoption of the technology even in the face of strong resistance by USACE, FDOT, Flagler County and local officials. One county official (FCPZD, Interview 4) referred to SFB as "folks with very strong opinions, who effectively became the vocal minority", recalling them as "the ones who get the time in front of the elected officials, and then have that almost exclusive audience". Similarly, a Flagler County engineer, when asked about SFB's presence at public meetings, told me that "there are some who just so strongly supported Holmberg and that sort of system and it's all they could talk about, it's all they could think about" (FCE, Interview 8).

After nearly 10 years, the persistence of the SFB group led the Flagler Beach City Commission to request and obtain from the Flagler County TDC a grant of \$50,000 for a preliminary study to assess the feasibility of employing a project by Holmberg Technologies, Inc. [412] The proposal was, nevertheless, eventually rejected unanimously by the Flagler Beach City Commission in March, 2013 [413], as they considered the resulting study to be insufficient in a variety of ways (see [357, 410, 414]).²⁰³ Among other problems, the secretive patented technology had

²⁰³ One city official, for example, called Holmberg's product "snake oil", sarcastically telling me in an interview that "[Holmberg] had a cure for everything" (FBPWD, Interview 3). Not all officials were so critical, however. For example one Flagler County official explained his reluctance to support the Holmberg technology this way: "I can't say that the Holmberg stuff alone was flawed, I think that our perspective was just that it wasn't tested enough. And that even in his defense of the science that the examples they provided were few and not local. And the idea that we had with it was it had merit if it... had been vetted through other agencies." (FCPZD, Interview 4).

been heavily criticized by both academics and government agencies that accused company representatives of making misleading claims and pointed to evidence that the technology has been ineffective in trial installations elsewhere (see [356]). After nearly ten years of lobbying efforts by SFB, the Holmberg alternative was officially taken off the table. The failure of the SFB group's efforts, however, may have had important repercussions beyond the group itself. In particular, some have suggested it may have reduced the possibility for similar kinds of civil society contestation in the future, at least at the local level. For example, a Flagler County official told me that after the rejection of the Holmberg proposal its advocates "felt that, well, we made the attempt and now this is what we have for this 10 year effort... really nothing to show for it" (FCPZD, Interview 4). And indeed empirical studies of civil society organizations suggest that the failure of these kinds of campaigns can "both use up the available resources and reduce the willingness of individual members to commit themselves to the collective effort" in the future ([415], p. 24).

In the local context of Flagler Beach, SFB demonstrated the potential for mobilization of residents and resources, over an extended period of time, in pursuit of an alternative introduced through collective social pressure rather than resulting from formal economic or political choice procedures. However, clearly the group's effectiveness was quite limited, amounting in the final analysis to what one Flagler County official (FCE, Interview 8) called "noise", only a "temporary divergence" from the normal course of decision making. The three major problems that seemed to affect the efficacy and legitimacy of SFB mirror more general challenges to progressive collective action throughout the state and country. First, while SFB was loud and proud, they were and remained a "vocal minority"; in fact, a majority of Flagler Beach citizens lacked awareness and had seldom if ever engaged in public discussion of the erosion issue.²⁰⁴ The second problem is related to the fact that SFB tended to target local authorities (city and county) who lack the kind of decision making power necessary to permit such a project, while higher level authorities remained unaffected in their categorical opposition. Finally, the group was ultimately promoting a scientifically dubious technology rather than a strategy based on or supported by scientific best practice. The resistance of SFB members to such criticism was, however, to a large degree rooted in a distrust of "experts" and politicians who, according to one SFB member (FCR, Interview 9), "lacked the guts" to stand behind a project which "interfered" with the status quo, suggesting instead that "money, power and greed" had won the day.

²⁰⁴ As an example, in the resident survey conducted with the City of Flagler Beach (see Appendix 1), less than 10% of respondents (n=376) said they attended public meetings related to beach management issues often, while 90% said they never (45%) or only sometimes (45%) attend. Similarly, on a list of beach management issues, erosion control strategies and projects were all ranked at the bottom of the list in terms of citizen familiarity.

Barriers to collective civil action for sustainable development

The case of Flagler Beach is just one concrete example of the environmental struggles faced by an increasing number of coastal cities in Florida, most of which are being inadequately addressed or actively getting worse. For example, the IUCN warned in 2017 that the Florida Everglades was not only critically threatened but rapidly deteriorating, labeling it the most critically endangered natural site in the entire United States (see [416]). The challenges facing the Everglades are numerous, ranging from sea level rise to pollution controls to habitat loss, among many others, and the same pressures are at work throughout the Florida peninsula, the United States, and the world more broadly.

Movements in civil society can target or spread to a variety of levels of social organization in the process of making claims for social change, a development which social movements scholar Sidney Tarrow calls “scale shift”, meaning the spreading of a contentious issue and its shifting “to levels of the polity in which new opponents, new potential alliances, and different institutional settings” begin to shape the movements progress (see [417], p. 192-193).²⁰⁵ Indeed, the kinds of institutional changes which would create conditions conducive to practicing social choice in environmental evaluation would need to be implemented at a variety of administrative levels, from federal to state to local. If pressure for change is targeted only at local levels, then higher level prioritization will continue to trump those priorities established at lower levels of organization. Targeting higher levels of organization would require, for instance, the building of coalitions across communities of interest in Flagler County, in Florida and around the U.S. And as we have seen above, when approaching the issue of SD from the perspective of freedom, those people interested in promoting environmental conservation would find their natural allies with those people most in need of removing pressing unfreedoms (whether political, economic or social), as both would be given priority in a social choice evaluative procedure focused on preserving or enhancing freedom within and between generations.

Florida being among the most vulnerable places with the most to lose regarding environmental conservation, the fact that little effective action is being taken in the state is reminiscent of a wider problem in the United States regarding the need for collective civil action for environmental protection. (Let alone the collective promotion of a freedom-based approach to SD). The same kinds of problems which made the SFB efforts in Flagler Beach problematic can be identified at a more general level in American civil society, namely 1) a significant portion of the

²⁰⁵ This has historically been the case for various of social movements. Tarrow notes, for example, how the percentage of international civil society organizations focused on environmental issues has grown from 6% to nearly 20% of the total between the 1950s and 2000s ([417], p. 239, Table 12.1).

American public holds anti-environmental sentiments, or are not convinced that the environment is a significant problem; 2) even those that do think the environment is in trouble tend to prioritize local solutions, which runs counter to established best practice in conservation sciences; 3) there is a crisis of scientific legitimacy, both among the general public²⁰⁶ and in popular circles of academy itself.²⁰⁷ And while these problematic tendencies may be supported by particular world-views or ideological positions, they will often be similarly rooted in the real problems experienced by citizens who are having their interests unsatisfactorily met in one way or another by the prevailing economic and political system, or whose interests may be challenged by institutional or physical changes proposed in the name of environmental conservation. Indeed, it is often the intent of those with political and economic power, when their interests may be threatened, to harness popular frustration to promote a worldview which supports furthering their political and economic interests, for example through the funding of private foundations (see [419]), which can yield significant influence over opinion in civil society.

