PLAYING GAMES: BUILDING CAPACITY FOR COASTAL ADAPTATION THROUGH ROLE-PLAY

By

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To my best friend and kindred spirit, Carson, for his love and encouragement

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GTM NERR	Guana Tolomato Matanzas National Estuarine Research Reserve

Abstract of Thesis Presented to the Graduate School
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This research investigates role-play simulations and their use in coastal adaptation planning. In 2012, local residents from Florida's Matanzas Basin played the Sea Level Rise Adaptation Role-Play Game during workshops held by the University of Florida (UF) and the Guana Tolomato Manatazas National Estuarine Research Reserve (GTM NERR) for the project, *Planning for Sea Level Rise in the Matanzas Basin*. To play, individuals adopted personas and worked together to "buy" strategies forming a community sea level rise adaptation plan.

The game educated participants on sea level rise and adaptation planning, promoted transformative learning about collaboration, and gathered valuable input for planning. Through playing the game, participants realized the importance of negotiation and gained a greater holistic understanding of the complex issue. For planners, the game provided encouragement for adaptation approaches, such as planned relocation, and offered a space to test the waters before moving forward with this sort of planning.

Overall, the game is highly transferable and has already been adapted for use in other planning and education contexts. By challenging participants to coordinate

different perspectives, limited finances, and various strategies under a time constraint, the game mimics challenges faced in real world planning. The shared learning experience created through role-play improves individuals' capacity to engage in the real world planning process and can help further efforts for adaptation planning.

CHAPTER 1
INTRODUCTION

Sea level rise presents coastal communities with an enormous planning challenge. For Florida, the U.S. Army Corps of Engineers' estimates a 9 to 24-inch rise by 2060 (Broward County, 2012). It goes without saying that this kind of change will have an extreme impact on most of Florida's population and urban environments. Despite the impending threat of sea level rise, the progress of preparing coastal communities lags in Florida.

In climate change planning, communication can act either hinder or aid planning initiatives depending on how leaders implement the communication (Hassol, 2008). Engaging the public in sea level rise planning challenges planners in a different way than traditional planning issues given the uncertainty and politically controversial nature of the issue. Nonetheless, it remains important to include as many stakeholders as possible in the planning process, aiming to gain their buy-in because community support can increase the long-term success of a planning initiative (T. Ruppert, personal communication, March 1, 2013).

Complex planning situations, like coastal adaptation planning, need public engagement tools that can improve negotiation and create a mutual understanding among stakeholders. As sea level rise becomes an increasingly pressing issue, the demand for tools to engage the public in adaptation planning will increase. Given the wide range of adaptation options available to planners, decision-makers need public engagement to help identify appropriate adaptation approaches for their communities. Moreover, it is important to introduce stakeholders to the economic realities of planning for an issue of this magnitude because this information enables stakeholders to make

informed planning decisions. Thus, to help facilitate coastal adaptation planning, coastal communities not only need more communication, but also better communication. Role-play offers planners a unique tool to engage in better communication.

Hence, the primary research objective is to evaluate role-play in coastal adaptation planning to answer the question, is role-play a useful public participation tool in coastal adaptation planning? Specifically, I focused on the usefulness of role-play from both the participant and planner's perspectives to answer the questions, does role-play build consensus? Does role-play provide useful input for planning? I hypothesize that role-play is a useful method of engaging the public in coastal adaptation planning. It builds consensus among stakeholders, improves understanding of a complex issue, and provides useful input to the planning process.

To evaluate role-play in coastal adaptation planning, I conducted a before-and-after quasi-experiment with residents of the Matanzas Basin of Florida who played the Sea Level Rise Adaptation Role-Play Game. I initially developed the game for the *Planning for Sea Level Rise in the Matanzas Basin* project, led by Dr. Kathryn Frank from the University of Florida Department of Urban and Regional Planning in conjunction with the Guana Tolomato Matanzas National Estuarine Research Reserve (GTM NERR). Collaboration leader of the project Dr. Dawn Jourdan proposed the idea of designing an interactive game for participants to play during the project's public workshops. Dr. Jourdan suggested that the game incorporate the economic costs associated with sea level rise adaptation as well as the different perspectives of the primary stakeholders in the study area. Based upon Dr. Jourdan's idea, I designed the Sea Level Rise Adaptation Role-Play Game. Recognizing the uniqueness of the game

and the opportunity to study its use in a real world planning process, I embarked on this research project.

As mentioned, I conducted this study in the Matanzas Basin, which covers 100,000 acres of forest and wetlands in St. Johns and Flagler Counties along the northeast coast of Florida. The major cities closest to the Basin are St. Augustine to the north and the City of Palm Coast to the south. A sample of residents living in and adjacent to the Basin participated in the study.

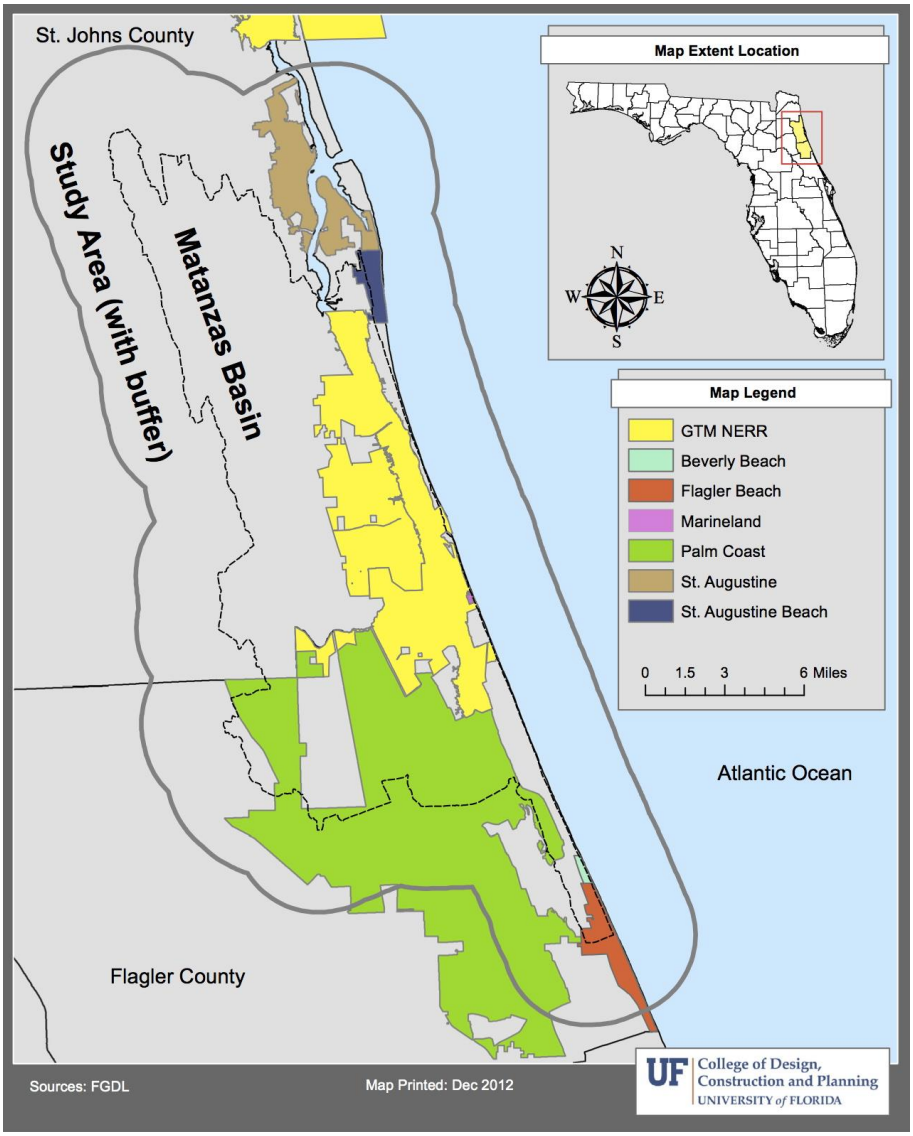


Figure 1-1. Map of study area. (Source: Planningmatanzas.org)

The GTM NERR, a partner of the *Planning Matanzas* project, manages the land within the Basin and aims to maintain the ecological integrity of the area. Approximately 90% of the Basin remains undeveloped, providing a unique opportunity for sea level rise planning. Its relatively undeveloped state makes the Basin suitable for testing an innovative sea level rise planning process, like *Planning Matanzas*, because the area provides a relatively clean slate for future sea level rise adaptation plans. It is important to note that the Matanzas Basin is regarded as one of the most ecologically valuable yet threatened areas in the northeast of Florida (Frank, 2012). Thus, not only is there the opportunity to implement meaningful sea level rise adaptation planning, but there is also the need for special attention to minimize potential conflicts between the vulnerable built and natural environments.

In the sections that follow, I put the Sea Level Rise Adaptation Role-Play Game in context by discussing climate change communication as well as role-play theory. Then I describe my methodological approach to my study, including how I developed the game. Next I present my results and findings. Lastly, I conclude with a discussion of the results and my recommendations for using the game in other contexts.

CHAPTER 2
LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

This chapter provides a background for my research and shows how the literature informed my development of the game, research questions and hypotheses, and research methodology. I briefly review sea level rise planning in Florida and different adaptation strategies for the built and natural environments. Then I discuss theories of effective communication of climate change issues and relate it to sea level rise. I highlight how the Sea Level Rise Adaptation Role-Play Game incorporates researchers' theories for effective climate change communication. Next I examine role-play theory, noting the advantages of role-play. Lastly, I discuss examples of role-play in planning, with particular attention towards role-play in coastal adaptation planning to provide context for the game.

Sea Level Rise Adaptation Planning

Sea level rise planning in coastal communities presents unique challenges to planners and decision-makers. Thomas Ruppert, Coastal Community Outreach Coordinator for Florida Sea Grant, explains that this uniqueness comes from the fact that coastal areas generally have more at stake financially because the coasts are lined with expensive infrastructure (personal communication, March 1, 2013). Additionally, coastal areas are generally subject to more intense weather events than inland areas of the state. In regards to the impacts of sea level rise, several coastal communities such as Cedar Key, Florida are already experiencing saltwater intrusion into their wells during high tides and storm events.

In response to the future sea level rise scenario, communities must begin increasing their resiliency by implementing adaptation strategies. However, adaptation

strategies that may work for one location may not work for another. When examining potential adaptation options, it is important to keep in mind the specific characteristics and qualities of a location from the perspectives of both the built and natural environments.

In sea level rise planning, researchers commonly classify adaptation strategies for the built environments into three main types: protection, accommodation, and retreat. Julie Dennis (n.d.) describes the difference between the adaptation approaches for the built environment in her briefing, “Adaptation Planning in Florida.” Protection strategies employ either hard or soft structures to defend coastal infrastructure from rising waters. An example of a hard protection strategy is a seawall, whereas an example of a soft protection strategy is a living shoreline. In contrast to protection strategies that try to fight the threat of sea level rise, accommodation strategies accept the threat and attempt to coexist by managing the built environment. Elevating homes and roads is a common example of an accommodation strategy. Lastly, there is the approach of retreat which may be the most controversial as it involves physically relocating existing infrastructure and populations out of high-risk areas to less vulnerable locations. Several methods of implementing a retreat over time are possible, including the use of rolling easements and conservation easements.

Additionally, there are adaptation approaches for the natural environment. Two examples, which the Sea Level Rise Adaptation Role-Play Game includes, are ecosystem conservation and water storage easements. These strategies can be used to protect ecosystems and ecosystem services. For the *Planning Matanzas* project, the main objective is to identify conservation areas and future development approaches to

enable habitat and species migration while maintaining ecological characteristics such as water flow and the estuary (K. Frank, personal communication, October 2, 2013). Hence, I included adaptation approaches for the natural environment to correspond with the intent of the *Planning Matanzas* project.