According to a public opinion survey conducted by the Associated Press-NORC Center for Public Affairs Research and the Yale School of Forestry and Environmental Studies in 2015 [420], nearly 60% of the American adult population is either apathetic about environmental issues or actively “anti-environmentalist” to some degree, meaning they, for example, deny there is an environmental crisis, express no interest in the topic or insist that environmental degradation is not problematic. In Flagler Beach, the majority (62%) of citizens who completed the beach management public opinion survey in 2016 ($n = 369$; see Appendix 1) rated the quality of the local beach environment as “excellent”, while only 3% rated it as below average, suggesting the idea that the city is in environmental crisis is not particularly wide-spread among the public.²⁰⁸ However, the problem is more than one of awareness or education.²⁰⁹ In Flagler Beach, for example, some citizens, rather than being ignorant of environmental issues, have instead expressed their

²⁰⁶ American comedian Jordan Klepper mocked the situation on his show in November 2017, sarcastically saying to his audience “You all know I don’t trust science. I haven’t since my chemistry teacher claimed salt was spelled NaCl. It’s not.”

²⁰⁷ I am here referring to much post-modernist scholarship which, since Nietzsche, has in different ways aimed to undermine of project of modernity and its rational foundations (see [418], especially Chapter IV).

²⁰⁸ It is very well possible that public opinion has shifted somewhat after hurricanes Matthew (2016) and Irma (2017), but the point I am trying to make is hopefully clear.

²⁰⁹ There is no evidence to suggest that simply being knowledgeable about environmental problems leads to pro-environmental behavior (this is well-known in social theory, but for a recent empirical example see [421]). Such a strategy as a model of social change is extremely limited, and indeed many strategies aimed at facilitating effective conservation do not rely on the educated individual, aiming instead at higher levels of social organization to effect widespread change in social environmental behavior [422].

frustration with what they see as excessively restrictive environmental regulations in the city, writing open comments such as:

I am sick and tired of all the turtle Nazis. Flagler Beach is for people also.

And:

Too many rules regarding turtles. They're fine, and besides our beach in comparison to the rest of Florida is relatively nil as in turtle nesting.

The anti-regulatory arguments that follow these anti-environmentalist sentiments are commonly coupled to claims for the need for economic growth or jobs. This may be reflective of the real needs of people who struggle economically under the current system and are reasonably concerned about the impacts of environmental regulation on livelihoods. Some Flagler Beach residents, for example, complained in open comment that "Flagler Beach does not look out for local business" or that they "do not begin to understand the lack of business minded city leaders". In the U.S. more generally, adults ranked the economy as the second highest priority for the nation in a 2017 Pew Research Center survey [423], and economy has remained a top priority for at least the last decade, particularly since the 2007 financial crisis [424].

Such an apathetic or anti-environmental perspective seems to be shared among a sizable portion of the U.S. population. One 2017 Pew Research Center survey [425] of American views on environmental issues found that nearly one-in-four adults think "the country has gone too far in its efforts to protect the environment", with the divide between advocates and opponents increasingly being along political partisan lines. Nearly six-in-ten Republicans and Republican leaners (58%), for example, said in 2016 Pew Research Center survey [426] that environmental laws and regulations cost too many jobs and hurt the economy, a marked increase from 34% in 2007.²¹⁰ Regardless of distribution along party lines, the lack of prioritization of the environmental question is troublingly widespread, with a 2017 Pew Research Center survey [423] indicating about 45% of American adults do not think the environment should be a top priority, and even among those who do think so ranked the environment 11th of 21 issues.²¹¹

²¹⁰ President Donald Trump said during an interview in November 2016 (quoted in [427]):

"Environmental protection, what they do is a disgrace; every week they come out with new regulations". "Who's going to protect the environment?" replied the interviewer. "We'll be fine with the environment," President Trump responded. "We can leave a little bit, but you can't destroy businesses."

²¹¹ The three topics considered top priorities by the largest number of Americans were, from first to last, terrorism, economy and education, while issues like climate change, transportation, drug addiction and family medical leave made up the bottom rungs.

The same position may also be championed by much more powerful political and economic actors set to benefit (e.g. financially) from reduced environmental regulation, and/or are ideologically committed to market fundamentalism. This sentiment has been, for example championed in the 2017 U.S. Republican Party platform. The GOP takes particular aim at what they label “radical environmentalists”, whom they accuse of being outdated and out-of-touch with current environmental problems and blinded to the economic needs of normal Americans. The party platform, for example, claims many environmental advocates are “stuck in the mind-set of the 1970s” and are promoting a conservation agenda “based on shoddy science, scare tactics, and centralized command-and-control regulation... that stifle economic growth and cost thousands of jobs” [428]. Similar examples could be provided from a variety of big-money private foundations.

Even if people do believe the environment is in need of timely protection, commonly held and promoted perspectives regarding the appropriate scale at which to practice environmental protection pose another problem. In particular, the widely held assumption that “localized decision-making is inherently more socially just or ecologically sustainable”, labelled the “local trap” ([429], p. 279), has become increasingly promoted as a sort of common sense on both sides of the political spectrum.²¹² A Flagler Beach resident, for example, expressed this popular opinion in an open comment section of the aforementioned public opinion survey conducted in Flagler Beach in 2016 (see Appendix 1):

If it wasn't for the bureaucracy of government regulations we could repair the dunes ourselves. Locals would know not to use little rocks and paper or seawalls to repair the dunes. Income from meters, tourists, taxes should be used for maintenance. Keep responsibility local and never cede management to county or state.

Such localization of conservation efforts is also the formal position of the current ruling political party in the U.S., the Republican Party, who claim that “the residents of state and local communities know best how to protect the land where they work and live. They practice boots-on-the-ground conservation in their states every day” [428]. The GOP, furthermore, directly connects this “boots-on-the-ground” conservation with the *privatization* of the country’s public environmental assets, asserting that “private ownership has been the best guarantee of

²¹² Jamie Peck, for example, railed against this tendency towards localization on the political Left in a public lecture at the University of York in 2013: “Many actually existing alternatives to neoliberalism are quite local. The left has actually celebrated localism. That seems to me to be a strategic error of a grotesque proportion. To console ourselves with running alternative coffee shops while leaving the Right in control of the financial system is a serious error. So, we shouldn't get into this kind of nostalgia, this localist trap, because the Left's localism, it seems to me, is a symptom of its weakness, not the key to its re-found strength” [430].

conscientious stewardship, while some of the worst instances of degradation have occurred under government control” (ibid).²¹³

However, despite the insistence by many that the more local, the better, and granted that many local environmental stewards do great work and may be very knowledgeable, it is cannon in conservation science that the effective, long-term management of ecological systems requires the protection of large areas of maximum diversity which are well-connected (i.e. minimal fragmentation) and have intact interiors (i.e. minimal edge) [431]. These requirements in turn necessarily involve cross-boundary coordination within and between levels of social organization, and indeed many prominent conservationists have called for just this kind of multi-level collaboration and coordination ranging from the local to the global (see e.g. [432]). But the logic of neoliberalization, which promotes decentralization and competition, is antithetical to these basic conservation principles.²¹⁴ In the absence of effective resistance, the increasing trend of neoliberalization in environmental policy, and its important social corollaries, will pose an increasingly powerful challenge to the kinds of institutional arrangements and regulatory mechanisms capable of fulfilling these scientific principles of conservation best practice. Adding to this challenge, this tendency towards localization can have detrimental implications for the longevity and coordination of collective action within civil society, what Tarrow ([417] p. 131-132) discusses under the rubric of the “tyranny of decentralization”.²¹⁵

Perhaps most troubling, trust in the ability of scientific knowledge to contribute objectively to the solving of social and environmental problems itself faces an uphill battle. A 2016 Pew Research Center survey [433], for example, found that more American adults believe scientific findings are influenced by the desire for scientists to advance their personal careers (36%) compared to those who believe findings are based on the best available scientific evidence (32%), though there are strong differences in opinion along partisan lines. The same survey showed that, regardless of political affiliation, more than 20% of American adults have little to no confidence that scientists act in the best interest of the public. Such a “legitimacy crisis” of science, or indeed of the promise of reason and modernity

²¹³ At the same time, the GOP platform acknowledges that the previous decades of environmental regulation have led to substantial environmental improvements: “Our air and waterways are much healthier than they were a few decades ago. As a nation, we have drastically reduced pollution, mainstreamed recycling, educated the public, and avoided ecological degradation”, though this recognition is quickly turned around to suggest that such success poses “a challenge for... environmental extremists, who must reach farther and demand more to sustain the illusion of an environmental crisis.”

²¹⁴ For an elaboration of this argument in the specific context of Florida, see [132].

²¹⁵ “While encouraging the autonomy of the base and exhilarating activists with a sense of participation, [decentralized movements] permit – and indeed encourage – a lack of coordination and continuity” ([417], p. 131).

more broadly, has its deeper foundations in what Faran and O'Byrne label "epistemological cynicism", meaning a skeptical view on, or outright denial of, the possibility for objective scientific knowledge, based in what critics see as "the failure of reason to deliver the promise of modernity and indeed, in some formulations, its complicity in the disasters of modern times, from colonialism, to genocide and environmental destruction" ([434], p. 3).²¹⁶

Because such scientific skepticism, and indeed the challenges of anti-environmentalism and localism too, are not purely ideological but reflective of peoples' real social and economic interests, overcoming these challenges will require more than education, and more than what Habermas called "the unforced force of the better argument" [435]. It will also require the identification of viable and achievable alternatives to the status quo (see e.g. [436]), including the practical demonstration of the usefulness of scientific analysis for civil society movements. And this in turn will require the collective over-coming of those institutional pressures within and outside the academy that work to obscure or restrict the capacity for scientific research to contribute to movements in civil society. This must include in particular those critics of scientific objectivity and truth from within the academy, and those political and economic pressures shaping academic institutions from the outside, forcing them to act more like businesses than centers of education (see [437]). As Faran and O'Byrne put it ([434], Section 6):

We recognize that to be practically useful to social movements in response to crisis, we must at the same time try to fight back the trend of commercialization and defend academic freedom and the independence of universities in the face of the infringement of economic powers, like those acting through private foundations. We are not trying to put the burden on individual [researchers] to sacrifice their livelihood in the name of integrity, rather that the response from academia should also be collective. The resistance in society that we seek to aid will have to be matched and united with a similarly organized resistance within the academy.

****Practicing social choice requires producing an adequate evaluative framework, adhering to appropriate behavioral and reasoning norms and the installation of supporting institutions. Sen and his collaborators, however, have yet to provide a theoretical basis for the operationalization of social choice. In this chapter I have pointed towards such a basis, though one that diverges significantly from the**

²¹⁶ "It would be simplistic", the authors clarify, "to put down the legitimacy crisis of science to epistemological cynicism. The practice of science as a social institution must shoulder its share of the blame", pointing in particular to the tendency of some academics to maintain naïve understanding of the role of scientific knowledge in social change, the tendency for others to collapse all knowledge types into the realm of relativist subjectivity, and more broadly to troubling tendencies towards commercialization of academic institutions and the resulting impacts on research funding allocation and academic freedom (see [434], in particular Sections 4 and 5).

Liberal tradition within which Sen is situated. I have pointed in particular to the role of civil society as the domain with the power to force the adoption of such a decision making strategy. The need to implement social choice at more aggregate levels of social organization will require coalition building between interest groups within civil society, and the capabilities approach to SD provides the foundation for why advocates of environmental conservation have their natural allies in those subaltern social groups which suffer from the most pressing unfreedoms. Such mobilization, however, is likely to be frustrated by anti-environmentalism, localism and skepticism towards science. Faced with such challenges, proving the need for scientific analysis will rely on the demonstrable usefulness of scientific analyses for movements engaged in the struggle for progressive social change, including identifying pathways of reform which head towards achievable alternatives to the undesirable status quo.

Chapter 8

In Place of a Conclusion

8.1 Towards a Research Programme in Sustainability Science

At this point, the formal thesis has come to an end, and the case in Flagler Beach has closed, at least until further actions are taken to address the issue's unresolved contradictions. In this chapter, I will present some more general reflections on the implications this thesis has for the conduct of scientific research itself, in particular how research can be made to be useful for those engaged in the struggle for progressive social change for sustainability. In anticipation, it might be helpful to first recall the journey that brought us to this point. The thesis began with an account of the emergence of the recognition of environmental problems, in particular in Flagler Beach, then proceeded to evaluate and supersede a variety of government and economy based practical strategies which have been proposed as solutions to these problems, finally landing at a procedure for collective decision making for sustainable development predicated on the expansion of human capabilities. The question which remains, however, is regarding the most promising strategy for turning this alternative into practice.

Looking back to the quote from Eugene V. Debs, probably America's most famous socialist, with which I opened this dissertation, his suggestion was that the major problem facing modern society is no longer the capacity to control nature, but the struggle *within society* regarding what matters most and who gets to decide. My hope is that this thesis has established this social struggle as central to the realization of a sustainable development. Furthermore, I have pointed to the necessary alliance between those promoting environmental conservation and those subaltern social groups most in need of removing unfreedoms, whether political, economic or social, as both of these interests would take priority in a freedom-oriented social evaluative process.

This research has been conducted under the relatively new field of Sustainability Science (SS), in which I demonstrate an approach to scientific research which differs significantly from most other existing work conducted under the SS rubric, and sustainability studies more broadly, in terms of its logic and procedure. As such, the thesis is among the first products of an ongoing attempt in collaboration with some of my colleagues²¹⁷ to demarcate the contours of a new research programme²¹⁸ within the still developing field and, by doing so, to contribute to the field's maturation as a science.

²¹⁷ I am here referring in particular to my friends and co-workers Dr. Turaj S. Faran and David O'Byrne.

²¹⁸ I am here and after using the spelling "programme" intentionally to indicate Imre Lakatos' specific use of the term, and to differentiate this sense of the term from a "research program" in a more colloquial sense of a single research plan or project.

SS was initially proposed in the National Research Council's 1999 publication *Our Common Journey: A Transition Towards Sustainability* [438] and was most famously elaborated by Robert Kates and colleagues in their seminal 2001 publication in the journal *Science* [439]. Since then, the emerging research field which led Clark and Dickson ([440], p. 8060) to enthusiastically proclaim in the pages of the *Proceedings of the National Academy of Sciences* that "something different is surely 'in the air,' something that is intellectually exciting, practically compelling, and might as well be called 'sustainability science'" has by now somewhat coalesced by comparison and its defining features are coming into sharper focus. A decade into this new intellectual endeavor, when reflecting on the question "what kind of a science is sustainability science?", Kates ([441], p. 19450) summed up the defining characteristics of the burgeoning field this way: "sustainability science is a different kind of science that is primarily use-inspired... with significant fundamental and applied knowledge components, and commitment to moving such knowledge into societal action". This "problem-driven" and "solution-oriented" character of SS is what led Clark ([442], p. 1737, following Stokes [443]) to place the still developing field in "Pasteur's quadrant" of scientific inquiry to emphasize that it is dually inspired by a quest for fundamental understanding *and* consideration of practical use.²¹⁹

Since its inception, SS has blossomed into a productive (and inescapably somewhat eclectic) field of scientific research, with thousands of peer-reviewed publications from a wide variety of geographic locations and academic disciplines, numerous scientific journals and an increasing number of higher education programs adopting the SS label [444, 445]. While the foundational ambitions of SS are timely and commendable, and the proliferation of research and education under the rubric of SS is impressive and encouraging, it is not clear whether SS can live up to its transformational ambitions or, indeed, whether it yet constitutes, to use Imre Lakatos' terminology, a "mature science" ([446], p. 88).