Furthermore, there is a distinction in adaptation planning between adapting present development and future development to sea level rise. Different strategies come with different lifespans. For instance, in the game I assign beach nourishment a lifespan of five years. Beach nourishment is an adaptation strategy for present development, but it would be unwise to rely on beach nourishment to protect future development. On the other hand, planned relocation is an adaptation strategy for future development. This strategy needs to be coupled with strategies to protect present development while a community carries on planned relocation.

Communicating Sea Level Rise

Although introducing communities to problem of sea level rise is important, planners should go a step further and introduce communities to the solutions, or the available adaptation strategies. Moser (2006) believes that showing individuals solutions to problems is key to building civic engagement on an issue (p. 115). We need civic engagement, especially on climate change issues like sea level rise, because adaptation planning demands that communities work towards a common goal (p. 110). Yet communicating climate change issues challenges planners due to the controversial and potentially divisive nature of the subject.

Researchers in climate change communication point to several barriers for effective communication including lack of education, a sense of uncertainty, systemic barriers, and the impact of negative emotions (Leiserowitz et al., 2011; Corner et al.,

2011; Norgaard, 2011; and Score, 2010). Although researchers cite many barriers to climate change communication, there are conflicting views about the extent to which these barriers actually inhibit climate change planning. Moser and Dilling (2007) note in *Creating a Climate for Change* that effective climate change communication should not only lower barriers, but also increase motivation for action. In what follows, I explore some of the communication barriers to climate change planning and investigate elements of effective communication.

To begin with, researchers frequently cite a lack of education as a barrier to climate change planning. Some researchers, like Leiserowitz, Smith, and Marion (2011), believe that a general lack of climate change knowledge among American adults prevents proactive climate change planning. On the other hand, several researchers, including Moser and Dilling (2007), disagree that a lack of education prevents climate change action. Moser and Dilling believe that a better understanding of climate change would not cause people to act any differently because more information alone does not evoke action. Rather, they believe that individuals will settle for obtaining more information about an issue and feel as though they have done their part in addressing the situation (p. 495).

Instead of relying on education, Moser and Dilling urge scientists and leaders to move onto the next step in the climate change conversation. They say that we should stop discussing what is happening and why and start talking about what we can do about it (p. 495-6). The Sea Level Rise Adaptation Role-Play Game takes this proactive approach that Moser and Dilling advocate by using adaptation strategies as the central focus of the game. The game transitions individuals beyond the education phase of

introducing them to sea level rise, and onto the action phase, showing them available solutions or adaptation strategies.

Other frequently cited barriers to climate change communication include a lack of community support and a lack of understanding about community values. These two items can be thought of hand-in-hand, although it is perhaps more difficult to address a lack of community support (Score, 2010). Thomas Ruppert notes from his personal experience that just because a community needs sea level rise planning doesn't mean that they will be receptive to such planning (personal communication, March 1, 2013). Likewise, Norgaard (2011) cites low community support as a major barrier to climate change planning (p. 179). Figuring out how to get people to care and act on the information they receive about climate change has become a driving motivation of climate change researchers.

Although the barriers to communicating climate change may seem daunting, researchers suggest several ways to increase the effectiveness of climate change communication including understanding audiences' values, using simple language, making information place-based, and offering solutions to problems. First, when addressing any audience Moser and Dilling (2007) recommend that communicators gauge the level of existing knowledge, learn about what the audience values, and figure out the audience's concerns (p. 499). Likewise, the American Planning Association (2011) advises researchers and planners to know what the audience cares about and what the audience values. For example, some audiences may be motivated to take action on climate change by the possibility of financial savings (Moser & Dilling, 2007, p. 503). Ruppert emphasizes this point by explaining that if a community values strong

property rights, then coastal planners can incorporate those values into their adaptation approach and highlight benefits to property owners in their policies (personal communication, March 1, 2013). As a planning tool, the Sea Level Rise Adaptation Role-Play Game can be useful to planners in climate change communication because the game extracts participants' values and attitudes towards sea level rise through the role-play process. Planners can translate the information gathered through the game into future adaptation planning policies and communication approaches.

In addition to knowing the audience, using the appropriate language is highly important in communicating climate change. Thomas Ruppert urges planners to keep language simple and nontechnical (personal communication, March 1, 2013). Likewise, Henderson-Sellers (2011) warns researchers against using "climate change jargon." Technical language and jargon can alienate the audience. Hassol (2008) also recommends using simple language, as well as eliminating all words that may be interpreted as uncertainty or ambiguity in any way. In this respect, the game avoids using overly technical language. However, the game capitalizes on the opportunity to introduce participants to technical terms related to sea level rise planning, such as planned relocation, which they will likely encounter in real world discussions about coastal adaptation planning. Thus, the game acts as an educational tool, empowering participants with the language and concepts necessary to join in future coastal adaptation discussions.

Along with using nontechnical language in messaging, researchers commonly note the importance of using place-based information in constructing climate change communication. For instance, Harvey et al. (2012) and Moser and Dilling (2007)

recommend that researchers use local knowledge when constructing their messages (p. 32; p. 500). Specifically, Moser and Dilling (2007) recommend that researchers ask for individuals' personal observations, focus on the benefits of climate change planning, and focus on how climate change will affect places that are important to people (p. 500). Local, place-based information is important in messaging, Norgaard (2011) explains, because showing changes happening in a far away place contributes to the public's apathy and inaction (p. 200). In regards to localizing the issue, I carefully included adaptation strategies specifically applicable to the Matanzas Basin and used images from the Basin as much as possible in the game's materials. As a tool, the game elicits local knowledge input and observations from participants who use this information to rationalize their choices in the game. Observers can record participants' local knowledge from such discussions during the game.

Lastly, it is important to provide communities with the tools they need to take action on climate change rather than just leaving them feeling helpless about the problem. In "Adaptation Behavior on the Front Line of Climate Change and Accelerating SLR in the Florida Keys," Score (2010) reports that respondents in her study specifically expressed interest in a sea level rise adaptation "toolbox," in addition to public education and analyses of local impacts. Desiring adaptation tools makes sense because as Norgaard (2011) explains, "focusing on something one can do" can be an effective way of handling the negative emotions of helplessness that climate change brings (p. 198). Similarly, Moser and Dilling (2007) recommend making communications solution-based, rather than problem-based. They suggest giving individuals ideas for specific actions they can take and, like Norgaard, see this as a way of providing the

public with hope rather than helplessness (p. 507). Again, the game takes an action-based approach by introducing participants to the adaptation strategies available for their community to adapt to sea level rise. Through the process of role-play, the game gives participants an idea of how decisions might be made in the future by balancing various stakeholder interests as well as financial concerns.

Role-Play Theory

To achieve its objectives of education and transformative learning, the game relies on engaging participants through role-play. The technique of role-play arose in social psychology during the 1950s as a way of gathering participants' reactions, emotions, and attitudes towards an experience (Yardley-Matwiejczuk, 1997, p. 2). As Yardley-Matwiejczuk (1997) explains in her book *Role Play: Theory and Practice*, role-play occupies a middle ground between real world observations and laboratory experimentation. Compared to traditional laboratory experiments, role-play enables researchers to attain a better understanding of the complex world where variables have an interdependency that is not easily replicated. Role-play creates a controlled environment where participants can experience a situation as nearly as possible without the situation actually happening (p. 1-3). Using role-play, researchers can create a safe space for participants to make decisions and see the effects (Innes & Booher, 1999b, p. 10). In this way, role-play creates an "experiential learning environment" for researchers to engage participants (Krolikowska et al., 2007, p. 199).

Historical studies demonstrate that active participation, such as through role-playing, generates attitude changes better than passive reception of information about an issue, especially when the issue is of high importance or complexity (Sarup, 1981, p.

191). Commonly, therapists, psychologists, and researchers employ role-play as a technique for dealing with situations that generate intense feelings and strong attitudes because role-play has been shown to improve listening skills and negotiation (Krolikowska et al., 2007, p. 199). As Sarup (1981) explains in “Role Playing, Issue Importance, and Attitude Change,” adopting roles can help individuals create understanding in controversial issues. When an individual adopts a role contrary to their currently held beliefs and attitudes, they must think of arguments from this different perspective and ignore any personal thoughts counter to the position. Interestingly, Sarup finds that participants experience a greater shift in attitudes when forced to play difficult roles, which he refers to as “counter-attitudinal role-playing” (p. 192). Yardley-Matwiejczuk (1997) explains that role-play helps facilitate personal growth because it demands spontaneous thinking, which requires creativity in participants (p. 52).

Like any tool, however, the ability of role-play to instigate personal growth in participants depends on its execution by the researcher or facilitator. For a high quality role-play experience, Yardley-Matwiejczuk (1997) recommends a few elements for successful role-plays including “personalization” of the role-play elements (p. 96). This personalization echoes the sentiments of Moser and Dilling (2007) who recommend relating the issue to the audience specifically. Yardley-Matwiejczuk (1997) also recommends providing participants with a scenario to set the scene for the role-play. Setting the scene creates a better sense of reality for participants (p. 32).

In the Sea Level Rise Adaptation Role-Play Game, I used the stakeholder roles targeted in the *Planning Matanzas* project as the role-play personas. I put the role-play scenario in context within the Matanzas Basin, incorporating appropriate adaptation

strategies for the study area. This personalization should enable participants to better relate to the role-play scenario and have a deeper mental transformation. I incorporated the theory that role-play should facilitate changes in attitudes into my research methodology, using pre and post-surveys to assess individuals' changes in attitudes and preferences.

The Advantage of Role-Play

Role-play has numerous advantages as a public participation tool including the ability to induce attitude changes, bring stakeholders together, develop an understanding of a complex issue, and improve negotiation. Therapists, psychologists, and researchers use role-play because it facilitates changes in attitudes, especially in non-scripted role-plays where participants are assigned a role that is contrary to their personal beliefs (Yardley-Matwiejczuk, 1997, p. 15). Engaging with others on an issue from a different perspective helps participants increase their awareness on an issue (p. 20). This growth occurs because role-play demands engagement on an issue, forcing participants to advance beyond passive thinking (p. 92).

In terms of the planning process, Krolikowska et al. (2007) use role-play to bring stakeholders together and promote lively discussion to work through a difficult issue (p. 208). Through role-play, planners and researchers can introduce stakeholders to different viewpoints. By role-playing a situation, participants become more aware of the problem's complexities because they must deal with its interrelated social, economic, and ecological issues (p. 199). Krolikowska et al. (2007) engage communities with role-play in the hopes that the simulated dialogue transfers to real world community dialogue. It should be noted however, Krolikowska et al. (2007) admit that role-play's

impact in real life conflict resolution remains unclear. In their view, bringing different stakeholders together and promoting lively discussion makes for a successful outcome to their role-plays (p. 208).

In addition to stimulating attitude changes and personal growth, role-play can provide participants with a high quality experience. For instance, Luca and Heal (2006) note in their article, “Is Role-Play an Effective Teaching Approach to Assist Tertiary Students Improve Teamwork Skills,” that role-play as a form of “situated learning” can create a pleasurable and entertaining environment for learning, encouraging participation and enhancing teamwork (p. 474).

For researchers, role-play is a useful tool for public participation. It can forecast outcomes of conflicts, strengthen interpersonal skills, and improve learning of a complex situation (Krolikowska et al., 2007, p. 199). Role-play allows researchers to gather information about a situation that would be very difficult, if not impossible, to observe in the real world (Yardley-Matwiejczuk, 1997, p. 2). This quality makes role-play suitable for sea level rise planning because in the Sea Level Rise Adaptation Role-Play Game we speed up the experience of planning for sea level rise and throw participants into the experience to observe their reactions.