To be sure, ideas about what SS is or should be about, as evidenced by the many insightful contributions provided by various individual scholars based at different academic institutions around the world.²²⁰ However, notwithstanding a number of useful surveys and reviews (e.g. [441, 444, 447, 450, 451]), it is unclear to what degree (or even if) these different contributions actually represent different "schools of thought", so to speak, regarding how SS should be conducted and why.

²¹⁹ The other quadrants outlined in this typology include Bohr's quadrant (high quest for fundamental understanding, low consideration of use); Edison's quadrant (high consideration of use, low quest for fundamental understanding); and common man (neither consideration of use nor quest for fundamental understanding).

²²⁰ Perhaps the most well-known examples come from the University of Tokyo (e.g. [447]) in Japan, Arizona State University (e.g. [448]) and Harvard University (e.g. [440]) in the U.S.A., and Lund University (e.g. [449]) in Sweden, among others.

In other words, whether they represent the seeds of emerging competing research programmes within a maturing SS, or whether the field remains an eclectic, though astute, collection of disconnected contributions.

Research Programmes and Scientific Progress

In his *The methodology of scientific research programmes*, Lakatos sets forth a theory of scientific development which, building on both the advances made by, and limitations of, the falsificationism of Karl Popper and the “mass psychology” of Thomas Kuhn’s scientific revolutions, sees science *in toto* as developing through a constellation of what he calls progressive or degenerative *research programmes*.²²¹ Mature science, according to Lakatos, “consists of research programmes in which not only novel facts but, in an important sense, also novel auxiliary theories, are anticipated”, with the “requirement of continuous growth” ([446], p. 88) determining whether a scientific research programme is progressive (growing through its anticipation of novel facts and theories) or degenerative (stagnant and primarily producing *post hoc* explanations of unanticipated anomalies). Perhaps the most well-known examples of research programmes are found in physics (which Lakatos himself draws heavily upon²²²), such as the research programme around Newton’s gravitational theory which Lakatos ([446], p. 48) considered “possibly the most successful research programme ever”.

A Lakatosian research programme consists of three fundamental components. First is an “irrefutable” hard core of “central hypotheses” which form the research programme’s unquestionable canon.²²³ Rather than being articulated from the start, however, this hard core is to be developed over time by those scientists engaged in advancing the particular research programme: “The actual hard core of a programme does not actually emerge fully armed like Athene from the head of Zeus. It develops slowly, by a long preliminary process of trial and error” ([446], p.

²²¹ As we note in a forthcoming paper I co-authored with Turaj Faran entitled “Paradigm Found? – Immanent critique as a strategy in sustainability studies” being presented at the Association of American Geographer’s conference in New Orleans, LA, April 2018., Lakatos himself uses the term “Research Programme” instead of the term “Paradigm” to take distance from Thomas Kuhn’s usage of the term and his idea of paradigm shift which Lakatos saw as “a mystical conversion which is not and cannot be governed by rules of reason” ([446], p.9). In view of the currency the term *paradigm* enjoys in universities today, and the semantic ambivalence the term ‘Research Programme’ is susceptible to, we thought it necessary to clarify the distinction between these terms. While I here continue with the Lakatosian terminology of research programmes, in our forthcoming paper we use the term Paradigm, but in doing so we follow those who use the term Paradigm in the (non-mystical and rational) sense of Lakatos’s Research Programme.

²²² Lakatos utilizes in particular the examples of the research programmes advanced by Prout and Bohr (see [446], sections 3c1 and 3c2).

²²³ “This ‘core’ is ‘irrefutable’ by the methodological decision of its proponents...” ([446], p. 48).

48, footnote 4). An example would be the three laws of mechanics and the law of gravitation which constitute the “hard core” of the Newtonian physics research programme ([446], p. 4).

The second component of Lakatos’ conception of a research programme involves a “refutable” protective belt of “auxiliary hypotheses” which are constructed to shield and defend the programme’s hard core. This protective belt is refined over time as scientists working within the research programme aim to advance hypotheses anticipating yet unobserved facts or for purposes of absorbing observed but unexplained anomalies. The idea here is that, if for example an observation is made which contradicts the hard core of a research programme, an additional supporting theory is advanced which “saves” the hard core by introducing potential intervening factors which would explain the anomaly in terms of the programme’s hard core.²²⁴

The third component involves a set of heuristics. Such heuristics function as “methodological rules: some tell us which paths of research to avoid (negative heuristic), and others what paths to pursue (positive heuristic)” ([446], p. 47). As Lakatos explains ([446], p. 48), the negative heuristic directs scientific inquiry *away* from the research programme’s hard core:

All scientific research programmes may be characterized by their ‘hard core’. The negative heuristic of the programme forbids us to direct the *modus tollens* at this ‘hard core’. Instead, we must use our ingenuity to articulate or even invent ‘auxiliary hypotheses’, which form a *protective belt* around the hard core, and we must redirect the *modus tollens* to these...

This latter component, the production of a “protective belt”, is the role played by a research programme’s positive heuristic, which amounts to “a partially articulated set of suggestions or hints on how to change, develop the ‘refutable variants’ of the research programme, how to modify, sophisticate, the ‘refutable’ protective belt” ([446], p. 50)

Such heuristics are essential to a research programme, as they keep the scientist from “becoming confused by the ocean of anomalies” ([446], p. 50) which can come either from outside via competing research programmes or from within as the programme uncovers yet-unincorporated empirical or theoretical incongruities.²²⁵

²²⁴ Lakatos (see [446], p. 16-17) offers an imaginary but clear example of how, in the face of a problematic anomaly, a scientist might advance auxiliary hypotheses to protect the hard core of a research program.

²²⁵ As Ian Hacking ([452], p. 116-117) has noted, “The positive heuristic is an agenda determining which problems are to be worked on. Lakatos imagines a healthy research programme positively wallowing in a sea of anomalies, but being none the less exuberant. According to him Kuhn’s vision of normal science makes it almost a chance affair which anomalies are made the object of puzzle-solving activity. Lakatos says on the contrary that there is a ranking of problems. A few are systematically chosen for research. This choice generates a ‘protective belt’ around the theory, for

Beyond absorbing anomalies, mature science, Lakatos ([446], p. 88) tells us, “unlike pedestrian trial-and-error- has *'heuristic power'*”. Heuristic power is characterized by “the power of a research programme to anticipate theoretical novel facts in its growth” ([446], p. 69, text and footnote 2), that is, “the power of a programme to generate excess empirical content, excess explanatory power” ([453], p. 50). By the force of its heuristic power, a mature research programme should be “consistently content-increasing”, which means that “each step in [the research programme’s] development must lead to predictions of some new facts (consistently progressive theoretical shift) [while] now and then some of these new predictions must be corroborated (intermittently progressive empirical shifts)” ([453], p. 49-50).