From a user perspective, role-play is a highly flexible tool that individuals can easily adapt without interfering with the results. For instance, Gordon and Schirra (2011) noted that the consensus-building effect of role-play in their Boston Chinatown study was not diminished when players shared roles. Rather, sharing a role forced participants to work together and come to an agreement, improving the overall cooperative environment of the group. In fact, Yardley-Matwiejczuk (1997) asserts that

role-play allows for the “infinite manipulation of time and space,” making it a highly flexible tool (p. 2). This flexibility lends creativity to users of role-play and helps facilitate growth by demanding spontaneous thinking (p. 37).

As Yardley-Matwiejczuk (1997) points out, role-play can be a facilitating, inspiring, and highly rewarding experience for participants but it depends on the facilitator to create this positive experience (p. 3). Like any tool, role-play can have its share of limitations. In terms of research, the effects of role-play can be difficult to assess given the element of personal transformation. Despite the positive outcomes of their research, Gordon and Schirra (2011) point to a lag between an individual’s participation in a role-play exercise and the changes in their rational decision-making. This lag makes the actual impact of role-play difficult to assess in a short timeframe. Innes and Booher (1999b) also point to the difficulty of assessing consensus building or role-play exercises. They note that even though participants find it hard to articulate the benefits of the exercise, they still feel that they benefited in some way (p. 11).

Transformative Learning

Climate change planning is an area where researchers can apply Transformative Learning Theory. In the article, “Transformative Learning and Adaptation to Climate Change in the Canadian Prairie Agro-ecosystem,” Tarnoczi (2010) writes extensively about transformative learning in the context of climate change communication. He notes that a collaborative environment where stakeholders share information and learning better enables learning to take place (p. 387). Similarly, Moser and Dilling (2007) note the importance of going beyond talking at the audience to actively engaging them (p. 501). Tarnoczi believes that this higher level of learning is an important part of “successful adaptation.” Through his study, Tarnoczi finds that interactive or experiential

communication most strongly correlated with the transformative learning experience, leading him to conclude that interactive communication is an important part of adaptation communication (p. 401).

According to Tarnoczi's research, the Sea Level Rise Adaptation Role-Play Game should promote transformative learning by engaging the public through a shared learning experience. Innes and Booher (1999b) view role-play as consensus building and a useful way to deal with an uncertain future (p. 10). This view supports the use of role-play for climate change issues, like sea level rise. Additionally, the researchers find role-play games to be transformative, altering the way participants view a scenario and their actions (p. 10).

In my research, I use the Sea Level Rise Adaptation Role-Play Game as a method of consensus building, which involves the process of transformative learning. As Innes and Booher (1999a) explain in "Consensus Building and Complex Adaptive Systems: A Framework for Evaluating Collaborative Planning," consensus building brings together different interests to work on an issue and hopefully overcome stagnation that arises in complex conflicts by finding mutually beneficial solutions (p. 412). The authors believe that solutions generated through consensus building can be more successful because they incorporate various interests and local knowledge about the issue (p. 414). (See Figure 2-1 below for potential outcomes of consensus building). Furthermore, Innes and Booher assert that consensus building can transfer into the real world with participants working together (p. 415). Hence, the ability to build consensus that impacts real world relationships and decision-making is another potential benefit of role-play.

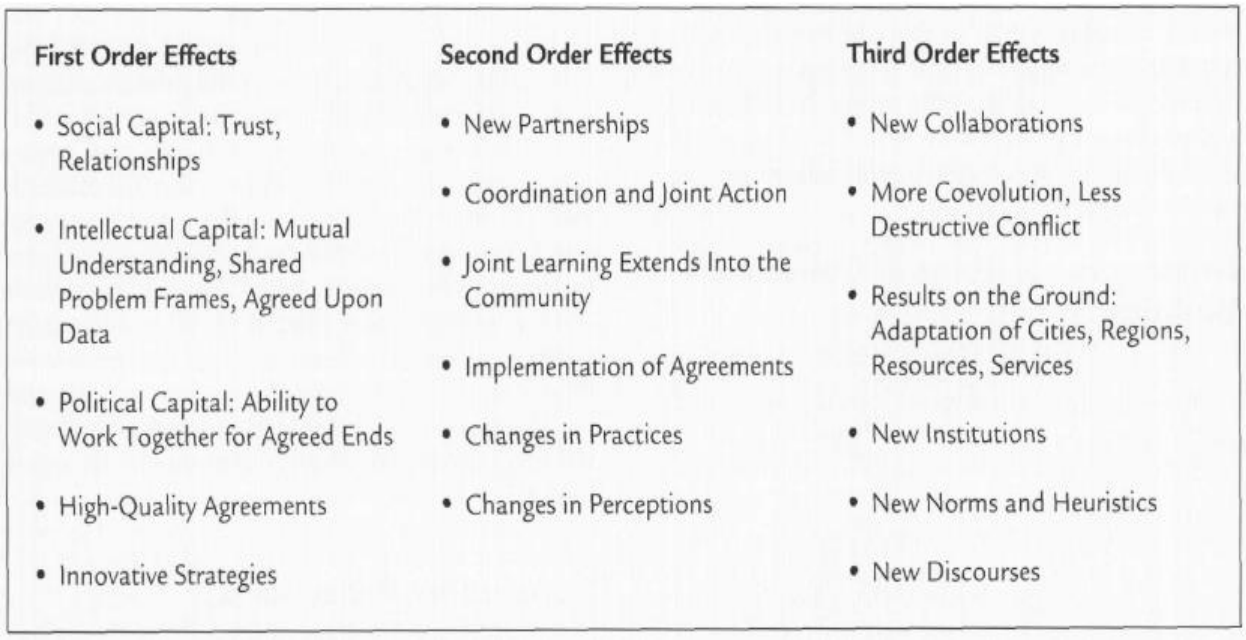


Figure 2-1. Potential outcomes of consensus building. (Source: Innes & Booher, 1999a, p. 419)

Role-Play in Planning

Planners and researchers use role-play as a communication tool for local stakeholders. For instance, Krolikowska et al. (2007) used a role-play simulation to communicate a conflict involving economic development and ecosystem preservation in Poland. They found that role-play created a dialogue about the issue among stakeholders who gained insight into the process of conflict resolution during the role-play exercise. Researchers found based on post-game discussions that their role-play exercise illustrated why issues often stagnate for long periods of time. As participants noted, the real conflict between people and the situation itself was not unsolvable (p. 203). Like the conflict in Poland, sea level rise brings up competing social, economic, and environmental interests. Hence, role-play can be a useful communication tool for illustrating those competing interests.

Although role-play does not seem to be widely employed as a public participation technique for coastal planning, a few examples of role-play games in sea level rise planning efforts exist. First, the New England Climate Adaptation Project (NECAP), a partnership between the Massachusetts Institute of Technology and the NERRS Science Collaborative, focuses on engaging coastal residents in climate change planning by using a role-play simulation. The researchers tailor each game to the individual community they work with. Compared to the Sea Level Rise Adaptation Role-Play Game, the NECAP games do not involve an economic component and are more time-intensive (NECAP, 2013).

Another example of role-play in coastal planning comes from Maryland where the Consensus Building Institute (CBI) brought 170 local leaders together in 2009 to play the Maryland Coastsmart Negotiation Role-Play game (CBI, 2011). In comparison to the Sea Level Rise Adaptation Role-Play Game, the Maryland Coastsmart game contains much more detail. It brings together larger groups of about ten individuals and it is much more information and data-intensive. The goal of the game is to inspire individuals to engage in collaborative problem solving in their communities with the aim of reaching an "informed consensus." The CBI reports that players responded positively to the game and state that it was an important tool for introducing participants to the viewpoints of other stakeholders.

An example of role-play outside of sea level rise planning comes from the U.S. Department of Transportation (DOT), which uses role-play to promote active participation in transportation planning. The DOT (2012) finds, like others, that role-play reduces conflict and tension by helping participants obtain a mutual understanding of an

issue. Additionally, the DOT finds that role-play can help participants build a better appreciation of others' perspectives and facilitate community planning initiatives. Being a useful tool for engaging the public on complex issues makes role-play suitable for public participation in sea level rise planning. The DOT notes, however, that they use role-play exercises as part of more intensive public involvement processes. Likewise, I used the Sea Level Rise Adaptation Role-Play Game as part of a larger public engagement process, *Planning Matanzas*.

In "Playing with Empathy: Digital Role-Playing Games in Public Meetings," Gordon and Schirra (2011) study the effect that role-play can have on residents' participation in community issues and their understanding of the situations. In the study, a group of local residents from Boston's Chinatown played a digital game entitled "Participatory Chinatown" in which they assumed different stakeholder roles and engaged in long term planning of Chinatown. Researchers concluded that role-play can be an effective public participation tool by engaging participants on controversial issues, sparking dialogue and encouraging teamwork.

Furthermore, Torres and Macedo (2000) provide an example of using a role-play game in planning for sustainable development. The researchers used a role-play game to "reduce an abstract concept to its basic components" (p. 119). They created a card game entitled "Learning Sustainable Development" as a way to increase awareness of sustainable development concepts. Like the Sea Level Rise Adaptation Role-Play Game, the researchers wanted to promote attitude changes on an issue to overcome resistance among the public for sustainable development policies (p. 120). The game showed participants the importance of conversation for addressing the issue, as well as

how collaboration and cooperation are essential (p. 125). This example supports the idea that simulation is an effective way to communicate complex issues (p. 120).

Evaluating Public Participation

As with any project or program, it is important that researchers assess the effectiveness to allow for improvements. The objective nature of "effectiveness," however, makes it difficult for researchers to determine a specific, widely accepted evaluation method. After questioning whether more participation in planning necessarily meant better outcomes, Judy Rosener (1978) undertook research in evaluation methods. She conducted a study to determine a method of assessing different types of participation (p. 457). Rosener employed "evaluation research methods" to determine if participation helped accomplish the goals of the program or project that sought public participation (p. 459). After studying the public participation program evaluation for Caltrans in California, Rosener developed a basic framework for evaluating effectiveness.

To start, Rosener points out that the effectiveness of participation depends on the type of actors involved. Different actors, or stakeholders, perceive the participation process and its effectiveness differently. Additionally, it is important to consider the goals and objectives of the participation as part of evaluating its effectiveness (p. 458). In other words, researchers must ask themselves why they are involved in a particular participation process.

Rosener explains how by using evaluation research researchers can determine the effect that public participation efforts have on furthering the goal of a project; specifically, if the public participation helped accomplish the goals of a program or project. To help determine the effectiveness, Rosener notes the importance of

understanding the value of the participation. Researchers should distinguish between participation processes used as an end in themselves from those used as an means to an end or both (p. 459).

In “Consensus Building and Complex Adaptive Systems: A Framework for Evaluating Collaborative Planning,” Innes and Booher (1999a) discuss process criteria and outcome criteria for evaluating consensus building approaches (p. 419). (See Table 2-1 below). This provides a useful reference for the Sea Level Rise Adaptation Role-Play Game since the game is a form of consensus building. Results of consensus building are difficult to quantify because the outcomes often include intangible products, such as mutual understanding of the issue and others’ perspectives (Innes & Booher, 1999a, p. 414-415). Determining if an agreement was reached can provide one way to assess consensus building. As Innes and Booher note, however, if the process achieves its objectives then it can be thought of as successful. In other words, if an agreement was not reached but “participants have learned about the problem, about each other, and about what may be possible,” this can provide a measurement for success (p. 415).

In the case of the Sea Level Rise Adaptation Role-Play Game, participation is a means to an end. The game introduces participants to sea level rise adaptation strategies and attempts to discover their preferences to better understand how local residents see their community adapting to sea level rise in the future. In the end, Rosener believes that participation efforts that help achieve the goals and objectives of the project are the most useful (p. 462).

Evaluations of public participation methods vary. Like Rosener (1978) and Innes and Booher (1999a), Rowe and Frewer (2000) suggest evaluating citizen participation on whether or not it achieves its goals and objectives (p. 10). In this research, I evaluate the Sea Level Rise Adaptation Role-Play Game based on if it achieves its intended impacts on participants as well as its ability to provide input for planners. In the next chapter I discuss my methodology for evaluating the game in detail.

CHAPTER 3
METHODOLOGY

To evaluate role-play in coastal adaptation planning, I conducted a before-and-after quasi-experiment with a retrospective-prospective focus. A before-and-after study design is useful for determining the impact of an intervention, like the Sea Level Rise Adaptation Role-Play Game, and assessing changes in attitudes. Thus, the before-and-after study design allowed the impact of the role-play game on participants to be measured by determining the change in participants' attitudes before and after playing the game.

Residents in and adjacent to the Matanzas Basin comprise the study population. A nonrandom accidental sampling design was used for convenience. Participants were self-selected by choosing to attend the stakeholder workshops held in December 2012 for the *Planning Matanzas* project, where I engaged participants in the game. Conducting this research as part of a larger workshop allowed for direct and easy access to coastal residents.

The Logic Model (Figure 3-1) below illustrates the steps I took to conduct my research, beginning with the first phase, development of the Sea Level Rise Adaptation Role-Play Game. To develop the game, I researched secondary sources to determine the appropriate adaptation strategies for the study area and their approximate economic costs. After I developed the initial game design, I pilot tested the game three times. After each pilot test, I altered the game to enhance its quality based on the pilot test results.

The second phase of the project involved conducting the game with the study population and collecting data. Seventy-four individuals played the game during the *Planning Matanzas* workshops over the course of two days in December 2012. I

collected data through participant observations, group interviews, and pre and post-individual surveys.

The last phase of the project involved data analysis and reporting. I aggregated and analyzed the data collected for each workshop. Then, I graphed and reported the final results in this report, as well as a separate report for the *Planning Matanzas* project. I discuss details about the game's development and administration below.

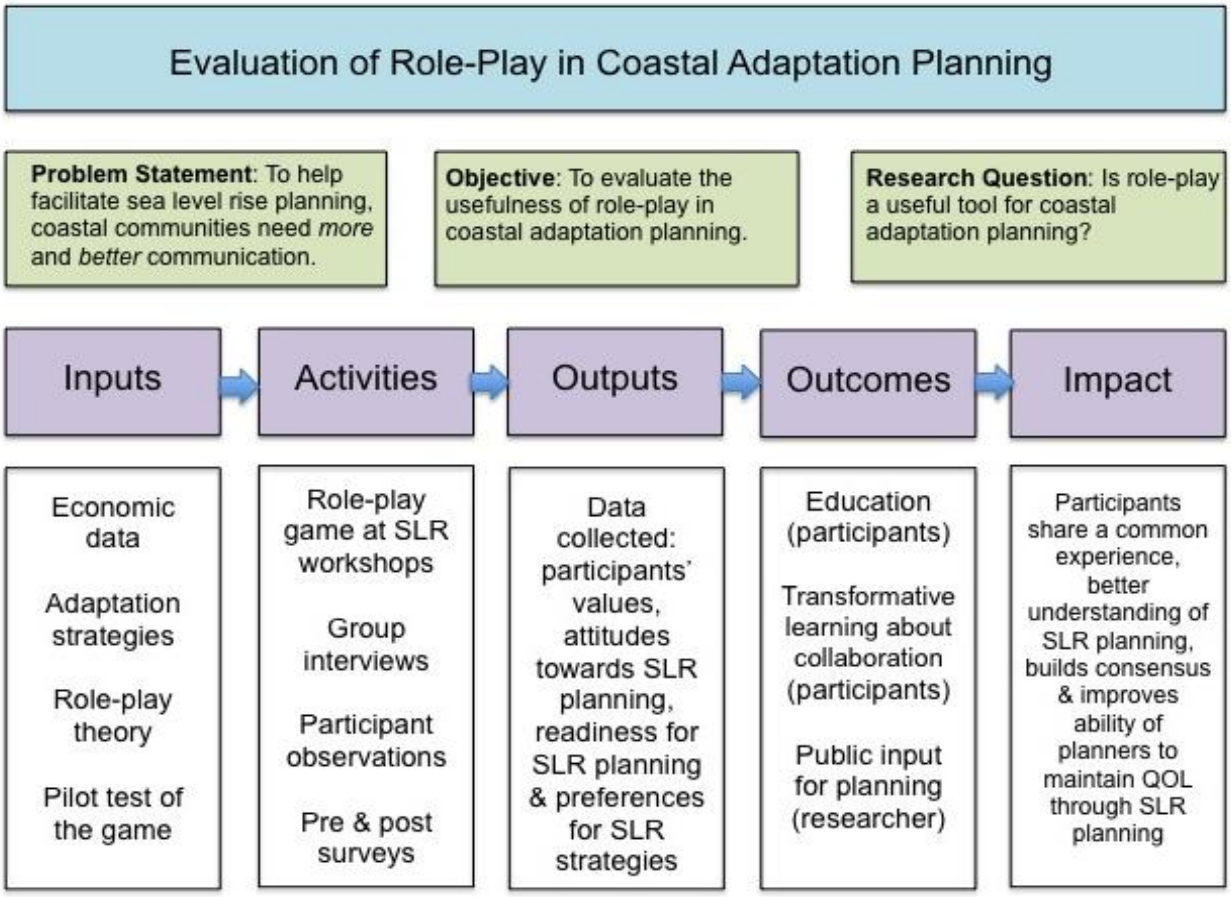


Figure 3-1. Logic model. (Source: Author)

Method of Developing the Game

This research project began with Dr. Dawn Jourdan's inspiration to create an interactive game for the *Planning* Matanzas workshops. Dr. Jourdan suggested that I develop a game that introduced participants to the economic realities of sea level rise

as well as the various roles involved in the planning process. As a research assistant for the *Planning Matanzas* project, I used this guidance to create the Sea Level Rise Adaptation Role-Play Game. Below I describe the different aspects of the game including the roles and adaptation strategies.

Developing the Roles

For the game, I chose five roles closely related to the stakeholder groups identified and targeted in the *Planning Matanzas* project. The roles developed for the game are as follows: government official, local resident, ecotourism business owner, inland developer, and environmental scientist. Each role represents a real world interest group present in the Matanzas Basin with a stake in the Basin's future. In the game, these roles are referred to as "stakeholder personas." The facilitator of the group assigns each person a stakeholder persona.

The only stakeholder persona that does not directly correspond to a stakeholder group targeted by the *Planning Matanzas* project is the environmental scientist. I chose this role to represent the environmental perspective on the issue, such as that of the GTM NERR who manages the ecosystem of the Matanzas Basin. Although the environmental scientist is not an explicit stakeholder group in the *Planning Matanzas* project, I believe it is an important perspective to represent in the game.

Developing the Strategies and Costs

Developing the sea level rise adaptation strategies and corresponding economic costs was one of the most challenging aspects of developing the game. The adaptation strategies chosen needed to be feasible options for the Basin to provide an element of reality in the game. An aspect of reality in the game is especially important because one of the intended outcomes of the game is capturing the participants' preferences for the

different adaptation strategies. The adaptation strategy preferences of the local residents discovered through the game can inform leaders of the sea level rise planning process by helping leaders understand which strategies have the most local support and hence which strategies may be the most successful.

Additionally, the collection of strategies used in the game needed to represent each of the common responses to sea level rise: armoring, adaptation, and relocation for the built environment, plus protection for the natural environment and future development. The array of strategies includes options that prioritize the natural environment, options that prioritize the built environment, and options that can be mutually beneficial to both the natural and built environments. The resulting preferences for one type of strategy over another can help researchers gauge participants' values for either the natural or built environments. Keeping in mind the intentions for the strategies to be feasible and represent a variety of options, the eight strategies chosen for the game are as follows: seawalls, elevating structures, living shoreline, ecosystem conservation, water storage easement, planned relocation, beach nourishment, and habitat migration corridor.

After selecting the set of eight strategies, I determined the economic cost of each strategy as accurately as possible using the available secondary data. Determining the costs was very challenging given the variability in costs based on the location of implementation. I used Climate Tech Wiki: A Clean Technology Platform (2013), found at the website www.climatetechwiki.org, as my main resource for determining the costs of the strategies. Some of the partners providing this up-to-date resource include the United Nations Developing Programme, the United Nations Environment Programme

(UNEP), the UNEP Riscoe Center, and the Energy Research Center of the Netherlands. Climate Tech Wiki provides users with free access to a database of climate change technologies that includes information about the costs of implementation, which I was especially interested in. Once I determined a base cost for the strategy, I adjusted the cost based on an estimated cost of implementation in the Matanzas Basin area. Hence, all of the costs assigned to the adaptation strategies are rough estimates for implementation. For a more detailed description of how I developed the costs for each adaptation strategy, see Appendix E.

Pilot Testing

Through the course of its development, I pilot tested the game three times. Pilot testing was a key part of the game's development because it allowed me to work out technical issues and make important changes to the game based on the participants' experiences and suggestions. I conducted pilot testing with college age students, primarily from Dr. Kathryn Frank's graduate environmental planning courses. The major changes to the game based on the results of the pilot testing include creating a scenario to give players a context for the game, designing visually appealing playing cards, displaying the costs effectively, and providing maps to aid players in their decision-making. For more details about the results and game development through pilot testing, see Appendix F.

Method of Evaluating Role-Play

For this research project, I evaluated the Sea Level Rise Adaptation Role-Play Game based on its impacts on participants and its ability to provide input to planning. (See Figure 3-2). The game's two primary impacts on participants are increasing education about sea level rise planning and promoting transformative learning about

collaboration. The game should educate participants on the functions and costs of sea level rise adaptation strategies. Also, the game should illustrate some of the complexities of the situation and demonstrate the interrelatedness between strategies and personas.