Importantly, research programmes do not exist in isolation, but are instead competing with rival programmes. This raises the issue of knowing when one research program has “won out” over another. Lakatos puts forward objective criteria for the supersession of research programmes and particular theories by way of comparing their respective degrees of explanatory power: “such an objective reason”, Lakatos ([446], p. 69) tells us, “is provided by a rival research programme which explains the previous success of its rival and supersedes it by a further display of *heuristic power'*”.²²⁶ Similar criteria, adapted from those set out by Lakatos, have been proposed by Bhaskar for rationally choosing between rival theories ([454], p. 6-7).²²⁷

one attends only to a set of problems ordained in advance. Other seeming refutations are simply ignored. Lakatos uses this to explain, why, *pace* Popper, verification seems so important in science. People choose a few problems to work on, and feel vindicated by a solution; refutation, on the other hand, may be of no interest.”

²²⁶ Lakatos offers this “classical example”: “The classical example of a successful research programme is Newton's gravitational theory... When it was first produced, it was submerged in an ocean of 'anomalies' (or, if you wish, 'counterexamples'), and opposed by the observational theories supporting these anomalies. But Newtonians turned, with brilliant tenacity and ingenuity, one counterinstance after another into corroborating instances, primarily by overthrowing the original observational theories in the light of which this 'contrary evidence' was established. In the process they themselves produced new counter-examples which they again resolved. They 'turned each new difficulty into a new victory of their programme'. In Newton's programme the negative heuristic bids us to divert the *modus tollens* from Newton's three laws of dynamics and his law of gravitation. This 'core' is 'irrefutable' by the methodological decision of its proponents: anomalies must lead to changes only in the 'protective' belt of auxiliary, 'observational' hypotheses and initial conditions” ([446], p. 48).

²²⁷ When rationally choosing between competing theories, it is important to remember, as Isaksen ([454], p.7) reminds us, that explanations should be thought of as “comparatively better or worse, meaning that they are on a continuum, not absolute.”

Sustainability Science Research and the Logic of Immanent Critique

The progressive development of science is a factor of competing research programmes. Are there competing research programmes in SS? (In other words, is SS a *mature* science?) If so, what characterizes the different “hard cores” of the competing programmes? Their respective “protective belts”? And what constitutes their primary “heuristics”? Given the relative novelty of the SS endeavor (scarcely two decades in the making), as well as its justified preoccupation with acute sustainability challenges such as climate change, it is perhaps unsurprising that the field has yet to reach a status of maturity comparable to other, much older sciences such as physics or sociology.²²⁸ However, any effort to demarcate a research programme within the developing field can help in the process of maturing SS as an intellectual endeavor and, indeed, is essential if it is ever to mature at all.

One way to judge this is by examining how various approaches to SS research deal with two constitutive dimensions of the SS field, namely the *problem-driven* and *solution-oriented* dimensions, as discussed above. These two dimensions require that research in the field adequately provide for two particular and unique characteristics, 1) interdisciplinarity (i.e. explaining what *is*) and, 2) normativity (i.e. arguing what *ought to be*). Indeed, the initial contours of the research programme I and my colleagues want to promote can be sketched out primarily in terms of the strategy adopted for addressing these two fundamental dimensions.

Why interdisciplinarity? SS is, as Clark ([442], p. 1737) put it, “a field defined by the problem it addresses rather than the discipline it employs”²²⁹, and the kinds of problems SS seeks to solve are overwhelmingly problems of human-environment interaction and SD [455]. Following, as I do, a critical realist philosophy of science, then phenomena in the “real-world” in which the problems SS seeks to address are situated are characterized by multi-causality, or what Roy

²²⁸ Indeed, Lakatos is quite explicit about the need for patience in developing research programs: “As opposed to Popper the methodology of scientific research programmes does not offer instant rationality. One must treat budding programmes leniently: programmes may take decades before they get off the ground and become empirically progressive” ([446], p. 6).

²²⁹ As a matter of course, SS has to draw on a wide variety of different disciplines in researching the real-world problems it is interested in solving. Within each discipline there are of course differences, such as competing paradigms, which force choices upon the researcher in any concrete research process. Because of this, the only real option is for a researcher to select a paradigm and apply it in a way that is internally consistent and compatible with other components of the research. No researcher can be an expert in everything, so we *must* rely on authorities in the field. In a field like SS, in my view, the point should be to use concepts and theories consistently in relation to their home disciplines, not to get bogged down in justifying the disciplines themselves. This applies, for example, to my use of Lakatos, but also to the use of other disciplines as well, for example ecology. Beyond the use of inadequate theory (e.g. insisting on being an old-school “Lamarckian” in biology), interdisciplinary researchers cannot be held to fully account for all of the intricacies and problems native to disciplinary paradigms.

Bhaskar termed *multi-mechanismicity*, as well as *emergence*, both being ontological features of the world which *necessitate* interdisciplinarity ([334], see also [230]). While interdisciplinarity is ubiquitously acknowledged to be fundamental to SS research, the major question which remains unanswered is: How can we include a multiplicity of disciplines in SS research in a non-arbitrary way? In other words, by what *scientific procedure* are various disciplinary contributions to be incorporated into the SS research process?

Why normativity (or, if you prefer, *ethics*)? It is instructive to recall Kates' ([441], p. 19450) insistence that the SS field's "real test of success will be in implementing its knowledge to meet the great environment and development challenges of this century". The intention to contribute to social change for sustainability invokes questions both about what the *ends* or *goals* which SS should contribute to are, as well as what practical *means* are adequate and desirable for achieving those goals. While many prominent SS researchers and educators insist that issues of normativity are central to the field's mandate (e.g. [456, 457]), the major question which remains is: *is it possible* to scientifically incorporate normativity in SS research? And, if so, *how*?

My colleagues and I are suggesting that a promising answer to these important, unresolved questions in SS is an approach to scientific inquiry known as *immanent critique*. Roy Bhaskar ([334], p. 21) defined immanent critique as a mode of critical analysis premised on "taking a system of thought on in its own terms [and] showing how it involves various internal contradictions and aporiai". Taking a system of thought "on its own terms" means that, rather than imposing external criteria on a given way of thinking as means to judge it, immanent critique advances understanding by demonstrating the conceptual *limits* of a given system in terms of its own logical structure and assumed content. As Buchwalter ([458], p. 254) has put it, immanent critique:

exposes the way reality conflicts not with some "transcendent" concept of rationality but with its own avowed norms... [it offers] an objective or "scientific" approach to critical theory, one in which reality is challenged not with arbitrary constructions but with norms whose acknowledged validity is part and parcel of reality itself.

The immanent approach to criticism is grounded in the logic of dialectic²³⁰ with its "emphasis on higher-order comments about previous ideas" ([319], 11b). Or, as Solomon ([460], p. 23) has put it, dialectic involves:

²³⁰ I think that Findlay's explanation of dialectic is perhaps the best I have come across thus far. For Findlay ([459], page 219f; quoted in [319], p. 11b-12b), what one does in dialectic is "... first to operate at a given level of thought, to accept its basic assumptions, and to go to the limit in its terms, and then to proceed to stand outside of it, to become conscious of it, to become clear as to what it really has achieved, and how far these achievements do or do not square with its actual professions. In dialectic one sees what can be said about a certain thought-position that one cannot

the process of discovering the limitations of various [conceptualizations], in part through the recognition of their contradictions – both internal and external – and thereby coming to see more adequate forms of [conceptualization] that resolve these tensions.