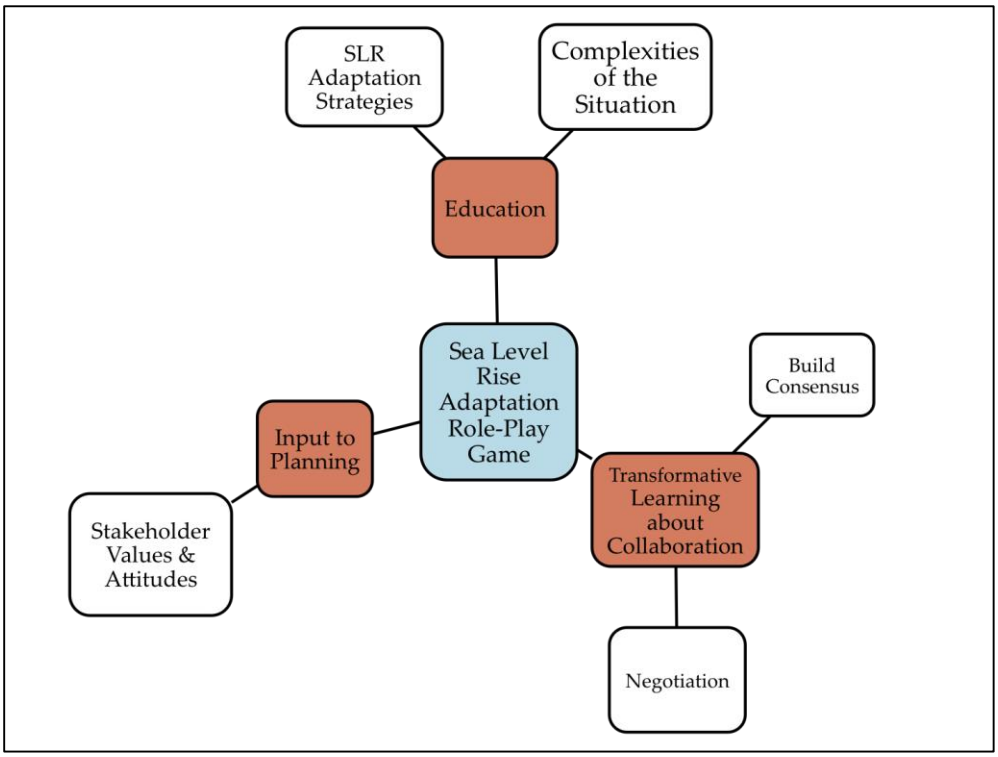


Figure 3-2. Evaluating the Sea Level Rise Adaptation Role-Play Game. (Source: Author)

Another impact on participants should occur through transformative learning about collaboration. Adopting personas and engaging in dialogue about adaptive planning should help build consensus among stakeholders as well as improve their skills for negotiation. Thus, the questions I asked in my group interviews and individual surveys attempted to capture these impacts. I base part of the evaluation of the game on the game's ability to achieve these impacts on participants.

Furthermore, the game should provide useful input to planning. Through the game, we can observe participants' values and attitudes towards the adaptive strategies and sea level rise. The game also provides planners and researchers with an idea for how the participants think about the issue and what kinds of mutually beneficial solutions may be possible. To gather additional information specific to the input the game provides for planning, I conducted interviews with the game facilitators.

To assess the impact of the game on participants' level of education and engagement in transformative learning about collaboration, I used observations, group interviews, and pre and post-surveys. I asked each participant to complete a twelve-question survey before and after playing the game. I used identical questions on both surveys to help me assess the influence of the game on participants' perspectives and values.

The surveys asked a variety of questions. The first two questions are ranking questions asking participants to rank their strategy preferences as well as what they believe to be the strategy preferences of their assigned stakeholder persona. The surveys ask participants to rank all eight strategies, but for the sake of time and ease, participants were told during the game to rank only the top three. After the top three strategy choices, there can be a problem of the remaining rankings becoming arbitrary.

In developing the surveys, I included ranking questions for strategy preferences based on the theory that role-play should influence attitudes. In playing the game, I expected participants' preferences for strategies to change. In particular, I expected the preference for planned relocation to increase because I anticipated the game would demonstrate how this can be a mutually beneficial strategy for multiple stakeholders.

Additionally, I expected the preference for built environment strategies such as seawalls to decrease because the game would demonstrate how these strategies are counterproductive for coastal adaptation and ineffective in the long run.

Next, questions three through eleven use a Likert scale. The survey asked participants to rank the extent to which they agreed with the given statements. The statements related to what the participants expected from the game and how they viewed the issue of sea level rise planning. I chose these questions because I was interested in determining how the game influenced participants' perspectives about sea level rise planning and collaboration. For instance, question eleven states "planning for sea level rise will be a vast undertaking." I expected that after playing the game, participants would more strongly agree with this statement because the game illustrates the complexities of sea level rise planning, such as balancing financial limits and competing interests. I also expected participants to more strongly agree with the statement that "sitting with other stakeholders is important in solving this issue" because I think the game highlights the importance of having different perspectives working on the issue. Furthermore, I included the statement "I think other group members equally understand the importance of the issue" to determine if the game increased mutual understanding of the issue among participants. I expected participants to more strongly agree with this statement after playing the game.

The last question was open-ended, asking participants what percentage of their personal income they would be willing to put aside for sea level rise planning. I included this question with the intent of getting a better understanding for how participants economically valued sea level rise planning. I found, however, that the wording of this

question confused many participants and it received highly varied responses. Thus, I excluded this question from my analysis.

To supplement the surveys, I used group interviews and participant observations collect qualitative data. The game facilitator conducted the group interview by asking six questions to the group and recording their responses. The questions recorded the outcome of the game for each group as well as the group's opinions of their challenges and most meaningful lessons learned.

The game facilitators also recorded participant observations. I provided each facilitator with observer journaling guidance to steer them into looking for similar aspects of the game experience. The guidance asks facilitators to record how easily participants are adopting their personas, the level of negotiation among the group members, the general consensus for environmental values, and the preferred strategies.

Conducting the Game

I conducted the game with participants at the end of the stakeholder workshops for the *Planning Matanzas* project in December 2012. All participants read and signed a release form approved by the University of Florida's Institutional Review Board (IRB), which I include in Appendix A. The first parts of the *Planning Matanzas* workshops introduced participants to sea level rise impacts and strategies. Afterwards, Emily Montgomery, a *Planning Matanzas* researcher, conducted a group visioning exercise asking participants to reflect on which features and services they value most in the Basin, as well as what they believe needs to change in order for effective sea level rise planning to take place. After this exercise, I conducted the Sea Level Rise Adaptation Role-Play Game with the participants.

To play the game, participants sat around a table in groups of five or six, accompanied by a game facilitator. The facilitator assigned each participant a stakeholder persona with a unique amount of money. Participants reviewed the strategy cards and maps in the middle of the table prior to starting the game. (See Appendix C for game materials). After completing the pre-survey, participants took turns explaining the position of their stakeholder persona and identifying the strategies that they believed their persona preferred. After all positions were stated, discussion ensued.

The object of the game was for participants to agree on a set of strategies by compromising and combining their funds to "purchase" the different adaptation options. At the end of thirty minutes, discussion ended and players filled out the post-surveys. As a group, the participants responded to an interview conducted by the facilitator. After all groups were finished, each game facilitator reported the outcome of the game for their group and described their group's ability to reach a consensus.

Participants

Seventy-four participants played the game. The participants were local residents of the Matanzas Basin area from areas including the cities of St. Augustine and Palm Coast, as well as the Flagler beaches. Participants were notified to attend the *Planning Matanzas* workshops through public advertisements and outreach by GTM NERR. To play the game, myself and the other game facilitators divided participants into groups of five or six players.

Game Facilitators

A game facilitator led each group through the game and conducted the data collection for that group. Along with myself, the game facilitators participating in this research were Dr. Kathryn Frank, Caitlin Cerame, and Mia Requesens from the

University of Florida, Dr. Dawn Jourdan from the University of Oklahoma, and Emily Montgomery, Tina Gordon, and Andrea Small from GTM NERR. Using game facilitators was an unplanned aspect of conducting the game. At the first workshop, we discovered that having an individual who was familiar with the game at each table would greatly ease the process of conducting the game and enhance the experience for the participants. Thus, each group had one or two individuals from the *Planning Matanzas* project sitting with them to guide the game process.

Dates and Locations

On December 5th, 2012, *Planning Matanzas* held two workshops at the GTM NERR Marineland Office at 9741 Ocean Shore Boulevard, St. Augustine, FL 32080: one at 9:00 a.m. until 12:00 p.m. and the other at 5:30 p.m. until 8:30 p.m.

On December 6th, 2012, *Planning Matanzas* held two more workshops: one workshop at the St. Augustine Alligator Farm at 999 Anastasia Boulevard, St. Augustine, FL 32080 from 9:00 a.m. until 12:00 p.m. and the other at Flagler College Ringhaver Student Center at 74 King Street, St. Augustine, FL 32084 from 5:30 p.m. until 8:30 p.m.

Data Analysis

After each game, I collected all of the data and stored it by workshop. Below, I provide an overview of my method for data analysis. For details about how I analyzed the group interviews and observations, see Appendix G. For raw output and additional graphs for the individual survey data, see Appendix H.

Group Interviews

The facilitator for each team of players conducted the group interview. To consolidate data from the group interviews, I summarized the responses to each

interview question and arranged them by groups according to workshops. Next, I analyzed the response summaries for similarities and differences. I highlighted similar responses to determine the general response of the participants. I also highlighted unique answers to examine as potentially interesting outcomes of the game.

Observations

As with the group interviews, the group facilitator recorded the participant observations. I summarized these observations and reviewed them for similarities and differences. Highlighting similarities helped distinguish a common theme of players' reactions to the game, while highlighting differences uncovered interesting responses and discoveries players had while playing the game.

Individual Surveys

To begin analysis, I arranged survey data in a spreadsheet. For the first question, which asked participants to rank their most preferred strategies, I assigned weights to the responses. Weighting the responses allowed me to distinguish the most preferred strategies. Next, I compared answers to the pre and post-survey questions using the Paired Samples T-Test and the Wilcoxon Signed-Rank Test in SPSS Statistics 21. For more details, see Appendix H.

Limitations of Study

Overall, the study has a few limitations. For one, the study lacked a control group, which inhibits my ability to conclude with any certainty that the game caused the changes in participants' values and perspectives because there were other unaccounted factors that may have had affected the participants. To help compensate for this limitation, I used a variety of qualitative and quantitative data collection methods: group interviews, observations, and pre and post-surveys. Although each data collection

method has its own limitations, the variety of data collected through this study should enhance the resulting analysis.

Another limitation of the study is the sampling design, which brings bias into the research. Given the voluntary nature of the workshop, people who attended the workshops presumably already held a favorable attitude towards sea level rise planning. This predisposition influenced participants' responses and strategy preferences. Thus, the sample is not accurately representative of the study population, the Matanzas Basin residents. In general, however, recruiting a diverse pool of participants can be problematic in planning because public meetings by nature tend to attract a limited group of people.

Additionally, the costs assigned to the adaptation strategies limit the game's ability to represent the economic realities of sea level rise planning. First of all, the costs of adaptation strategies vary widely. Seawalls are a good example. The price to implement a seawall will depend on location, height, wave action, potential land costs, and much more. It is very difficult to accurately account for all of these factors; hence the costs used in the game are rough estimates for implementation. Furthermore, the economic costs did not take into account inflation. For instance, the cost for seawalls was based on a 2009 price. Another consideration is the way I expressed the costs. It may have been more appropriate to use square feet as a unit cost for living shorelines, for instance, rather than acres.

Lastly, the design of the pre and post-surveys limited my ability to collect more meaningful data. In theory, using pre and post-surveys would be a good way to assess the impact of the game on participants' attitudes. In practice, however, this technique

proved difficult. First, asking twelve questions demanded participants spend a considerable amount of time on the worksheets and its likely that some participants filled out the surveys without spending the necessary time needed to think about their answers more thoroughly. Furthermore, I could have worded some of the questions more clearly. Participants were frequently confused over the first two questions, which asked them to rank their preferred adaptation strategies from their own perspective and then from their assigned persona's perspective.

In general, the pre and post-surveys were limited in their ability to provide the most meaningful data to my research. The questions I asked were mostly unable to get the information that I actually wanted and needed to know from participants to most effectively evaluate the game. Specifically, I wanted better data on the impact of the game on participants' knowledge about adaptation planning, shifts in attitudes about collaboration, and explicit input to planning. To remedy this, I created a revised pre and post-survey and conducted the game again to test how well this new survey gathered good quality data. I discuss this revised survey and second round of game play below in Chapter 4.

Lastly, the unclear wording of the final question necessitated its removal from my data analysis as it received very highly varied responses. It asked participants what they were prepared to set aside for sea level rise planning, but many participants interpreted this from the perspective of their assigned persona and answered the question based on how much money their persona had in the game. For example, several participants responded with 90% or more. It's highly unlikely that an average local resident would put 90% or more of their financial resources towards sea level rise planning in real life.

CHAPTER 4
RESULTS

In total, 74 individuals participated in the Sea Level Rise Adaptation Role-Play Game during the *Planning Matanzas* local resident stakeholder workshops. Facilitators conducted interviews, observations, and surveys in 14 groups. I systematically analyzed the data from the workshops. I present the summarized results below. I also discuss creating a revised pre and post-survey, conducting the game again with this revised survey, and present how well the revised pre and post-surveys performed.

Group Interview Results

After playing the game, the facilitators asked participants six questions and recorded their responses as a group. The first question asked if the group reached a consensus on the strategies they would include in a community adaptation plan. Out of the 14 groups that played the role-play game, seven teams reported that they reached a consensus, while seven teams did not. Hence, there was a 50% rate of consensus in the game. Players reported several challenging aspects of the game that impeded their ability to reach a consensus. The most commonly reported challenge was coordinating the different perspectives, needs, and viewpoints of the various stakeholder personas. Another commonly reported challenge was grasping the financial aspect of the game. Players reported that the economic limitations imposed on them directly affected their ability to reach consensus. In some cases, there was not enough money for players to purchase the combination and quantity of the strategies that they wished. Other common challenges included difficulty in prioritizing strategies, having trouble grasping the entirety of the situation with sea level rise, maintaining stakeholder persona roles, and managing the logistics of the game such as measurements.

After playing the game, players reported learning numerous lessons. One of the most common lessons learned was the importance of considering the perspectives of others and having a diverse representation of stakeholders working to resolve an issue. Likewise, participants highlighted the importance of maintaining an open discussion. Another important realization that players came to was how the adaptation strategies related to each other and interacted together. Several times players noted learning how a strategy can benefit multiple stakeholders in ways that are not initially apparent.

Table 4-1. Common challenges and lessons learned. (Source: Author)

Challenges	Lessons Learned
Coordinating perspectives, needs, and viewpoints.	Importance of others' perspectives and engaging diverse stakeholders on the issue
Limitations from the financial aspect	Importance of having an open discussion
Grasping the entirety of the situation	Relationships between strategies
Prioritizing strategies	Mutually beneficial approaches
Adopting a different perspective	The vastness of the situation makes it difficult to plan for
	Planning for sea level rise is very expensive
	"We need to pay attention to the planning process."

Furthermore, players frequently commented that the vastness of the situation makes sea level rise an exceptionally difficult issue to approach and resolve. The adaptation strategies, players realized, can be tremendously expensive, some times prohibitively so. For many participants, the financial reality of the situation was hard to grasp. Despite its high economic cost in the game, many players showed an interest in planned relocation. For many players, playing the game introduced them to planned

relocation as an adaptation strategy for the first time. While most lessons learned were positive, players from one team noted their feeling of helplessness about sea level rise after concluding the game. They explained feeling helpless because they believe that the developers and government officials will dominate the situation and as local residents they will be subject to the will of those in power.

In regards to the usefulness of the game as a learning tool, participants provided several suggestions for improvement. Almost all participants suggested increasing the time allowed to play the game. Other suggestions were less common but included adding additional strategies, writing the disadvantages of the strategies on the cards, increasing the amount of money provided, adding other personas like a lobbyist, and using easier units to represent the economic costs.

Observation Results

While participants role-played, the facilitators recorded observations about participants' reactions, interactions, and interesting comments. As a whole, facilitators noted that participants responded positively towards the game. Individuals commented that they had fun playing the game and found the exercise very interesting. In terms of playing the game, the facilitators observed that most participants were able to adopt their stakeholder personas and stick to their roles. However, several participants showed difficulty disengaging from their personal careers and experiences. These participants used their personal opinions and backgrounds to choose their strategies and reason with other players. In one case, a group of participants had trouble taking their roles seriously, failing to make much of an effort at all. Nevertheless, facilitators reported that the vast majority of participants demonstrated a high level of engagement in the game and took their persona roles seriously.

During the game, the groups demonstrated a few different approaches to negotiation. Many groups used bartering and tradeoffs between stakeholder personas when forming their strategic plans. Groups commonly engaged in critical debate with impassioned arguments to convince each other about the merits of one strategy over another. In a handful of groups, one player would emerge to lead the group through negotiations. Some groups relied on financial arguments more than others. In one group, for instance, players weighed the options by seeing which strategies they could get the most “bang for their buck.”

One objective of the game from a researcher’s perspective was to discover the participants’ values; specifically, whether natural ecosystems are valued equally as built environments. Protecting the natural environment emerged as a priority in all groups. Facilitators reported that nearly all groups recognized how protecting the ecosystems would be beneficial for the built environment and livelihoods. Despite a general consensus that ecosystems are as valued as built environments, a few groups struggled with prioritizing strategies to protect ecosystems over protecting the built environment. Sometimes a strong consensus on strategies would emerge. In one case, for example, all group members decided that beach nourishment was a waste of money and refrained from using that strategy from the beginning of the game.

Overall, facilitators noted a general consensus among participants that ecosystems are as important as people. In the St. Augustine evening workshop, however, participants raised more concerns about the built environment and protecting historical resources. These groups gravitated towards strategies that protected ecosystems, but held more debate about protecting ecosystems over the city. In

general, facilitators observed that participants showed the most preference towards ecosystem conservation as well as a high interest in planned relocation.

In their observations, facilitators noted interesting comments from participants. In one group, participants discussed the problem with planning for an uncertain future. They pointed out that the appropriate adaptation strategies to implement would depend on the exact level of sea level rise, which remains uncertain at this point. Other players looked beyond the uncertainty, commenting that their generation has a responsibility to future generations. They recognized that the decisions made today will be their legacy.

During the course of the game, facilitators reported that several groups strayed from focusing on the monetary aspect of the game and focused instead on tradeoffs. Although most groups used the provided maps, a handful of groups did not use the maps. However, it seems that neither the omission of the financial aspect nor neglecting to use the maps affected the participants' ability to realize the object of the game since facilitators reported that all participants focused on discussing strategies and engaged in role-play at least on a basic level.

Individual Survey Results

Before playing the game, participants completed a twelve-question survey. They completed the same survey again after playing the game. In total, I collected surveys from 74 participants. The first set of questions on the surveys sought to gauge participants' preferences for the different adaptation strategies. The first question asked participants to rank the strategies in order of preference from a personal perspective, while the second question asked for the ranking from the perspective of the participants' assigned stakeholder persona. I focused on the results for participants' personal preferences for this research. It is important to note, however, that participants were

sometimes confused about whether to answer the questions from their own perspective or from the perspective of their persona. The facilitators did their best to address this confusion, but not consistently and therefore confusion remained. Thus, I interpret my results keeping this potential issue in mind.

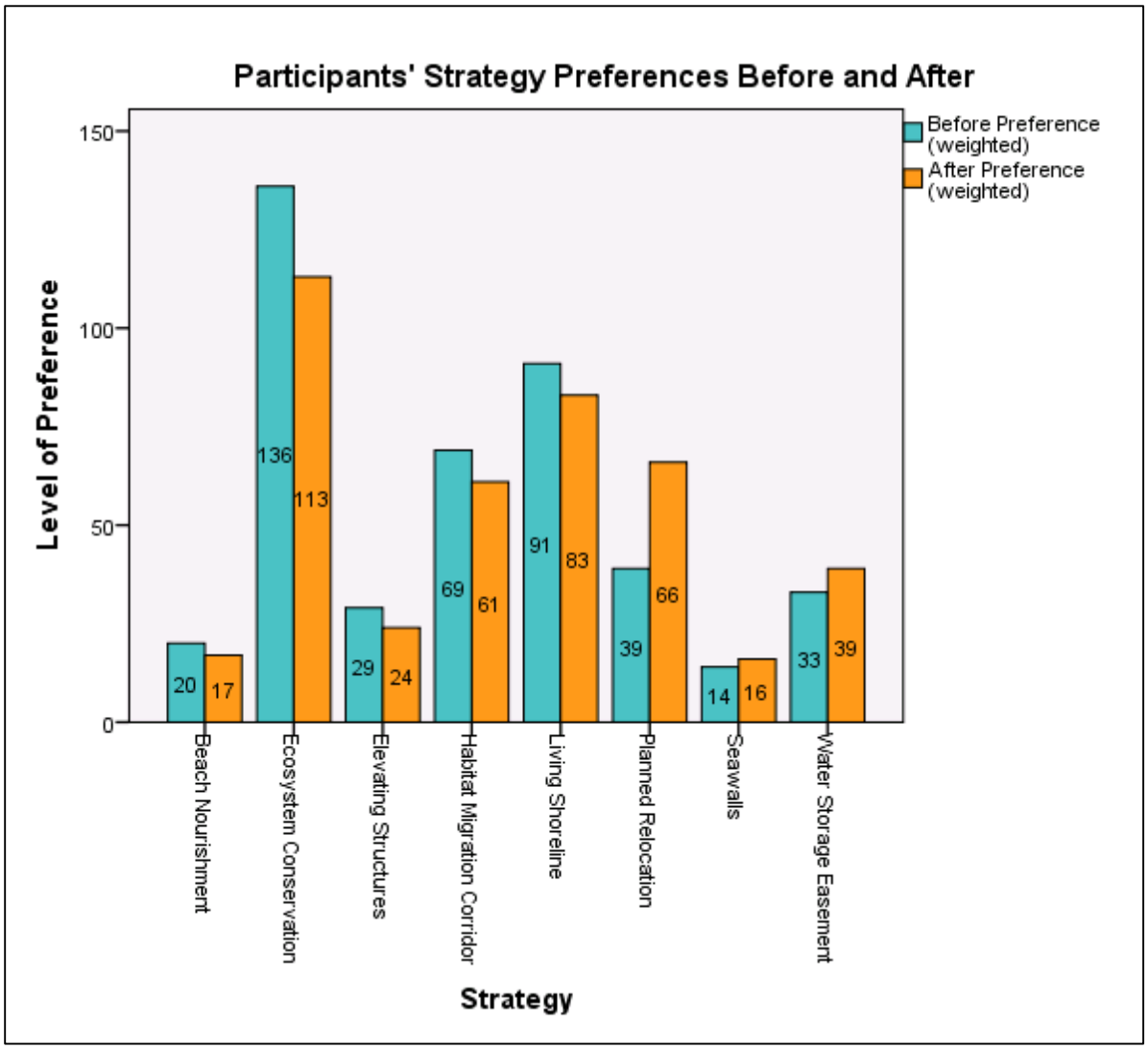


Figure 4-1. Participants' preferences for adaptation strategies. (Source: Author)

Before playing the game, participants ranked ecosystem conservation, living shorelines, and habitat migration corridors as their most preferred adaptation strategies. After playing the game, preferences for a couple of the strategies changed noticeably,

while preferences for the other strategies only fluctuated slightly. As the graph above (Figure 4-1) illustrates, the shifts in preference for the ecosystem conservation and planned relocation strategies were the most dramatic. In fact, planned relocation and ecosystem conservation were the only strategies with a statistically significant change. After playing the game, the overall weighted preference for ecosystem conservation dropped from a score of 136 to 113. On the other hand, planned relocation had an increase in overall weighted preference from 39 to 66. Despite the fluctuations, after playing the game the top-rated strategy remained ecosystem conservation, followed by living shorelines and planned relocation.