Immanent critique can contribute to SS in two fundamental ways. First, it provides a productive and scientific method for conducting interdisciplinary research that provides a logical procedure for progressive disciplinary inclusion.²³¹ Practically speaking, the procedure can be stylized something like this. To start, the contribution to be extracted from a single discipline in terms of conceptualization of a given problem is advanced until exhausted (i.e. to its conceptual limits) and nothing new can be said about the problem from within the single discipline, say political science.²³² At this point, the movement to another discipline can be demonstrated to be conceptually necessary in order to adequately understand the problem or to absorb yet unaccounted for components of the phenomenon, say by incorporating insights from ecology. Such ecological insight may be relevant to the problem context, but lies beyond the purview of political science concepts. In this way, research incorporates disciplinary contributions as part of a *process* of progressive conceptual development of the objective phenomenon under study, rather than disciplinary inclusion being arbitrarily chosen by the researcher (for example, based solely on personal interest).

In this thesis, the immanent approach to interdisciplinarity is reflected in the structure of the thesis itself.²³³ While many interdisciplinary theses contain “background” sections on an areas physical geography and ecology which tend to function primarily as a backdrop for the other, often largely disconnected components of the work, this thesis incorporates physical geography and the life sciences only when the understanding of the erosion problem in Flagler Beach could not be further advanced unless the specific bio-geographical context was clarified and incorporated into the developing conceptualization. As a result of following this procedure, contributions from individual disciplines do not appear in

actually say in it. And the sort of comment made in dialectic is not a comment on the correctness or truth of what is said in a certain manner or in terms of certain concepts, but a comment on the adequacy or logical satisfactoriness of the conceptual approaches or instruments one has been employing. In dialectic one criticizes one’s mode of conceiving things, rather than the actual matter of fact that one has conceived.”

²³¹ The issue of interdisciplinarity in sustainability research is elaborated in more substantial detail in a forthcoming paper co-authored by Dr. Turaj Faran and myself entitled “Paradigm Found? – Immanent critique as a strategy in sustainability studies” to be presented at the Association of American Geographer’s conference in New Orleans, LA, April, 2018.

²³² It is crucial to remember that the idea of a discipline being unable to sustain an explanation must be understood in relation to a concrete problem from which explanatory limitations can be established and anomalies beyond the purview of a particular discipline identified.

²³³ Similarly, this dialectical incorporation of contributions from various disciplines and data sources is largely reflected in the ordering of the thesis’s cited references.

the thesis until conceptually necessary; for example, disciplinary contributions from ecology are not incorporated until Chapter 4, rather than appearing as a component of a context-setting background section as is often the norm.

In addition to interdisciplinarity, immanent critique provides a means for addressing the issue of *normativity* in science.²³⁴ The founding document of SS, *Our Common Journey*, takes the Weberian²³⁵ (and thus Kantian, see [462]; also see [463], Chapter 3) position on the normative question of what society *ought* to do, placing it firmly outside the boundaries of science, stating: “Of course, which goals *should* be pursued [in SS] is a normative question, not a scientific one” ([438], p. 2). This generally dominant position views social science as ethically neutral in two ways: “first, in that its propositions are logically independent of, and cannot be derived from, any value position; second, in that value positions are logically independent of, and cannot be derived from, any social scientific proposition” ([464], p. 59). Instead, the ends to which SS is directed are said to be those goals that “have been defined through recent extensive and iterative processes of international political debate and action, and sanctioned at intergovernmental conferences over the last several decades” ([438], p. 2). But relying on the vagaries of politics to set the ultimate goals of SS research is problematic and lacks assurance that the politically agreed upon goals will be sufficient to solve pressing social and environmental problems. (One could ask: if generally anti-environmental, climate-skeptical positions were reflected in the outcomes of these intergovernmental conferences, should SS be equally enthusiastic in contributing to their fulfilment?)²³⁶

Overcoming the limitations of value relativism means that SS needs an objective, that is, *scientific*, procedure by which one can infer an “ought” from an “is”, as the saying goes. By employing immanent critique for this purpose, I resort to what can be considered a Hegelian understanding of ethics. Hegel criticized the

²³⁴ The issue of normativity and sustainability research is elaborated in more substantial detail in a forthcoming paper co-authored by Dr. Turaj Faran and myself entitled “Paradigm Found? – Immanent critique as a strategy in sustainability studies” to be presented at the Association of American Geographer’s conference in New Orleans, LA, April, 2018.

²³⁵ Weber ([461], p. 140-141) firmly insists on the “impossibility of ‘scientifically’ pleading for practical and interested stands--except in discussing the means for a firmly given and presupposed end”, stating “it is one thing to state facts, to determine mathematical or logical relations or the internal structure of cultural values, while it is another thing to answer questions of the value of culture and its individual contents and the question of how one should act in the cultural community and in political associations. These are quite heterogeneous problems. If [a teacher] asks further why he should not deal with both types of problems in the lecture-room, the answer is: because the prophet and the demagogue do not belong on the academic platform.”

²³⁶ Perhaps the most sophisticated solution to the problem of ethics and objectivity in the Kantian paradigm came from the scientific value relativism of Gunnar Myrdal (see [465]). Turaj Faran and I cover this issue in more detail in our forthcoming paper “Paradigm Found? – Immanent critique as a strategy in sustainability studies” to be presented at the Association of American Geographer’s conference in New Orleans, LA, April, 2018.

Kantian application of *external* ethical criteria to human morality, arguing that such arbitrary moral injunction lacks the ability to demonstrate the *necessity* of a moral agent to carry out such moral obligations (see [466]), or indeed their ability to live up to such ethical criteria at all.²³⁷

In contrast, the position I advance in this thesis starts not from an abstract, ahistorical ideal of what would be the right thing to do in general, such as some model of “good governance” or the like, but with the ideas and practices that already exist in the concrete context; that is, how society has *actually* attempted to solve the problem historically. By building on the reasonableness in reality²³⁸, and demonstrating the limits of current ways of thinking and acting, immanent critique provides a way to scientifically identify the need for particular kinds of change if a concrete situation is to overcome its own current limitations. Grounding scientific analysis in this rational existence provides, in my view, the proper underpinning for a science of sustainability interested in connecting scientific knowledge production to the practical resolution of actually existing problems, which Sustainability Science aspires to be.²³⁹

In this way, immanent critique offers a method by which what goals *should* be pursued to address a given problem, rather than adhering to an externally imposed and thus subjective normativity, can be *objectively*²⁴⁰ set by demonstrating the steps needed to transcend the failures or inabilities of what already exists to fulfil its own implicit “success” criteria or self-created needs. This requires the clarification of a given idea or concept, and the positioning of that concept in the wider social context to which it is directly native and relevant.²⁴¹ As MacIntyre

²³⁷ As Richard Winfield has noted [467] Hegel showed that “Kantian ethics is such that the way it conceives what is normative, or what is right in conduct, is such that it can’t be realized. That it is only something that ought to be... that it can’t possibly be actualized. And an ethics that conceives of what is normative, of what ought to be, in such a way that it is only an ought to be, is fundamentally flawed.”

²³⁸ “The task of philosophy is to understand *that which is*, since what which is is the reasonable” ([468], p. 327)

²³⁹ Hegel, in his lecture *On the History of Philosophy*, expressed the point I want to make this way: “This is the function of our own and of every age: to grasp the knowledge which is already existing, to make it our own, and in so doing to develop it still further and to raise it to a higher level. In thus appropriating it to ourselves we make it into something different from what it was before. On the presupposition of an already existing intellectual world which is transformed in our appropriation of it, depends the fact that philosophy can only arise in connection with previous philosophy, from which of necessity it has arisen” ([469], p. 212).

²⁴⁰ I think Förster ([463], p. 308) had a clear way of capturing the objectivity of immanent critique when he explained how it “requires that we abstract from all of our *own* thoughts and opinions and focus on nothing but the internal dynamics of the [idea] under consideration”.

²⁴¹ “Hegel will criticize that point of view that regards ethics as being a discipline which in a sense has something to teach institutions; that is, it is concerned with providing us with an “ought to be” that is distinct from what “is”. And he regards there being something inherently faulty as regarding ethics [that attempt to] prescribe something that is completely detached from what we find given,

([470], p. 203) explains, a non-arbitrary and objectively self-determinate approach to ethics requires that claims to normative necessity be grounded in a concrete historical context in which the ways of thinking and acting being criticized actually emerged:

... if we wish to understand any concept or explain any belief, we must first locate it in the system of which it is a part; this system will manifest itself both in a characteristic mode of life and in characteristic forms of theorizing... in so doing, the more conscious the agent becomes of the form of life in which he is involved as a whole, as a form of life, the more he will acquire goods which lie outside and beyond that form of life, the achieving of which demand that it be transcended.

The process of moving from one conceptualization, with its identified limitations and residual tensions, to a better one is driven by the force of conceptual necessity. It is this necessity of solving conceptual tensions which drives forward the scientific process of progressive conceptual development – and this necessity itself is the *heuristic power* of immanent critique. However, because the idea of being logically “necessary” is easily interpreted as implying inevitability, invoking a sort of determinism which is not intended, I want to clarify that, following Solomon ([460], p. 206), “‘necessity’ means quite simply, ‘the way one gets from there to here’”²⁴².

The differing ways of theorizing and corresponding forms of practice which provide the raw material through which immanent critique can operate, and thus by which conceptually necessary relations established, are those forms which actually emerge historically. The actual *chronological* emergence of these forms does not, however, unavoidably or perfectly follow these logically necessary relationships.²⁴³

and thereby puts ethics in a position of... imposing designs upon the present, without regard for the character of the present” [467]. For a slightly different but related argument, see [92].

²⁴² Robert C. Solomon ([460], p. 206) offers the most lucid explanation of what is meant by the Hegelian concept of “necessity” that I have come across: “... we can see perfectly intelligibly (unless one tries to make a logic deduction out of it) that a plant must produce blossoms before it produced fruits, that the first is a necessary stage to the second, and that the second is a necessary result of the first. Does this mean that there could be no fruits without blossoms? Of course not; one could imagine a scientist developing a plant that springs fruit without flowers, and one can always entertain the customary vision of God’s creation of the vegetable kingdom in which at least one apple seems to have been created *de nihilo*, without the usual botanical preliminaries. Does this mean that a blossom necessarily turns into a fruit, as a matter of logic? Of course not, again; blossoms fail to be fertilized; they are destroyed by wind or chemicals; they are picked for springtime lovers, thus frustrating their “natural necessity.” But we can talk about a necessary progression, nonetheless”.

²⁴³ Regarding Hegel’s understanding of history, MacIntyre ([470], p. 201) reminds us that: “Hegel pictures developed society in terms of a succession of forms of life, each of which, by a natural transition, is transformed into its successor. [However], there is no suggestion – there is, indeed, a denial – that actual historical periods must rigorously follow out this pattern. Rather, the suggestion

Furthermore, while a change can be said to be conceptually necessary if it resolves the contradictions in the previous way of thinking or acting, this in no way implies that the necessary (theoretical or practical) change is *bound* to happen, but simply that such a move is necessary for the rational resolution of the contradictions internal to the previous way of thinking and acting. The possibility of wrong-headedness and digression of course exists (remember that Flagler Beach officials were forced to accept an inferior erosion control project once the USACE retracted their support for re-nourishment), but this does not preclude us from talking about necessary moves between progressively better conceptualizations.

A variety of ideas organized according to their internally necessary relations, when conceptualized as a process and not simply a collection of refutations²⁴⁴, can be likened to, in Findlay's ([468], p. 68) mind at least, "those photographs in which several successive ballet-positions are projected on the same film", with each individual idea, some which must logically precede others, forming a necessary stage in a larger process of the conceptual and practical realization of the truth of the matter. In the thesis presented above, the progressive conceptual development of the erosion problem in Flagler Beach begins with the emergent recognition of human-induced environmental problems as problems of individual misbehavior, which led to the attempt to solve these problems through governance mechanisms such as public policy. Once the governance approach was shown to be theoretically and practically limited in the case context, the environmental problem in the city was then sublated to a structural problem of SD by way of the state transportation department. I then proceeded to assess and supersede weak, strong and critical varieties of SD, ultimately finding serious limitations in these approaches regarding their practical achievability and the extent of their theoretical coverage. This latter issue in particular exposes major constraints with the economic approach to SD regarding the breadth of information that it is possible to incorporate into collective decision making processes. In overcoming these practical and informational limitations, I laid out a reasonably superior alternative decision making strategy for SD, the operationalization of which enlisted civil society as the mechanism for necessary social change.

is that insofar as they do follow out this pattern, their history exhibits the logic of these Hegelian transitions".

²⁴⁴ "[C]onventional opinion... does not comprehend the diversity of philosophical systems as the progressive unfolding of truth, but rather sees in it simple disagreements. The bud disappears in the bursting-forth of the blossom; and one might say that the former is refuted by the latter; similarly, when the fruit appears, the blossom is shown up in its turn as a false manifestation of the plant, and the fruit now emerges as the truth of it instead. These forms are not just distinguished from one another, they also supplant one another as mutually incompatible. Yet at the same time their fluid nature makes them moments of an organic unity in which they not only do not conflict, but in which each is as necessary as the other; and this mutual necessity alone constitutes the life of the whole" ([471], ¶ 2).

Taken together, this movement from one point of theory/practice to another represents the rational, progressive development of an ever truer conceptualization of the critical erosion problem in Flagler Beach, with preceding analytical stages forming the necessary conceptual foundation of those stages which come after.²⁴⁵ This does not, to reiterate, mean that these different forms actually emerged in this precise order chronologically, or that the most progressive conceptualization is *bound* to be realized simply because it is rationally necessary; indeed, neither of these assumptions have historically been the case. Decision making procedures and management strategies are, to borrow Findlay's ([468], p. 328) words, "things that cannot *be*, except in-so-far as they are *made* to be", meaning they are only actualized in *practice*, and, given the established limits of government and the market to bring about this necessary change, the realization of this idea in practice will require strategic, collective political engagement by civil society. And those advocates of environmental conservation set to gain by this shift towards social choice would do well to build coalitions with other subaltern social groups with similar interests in a sustainable future.