I intended for the next set of questions on the surveys to gauge participants' attitudes towards collaboration and sea level rise planning. I used a Likert scale, which started at 1, "do not agree at all," and went to 5, "agree completely." The following table summarizes the results for these Likert scale questions. Although the questions are labeled 1-9 here, these numbers correspond to 3-11 on the original surveys.

Table 4-2. Summary of individual survey questions. (Source: Author)

Question	Mean Before	Mean After	Mean Change (After-Before)	Correlation	Statistically Significant
1. It will be easy to portray my stakeholder persona.	3.36	3.69	0.324	Slight	Yes
2. It will be easy to negotiate with my group members.	2.73	3.01	0.284	Weak or none	No
3. I expect to learn something meaningful from the game.	4.00	3.91	-0.095	Weak or none	No
4. I expect to reach a satisfactory outcome with my group members.	3.14	3.03	-0.108	Weak or none	No
5. I think other group members equally understand the importance of this issue.	3.82	3.80	-0.027	Slight	Yes
6. The amount of money available to my persona is sufficient.	2.57	2.26	-0.311	Moderate	Yes
7. My persona needs more money.	3.46	3.09	-0.365	Moderate	Yes
8. Sitting with other stakeholders is important in solving this issue.	4.41	4.39	-0.014	Slight	Yes
9. Planning for sea level rise will be a vast undertaking.	4.89	4.36	-0.446	Slight	Yes

As Table 4-2 illustrates, several questions resulted in moderate or slight correlations of statistical significance when the pre-survey responses were compared to the post-survey responses. (See Appendix H for more details on data analysis and SPSS output.) Based on the results for statistical significance and level of correlation between the mean before and after responses, I generalized the following outcomes.

Overall, participants found it *easier* to portray their assigned persona than they expected. After playing the game, participants were *less* likely to believe that other group members equally understood the importance of the issue. Additionally, participants *did not* believe that their persona had sufficient money. However, there was a *decrease* in the number of participants who believed that their persona needed more money.

Furthermore, participants were *slightly less* likely to agree that sitting with other stakeholders is important for solving the issue after playing the game. This decrease is a weak correlation, but it is statistically significant. However, mean answers decreased from 4.41 to 4.39. Thus, participants still believed that sitting with stakeholders was very important overall. Additionally, participants believed that planning for sea level rise will be *less* of a vast undertaking than they did before playing the game. Again, mean answers decreased from 4.81 to 4.36. Although the relationship is a slight correlation that is statistically significant, the mean answer of 4.36 indicates that participants still agreed that planning for sea level rise will be a vast undertaking overall.

Summary of Results

Overall, participants engaged with the game and responded positively towards the exercise. Many participants found role-playing to be a fun and interesting experience. It was relatively easy for participants to play the game and portray their

stakeholder personas. Coordinating among the different perspectives and dealing with the financial aspect of the game, however, was challenging. Half of the groups were able to reach a consensus on adaptation strategies, while the other half ended the game undecided. Nonetheless, the game sparked critical debate among group members about the efficacy of different adaptation strategies and the direction that sea level rise planning should take in the Matanzas Basin. Results indicate that participants value the natural environment as well as the built environment. In fact, the top three preferred strategies to use in the Matanzas Basin after playing the game were ecosystem conservation, living shorelines, and planned relocation.

Common lessons that participants learned though the game emerged. A primary lesson was the value of having diverse stakeholder perspectives represented on an issue. Understanding how adaptation strategies related to each other is another lesson learned. The game demonstrated how certain strategies could be mutually beneficial for multiple stakeholders. In the end, participants realized that planning for sea level rise will be tremendously expensive. They also noted the problem of planning for an uncertain future. Some participants were discouraged by this challenge, while others saw it as an opportunity for their generation to create a positive legacy.

Discussion of Results

To evaluate the use of role-play in coastal adaptation planning, I examined three aspects of the role-play game: ability of the game to educate participants about a complex issue, ability of the game to promote transformative learning among participants about collaboration, and the ability of the game to provide useful input to planning. Below I discuss the game's capacity to achieve those objectives.

First, I will briefly review the results of the keypad polling exercise that researchers used in the *Planning Matanzas* stakeholder workshop to provide some context for the game results. *Planning Matanzas* researchers conducted the keypad polling exercise before the workshops began and again at the workshops' conclusion to gauge the impact that the workshops had on participants' attitudes and views on sea level rise planning. Although the Sea Level Rise Adaptation Role-Play Game was only one part of the workshop among other presentations and activities, I refer to these keypad polling results to get a sense for the general attitude participants held towards sea level rise planning before and after the workshop.

The keypad polling results show a 60% increase in participants responding they were either well-informed or very well-informed about sea level rise in the Matanzas Basin after the workshops. Additionally, there was an 18% increase in participants saying sea level rise was already occurring and a 22% increase in participants strongly agreeing that sea level rise is already affecting their community. Thus, participants generally held favorable attitudes towards sea level rise planning and felt that the workshops, which the game was a part of, increased their understanding of sea level rise in their community.

Overall, the game performed well as a tool to educate participants on sea level rise planning, encourage transformative learning about collaboration, and provide useful input for planners. First in regards to educating participants about adaptive sea level rise planning in the Matanzas Basin, participants reported learning about the functions and costs of adaptation strategies that they were not aware of before playing the game. For instance, several participants commented that they were not aware of planned

relocation as a feasible adaptation strategy before playing the game. Post-survey results showed a notable increase in preference for the planned relocation strategy after playing the game, supporting this notion. In fact, the increase in preference for planned relocation is statistically significant.

In addition to learning about new strategies, participants learned about the economic realties of planning for sea level rise. After playing the game, participants repeatedly commented that they had not realized how expensive certain adaptation strategies like seawalls were. They were surprised by the huge financial weight sea level rise will bear on their community. Hopefully the understanding of the financial aspect of sea level rise planning will help individuals think more realistically about how their community will be able to adapt.

Another intention of the game was to engage participants in transformative learning about collaboration. Participants seemed to build consensus on the issue of sea level rise planning in the Matanzas Basin. I intended the process of playing the game to improve negotiation and engage players on a complex issue. In the context of the game, negotiation occurred through tradeoffs and bartering to form strategic plans. Half of the groups reached a consensus on a strategic adaptation plan while half of the groups did not. Reaching a consensus on a strategic adaptation plan was not the goal of the game, however. The game was created for participants to go through the role-playing process and experience transformative learning related to adaptive sea level rise planning.

Although it is difficult to determine how the lessons learned about negotiation and collaboration will transfer to the real world outside of the context of the game, myself

and the other game facilitators noticed transformative learning about collaboration taking place during the game. For instance, most participants recognized the importance of including different stakeholders in an open discussion on this issue. Also, participants realized how certain strategies could be mutually beneficial for multiple stakeholders and ways that creative adaptation approaches could be achieved over time. For instance, ecosystem conservation can benefit both inland developers and environmental scientists.

Overwhelmingly, participants responded that planning for sea level rise will be a vast undertaking. A shared understanding about an issue should result from shared learning, so consensus on this idea was not surprising. An interesting result occurred, however. After playing the game, players were slightly *less* likely to agree that planning for sea level rise will be a vast undertaking. The result is a statistically significant slight correlation. I thought that participants would agree more strongly that planning for sea level rise will be a vast undertaking after they played the game. This slight decrease in agreement perhaps resulted from participants understanding more about the issue by playing the game. For instance, some participants who learned about planned relocation as an option for the first time may see this as a valuable strategy. The game demonstrated how strategies work together and perhaps participants realized how sea level rise planning might work, whereas the situation seemed too incomprehensible before.

Another interesting result was a decrease in agreement with the statement that other players equally understood the importance of the issue. I expected that players would come to a more equal level of understanding after playing the game. However, it

seems that participants overestimated their group members' level of understanding before playing the game. Playing the game showed participants that they did not have an equal understanding of the issue.

Lastly, I intended for the game to provide useful input to planning. Observations from the game can help planners gauge participants' level of sea level rise knowledge and readiness for adaptation. Observations of participants role-playing can also provide insight into participants' personal preferences and values. Most of this input, however, is best gathered through observation of off-handed dialogue during the game when participants step outside their persona role and reveal their personal beliefs. To better collect this type of data in the future, I recommend audio recording the game.

The rate of consensus on a strategic adaptation plan provides useful information to planners. The role-play can help forecast conflicts in the planning process between stakeholders. It can also provide insight into creative solutions to overcoming those conflicts as well as creative approaches to adapting by using the local input and knowledge of the stakeholders. The game draws out participants' preferences for strategies as well as values, such as valuing protection for ecosystems.

As I reviewed the results of the game, I realized that I could gain more insight about how the game specifically provides input to the planning process by interviewing some of the individuals who assisted with facilitating the game. I asked the facilitators how they think the game provides input to the planning process and what they learned from watching participants play the game. Although I asked these questions to facilitators nearly a year after conducting the game, facilitators still provided useful and interesting insights.

For instance, Dr. Kathryn Frank saw the game as one way to test the waters and see if she can move farther with the process based on the level of support for this type of planning. Dr. Frank felt the game provided support and encouragement for planners to explore different adaptation approaches, like planned relocation. Seeing participants support directing development away from the coast instead of backing away from this proposal was encouraging for Dr. Frank because it gives planners adaptation options beyond protection. Similarly, Dr. Dawn Jourdan viewed the game as a way to test the "palatability" of each adaptation strategy. The game also illustrated the strategies most important to participants, since they were forced to work with each strategy's financial cost and prioritize.

Likewise, Tina Gordon felt that the game helped her understand the preferences of the community for different adaptation options. She learned that it is difficult for people to "turn off" their perspectives but by doing so in the game, participants can achieve a more holistic perspective of the situation. The game provides a useful tool for planners and educators to introduce local residents to the real life constraints of adaptation planning. Additionally, as Dr. Frank reported, the game provides planners with a capacity building tool. Seeing that a community *can* work together through this simulation encouraged Dr. Frank because so often communities get caught up in reactive responses and fail to engage in proactive planning.

Observing participants play the game also provided encouragement to Dr. Jourdan, who found most participants were eager to compromise and negotiate to reach a collective agreement. Importantly, the game highlighted for Dr. Jourdan the need for individuals to "grieve for the future loss of place." Until facilitating the game, Dr. Jourdan

did not realize the importance of this grieving in helping prepare a community for future changes.

Furthermore, the game demonstrates the level of agreement that can be reached when planners take a community-generated plan. In other words, the game illustrates to planners the need and benefit of a good public participation process. Furthermore, the game helps planners understand the social-political system better from watching people portray personas. It helps provide a better understanding of the people and place. Lastly, as a tool, the game can be used to motivate meeting attendance because it makes the meeting more interesting, engaging, and memorable.

Revised Survey Results

As mentioned in Chapter 3, the pre and post-surveys that I originally created and used to collect my data about the game were limited in their ability to provide the most meaningful data to my research. The questions on the surveys did not get at the heart of what I wanted to know about participants' experiences through the game. To remedy this, I created a revised pre and post-survey and conducted the game again to test how well this new survey gathered good quality data. (See Appendix I for the revised pre and post-survey). Below I discuss how I revised the survey, how I tested the survey, and the results.

Developing the Revised Survey

First of all, I began the revised survey with a section to collect basic demographic information. Demographic information sought includes age, gender, occupation, relation to the coast, and length of involvement in the Matanzas Basin. Next, to determine the extent to which the game educates participants about the different adaptation strategies, I asked participants to rank how familiar they are with each of the strategies

used in the game. Then, I asked participants to select how important they believe each adaptation strategy is for the Matanzas Basin in the next 20 years. This question can help determine participants' values for the strategies.

To further assess the game's potential to educate participants, I asked respondents to briefly describe planned relocation and select which stakeholders they believe this strategy would most appeal to. I chose to focus on planned relocation because from the previous games, planned relocation had the greatest increase in interest.