****In summary,** immanent critique can play several crucial roles in developing a promising research programme in SS. In particular, the immanent critique approach to interdisciplinarity is related to the production of the hard core of the research programme (i.e. what theories and concepts will eventually form the research canon). The logic of immanent critique, furthermore, provides a positive heuristic for working on the research programme's supporting belt by directing researchers to focus their attention on identifying conceptual limits of current ways of thinking and acting and transforming these limits into necessary, constructive and novel conceptual progress. Finally, the fulfilment of the "consistently content increasing" requirement of a progressive research programme is likewise facilitated by the heuristic capacity of immanent critique, in particular its power to anticipate novel theoretical and empirical content by stipulating necessary adjustments to both theory and practice based on the inherent inadequacies of existing ideas and practices. The outcomes of this approach, which can demonstrate the objective necessity of specific kinds of adjustments to be made in a concrete practical

²⁴⁵ In a more general sense, the comparison and evaluation of competing conceptualizations or disciplinary explanations from a Hegelian perspective would follow similar criteria to those set forth by Lakatos and Bhaskar discussed above. Findlay ([468], p. 352), for example, recalls with approval how Hegel taught us that "while *within* a given mode of speech and conception there may be a standard of absolute truth or falsehood, and a strict application of logical procedures, there is no such standard of truth and falsehood *among* the varying possibilities of speech and thought, and that one can only say that one [mode of speech and thought] is better, or more inclusive or more profoundly adequate than another".

context, can be particularly useful for those practically engaged in the struggle for progressive social change.²⁴⁶

²⁴⁶ In addition to this thesis as an exemplar, forthcoming work with David O’Byrne, Turaj Faran and I will further develop the central aspects of this germinating research programme. This includes 1) a forthcoming paper co-authored by Faran and Boda entitled “Paradigm Found? – Immanent critique as a strategy in sustainability studies” being presented at the Association of American Geographer’s conference in New Orleans, LA, April 2018; 2) a forthcoming paper co-authored by Faran, O’Byrne and Boda entitled “Sustainability and Sen’s Social Choice – An appreciation and appropriation” being presented at the 2nd International Conference in Contemporary Social Sciences at the University of Crete, Rethymno, June, 2018; and 3) a paper co-authored by Faran and O’Byrne entitled “Like poets in times of dearth: The legitimacy crisis of science and social movements” [434]. The reader is encouraged to stay tuned.

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Appendices:

Appendix 1: Supplementary information for the Flagler Beach public survey

The citizen survey was a 13 part questionnaire, with 10 multiple choice and 3 free-answer questions. The survey questions were formulated around the central themes identified in the Flagler Beach- Beach management Plan related to issue prioritization, awareness, participation, communication and responsibility. Multiple choice questions were organized using Likert Scale anchors (e.g. High, Medium, Low). The survey was intended specifically for citizens of Flagler Beach, which was indicated on the survey cover letter. The survey was conducted between January and June 2016 and processed using the online survey provider SurveyMonkey (surveymonkey.com). The survey link was disseminated via social media and the City of Flagler Beach Homepage, resulting in roughly 155 responses. Hard copies of the survey were also mailed to Flagler Beach citizens through a municipal utilities bill insert and then later submitted as online entries once returned by respondents to City Hall, resulting in roughly 240 responses. The multiple choice questions were then processed for basic trends in public opinion. Open comments were also analyzed and thematically organized for further evaluation.

City and Survey Demographics			
	Population	Gender ratio- M / F (>18)	Age distribution (>18)
City of Flagler Beach (data from U.S. Census Bureau, 2016)	Approx. 4500	48% / 52%	7.2% = 20-29 yrs 7.3% = 30-39 yrs 14.1% = 40-49 yrs 23.2% = 50-59 yrs 47.1% = 60+ yrs
Survey Respondents: 4.7% Confidence Interval	397	40% / 60%	1.03% = 20-29 yrs 5.38% = 30-39 yrs 6.15% = 40-49 yrs 22.82% = 50-59 yrs 64.62% = 60+ yrs

Appendix 2: Flagler Beach biodiversity field sampling protocol

The following is the protocol I followed for collecting dune vegetation samples in Flagler Beach.

Description: A point based sampling study of coastal dune vegetation cover and species composition was undertaken as part of ongoing PhD research. Samples were collected in three separate sessions between September 25 and October 3, 2016. The data was collected with permission from the City of Flagler Beach and the Florida Department of Environmental Protection.

Purpose: The purpose of the sampling study is to provide a baseline measurement of current vegetation cover and species composition in a critically eroded area under consideration for beach nourishment in Flagler Beach. The sample data collected can serve as a comparative baseline for future monitoring efforts by the community or responsible agencies. No previous vegetation sampling studies have been undertaken in the area.

Location: The sampling study takes place on the primary fore-dune of the barrier island beach lining the City of Flagler Beach in Flagler County, Florida, U.S.A. The beach has been divided into critically eroded and non-critically eroded portions by the Florida Department of Environmental Protection (FDEP), and much of the existing critically eroded area is lined by a rock revetment and small seawall. The critically eroded area between Range Monuments 80 and 94 (R-monuments; these standard locations were established for survey purposes by the FDEP) in Flagler Beach are under consideration for a beach nourishment project conducted by the US Army Corps of Engineers, which involves a 10foot extension of the existing dune for purposes of hurricane and storm damage reduction.

Design: Three random R-monuments were selected within the project limits (R-80 and R-94) to act as starting locations for initial pilot sampling plots. Using a random number generator (random.org), R-monuments 84, 89 and 94 were assigned plot numbers 3, 2, and 1 respectively. Plot baselines were oriented parallel to the beach and were 66 feet long. The cardinal direction used to orient the plot baseline were 320 degrees NW, in general parallel to the beach. 5 transects were then oriented perpendicular to the baseline at 70 degree NE inside the plot, systematically separated at 13ft intervals. A tape measure was laid along the surface of the vegetation following the transect orientation. Every 0.5 feet a point sample was taken using a plastic rod ca. 0.25 inches in diameter. At each sampling point, the rod was lowered down at a vertical angle and the hit type (either vegetation or bare) was recorded, as well as the species or cover type (e.g. rock, sand, weed-mat). Penetrating the canopy of ground vegetation, rather than intercepting the basal area, was counted as a hit. Transects continued until the dune terminated, indicated either by the absence of vegetation to the MHW line or the terminus of coastal erosion control infrastructure (e.g. the foot of the rock revetment).

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Overseas Highway, 1939 © Ralston Crawford. Oil on canvas.



Chad Stephen Boda, the youngest of four siblings, has long been passionate about issues of environmental conservation and sustainable development. This passion has led him to pursue higher education degrees in geography, environmental studies and sustainability science. Chad was born and raised in Flagler Beach, Florida, U.S.A. He currently resides in Malmö, Sweden.

That Florida is in the midst of an ecological crisis is a perspective increasingly shared by academy, government, private industry and civil society. Ideas about the causes of the state's environmental problems and how best to address them, however, are not so well aligned. While some are prone to emphasize the primacy of economic growth over environmental conservation, others argue that, like love and marriage, you cannot have one without the other. More particularly, Florida's many densely populated barrier islands are experiencing increasingly severe critical erosion, threatening people, property and endangered species habitat. In the face of expanding urban development, rising seas and coastal squeeze, the traditional strategies for managing erosion are looking less and less appropriate and the need for a sustainable coastal development strategy more and more apparent.