The next question asks participants to select the three most important things they think need to happen for proactive sea level rise planning to occur. This question can provide useful input to planning and also help signal transformative learning about collaboration if response rates for "open discussions among stakeholders" increases. Likewise, the questions of how well participants think their community can work together to plan for sea level rise and if sea level rise adaptation planning needs to begin now can help planners gauge the readiness of their community for collaborative adaptation planning. Similarly, the final questions asking participants for their attitude towards proactive sea level rise planning (overwhelming and hopeless, comprehensible and hopeful, something that does not concern them, or none) along with what they believe their role in sea level rise planning will be can help planners get a sense for the attitude of the community towards adaptation planning and their ability to participate in future action.

The post-survey contains all of the same questions as the pre-survey plus two additional questions. One question asks participants how their view of adaptation

planning changed through playing the game. The other question asks if participants learned anything surprising or unexpected. These questions were intended to gather information about how the game influenced individuals' perspectives on adaptation planning that the earlier questions may have missed.

Testing the Revised Survey

To determine how well the revised surveys can provide meaningful data, I tested the surveys by playing the game with two different groups. The first group consisted of employees of GTM NERR and students from the University of Florida College of Design, Construction, and Planning comprised the second group. I conducted the game with GTM NERR on October 24, 2013 from 1:00 p.m. until 2:30 p.m. and I conducted the game with the UF students on October 25, 2013 from 3:00 p.m. until 4:30 p.m.

Before playing the game, I gave a 15-minute presentation about the unique characteristics of the Matanzas Basin and the different adaptation strategies. I presented this information to the participants since the earlier participants in my study received a similar presentation in the *Planning Matanzas* workshops preparing them for the game. Then participants played the game, completing the pre and post-surveys. I conducted the group interview and recorded observations for each group. In total, 14 individuals participated in the game and completed the revised survey.

Results

Overall, the participants responded positively to the game and engaged in thorough discussion about sea level rise adaptation planning. Neither of the groups reached a consensus on strategies. Both groups attributed this lack of consensus to conflicts of interest between personas. While it was relatively easy for participants to

agree with one or two other personas, they felt it was nearly impossible for everyone to agree on any one strategy.

Nevertheless, participants learned about the functions, costs, and interrelationships of the adaptation strategies. Many participants specifically noted learning more about planned relocation through playing the game. Several participants already had an idea of what planned relocation entailed, but gained a better understanding of the concept through playing with the strategy in the game. Many participants also reported learning about the perspectives of other stakeholders in the area. In a few cases participants found it very difficult to portray their persona because it deviated drastically from their personal beliefs. Nonetheless, these participants recognized the usefulness of at least attempting to view the situation from another perspective.

Additionally, the game promoted several discussions about real life events as participants stepped in and out of their persona role to bring in their personal experiences and knowledge about sea level rise. In one group, for instance, participants began discussing the immediate issues of vulnerable infrastructure in their community. Both groups expressed sentiments that proactive planning will be less expensive in the long run than having to respond to sea level rise impacts as they happen.

Compared to the survey I used to conduct the game originally, I think the revised survey provides significantly better quality data about how the game impacts participants. It is also designed to better capture input for planners, specifically if planners focus on responses to the post-survey. For instance, the second question asks participants to rank how important they think different adaptation strategies are for the

Matanzas Basin in the next 20 years. Planners can use the responses to this question to help guide decision-making when determining which strategies to focus more on than others. For instance, 11 of 14 participants responded that living shorelines are very important for the Matanzas Basin in the next 20 years. With a larger sample size, planners can use this information to help guide their approach for adaptive planning.

Statistical analysis of the before and after change in familiarity with each strategy and analyzing the before and after responses about planned relocation would help demonstrate the game's ability to educate participants about sea level rise adaptation planning. A quick comparison of the pre and post-surveys shows that participants were "very familiar" with more strategies after playing the game and generally attained a more refined definition for planned relocation.

Thus, I believe the revised survey can gather better quality information for analyzing the impact of the game on participants as well as providing input to the planning process. In the future, it would be interesting to compare the survey responses based on the demographic information, especially looking for generational differences. Unfortunately, time constraints prevent me from statistically analyzing the revised survey responses for this research.

CHAPTER 5
TRANSFERABILITY

In this chapter I review the transferability of the Sea Level Rise Adaptation Role-Play Game. I include examples of how researchers and educators have used the game in other contexts. I conclude that the changes that individuals made to the game have not interfered with the game's integrity.

Since conducting this research, other researchers and educators used the Sea Level Rise Adaptation Game in a couple of other contexts. First, two environmental science professors from Flagler College in St. Augustine, Florida expressed interest in using the game in their classrooms after the *Planning Matanzas* workshop on December 6, 2012. I supplied the professors with the game design and materials. Here is what Dr. Jessica Veenstra had to say about the game:

> Overall, I think that it is a fantastic teaching tool for us here at Flagler College, because it is so locally relevant. These students really care about this area, and it's very realistic that they will have to be planning for these issues and dealing with them in the future. It was also a great opportunity for them to try on different roles in the community (personal communication, March 28, 2013).

Dr. Veenstra went on to say that she hopes to play the game again with her students, this time without the stakeholder personas, allowing students to put together a plan fitting their personal interests.

Additionally, the *Planning Matanzas* project team used the game with students from middle school to college-level in the Matanzas Basin area. For middle school students, the team adapted the game to an appropriate comprehension level. Their teachers prepared the students by reviewing sea level rise concepts and adaptation strategies with them before playing the game.

Furthermore, I assisted in conducing the game with stakeholders in Cedar Key, Levy County, Florida as part of a community sea level rise planning workshop held by students and professors from the University of Florida Department of Urban and Regional Planning studio in February 2013. Compared to the Matanzas Basin, Cedar Key has a different geography and thus different adaptation strategies are more appropriate in this area. To play the game in Cedar Key, we substituted more appropriate strategies where necessary. We also eliminated the economic component to make it easier for players. We felt that the economic component may distract from the purpose of the game, which is to engage participants in a discussion about different adaptation strategies and perspectives. The game performed well with these changes. With the help of facilitators, participants engaged in lively discussion about the benefits and limitations of the different adaptation strategies and came to similar realizations about collaboration and negotiation as participants in the Matanzas Basin.

Thus, I believe that the game is very adaptable to other contexts, adding to its usefulness as a public participation tool. As demonstrated, different strategies and personas can be added, strategy costs can be edited, and different visual aids can be provided. If there are larger groups, participants can pair together to play stakeholder personas and still enjoy the same shared learning experience. There are many possibilities for adapting the game for other uses, changing the scenario or making it even more interactive.

CHAPTER 6
CONCLUSION

Overall, the Sea Level Rise Adaptation Role-Play Game exemplifies a unique and useful approach to communicating complex planning issues. In my research, participants responded positively to playing the game and engaged in lively discussion about coastal adaptation planning. Above all, hearing individuals comment about how eye opening the experience was and how much they learned about opportunities for adaptation demonstrated for me that the game is an effective planning tool.

For complex situations like planning for sea level rise, I believe that role-play offers planners a good way to communicate the various stakeholders, perspectives, strategies, and the planning process to individuals. Role-play can be a capacity building exercise, encouraging active involvement in future adaptation processes by empowering individuals with a holistic understanding the issue. As the facilitators noted, the game can provide planners with encouragement and support for certain adaptation approaches. Additionally, the game encourages transformative learning about collaboration, building consensus among stakeholders and creating a public more attuned to coastal planning issues.

It is important to maintain realistic expectations about the use of role-play, however. I recommend, as do other researchers, to use role-play exercises like the Sea Level Rise Adaptation Role-Play Game as part of a broader communication and planning approach. As a role-play simulation, the game is very transferable to other planning initiatives and educational contexts. I advise using a research instrument like the revised survey to gauge participants' education about adaptation planning and

gather input for planning. The research instruments also function to debrief participants, an important step in collaboration activities.

To improve upon this study, I recommend conducting further research to provide more accurate cost estimates for the sea level rise adaptation strategies. What the game provides is a good starting point, but more research should be performed to account for more of the variables that constitute the economic costs. In particular, future research could focus on improving the cost estimates for implementing strategies in a specific location. I also recommend that future research compare role-play directly to other methods of public engagement. For instance, one could compare communicating sea level rise planning through role-play to communicating the same issue without role-play. This comparison would help to further highlight the unique capacity of role-play to influence participants' perception of an issue. In the future, I hope for refinement of the Sea Level Rise Adaptation Role-Play Game and its continued adoption for educational purposes.

APPENDIX A
UNIVERSITY OF FLORIDA INSTITUTIONAL REVIEW BOARD DOCUMENTS

UFIRB 02 – Social & Behavioral Research

Protocol Submission Form

This form must be typed. Send this form and the supporting documents to IRB02, PO Box 112250, Gainesville, FL 32611. Should you have questions about completing this form, call 352-392-0433.

Title of Protocol:	The effectiveness of role-play in coastal adaptation planning		
Principal Investigator:	Briana Ozor		**UFID #:** 6965-9706
Degree / Title:	B.A. Economics/Graduate Student, Masters of Urban and Regional Planning	**Mailing Address:** (If on campus include PO Box address): 221A NW 12th Terrace, Gainesville, FL 32601	**Email:** briozor@ufl.edu
Department:	Urban and Regional Planning		**Telephone #:** (813) 380-5408
Co-Investigator(s):		**UFID#:**	**Email:**
Supervisor *(If PI is student)***:**	Dr. Kathryn Frank	**UFID#:** 6893-8417	
Degree / Title:	Ph.D. City and Regional Planning/Assistant Professor	**Mailing Address:** (If on campus include PO Box address): Department of Urban and Regional Planning, University of Florida, PO Box 115706, Gainesville, FL 32611-5706	**Email:** kifrank@ufl.edu
Department:	Urban and Regional Planning		**Telephone #:** (352) 392-0997 ext 458
Date of Proposed Research:	November 15, 2012 – May 2013		
Source of Funding *(A copy of the grant proposal must be submitted with this protocol if funding is involved):*	None		

Scientific Purpose of the Study:
To develop and determine the effectiveness of a role-play tool in planning for sea level rise as a method of public participation. Role-play tools may provide a useful means of bringing together people of different backgrounds and perspectives to discuss and work towards a solution for a common problem.

Describe the Research Methodology in Non-Technical Language: ***(****Explain what will be done with or to the research participant.****)***

Participants will be asked to play a game in groups of five. Groups are given different sea level rise adaptation strategies and costs. Each participant assumes a character role and works with their group to decide on the best strategies for their community to adapt to sea level rise. After the game is played, groups will take turns sharing their decisions. During the game, notes will be taken of participants' conversations and reactions to the game. Before and after the game, participants will be asked to fill out short questionnaires.

Describe Potential Benefits:

Increased awareness of important coastal issues and improved attitude towards negotiation as a key part of dealing with such issues.

Describe Potential Risks: (*If risk of physical, psychological or economic harm may be involved, describe the steps taken to protect participant.)*

No more than minimal risk.

Describe How Participant(s) Will Be Recruited: Participants are notified of public workshops being held for the Planning for Sea Level Rise in the Matanzas Basin project already underway with coordination between UF and the Guana Tolomato Matanzas National Estuarine Research Reserve. This hypothetical game is one component of the workshop. Participation in the workshops and subsequently the game and study is completely voluntary.

Maximum Number of Participants (to be approached with consent)	150	**Age Range of Participants:**	18+	**Amount of Compensation/ course credit:**	None

Describe the Informed Consent Process. (Attach a Copy of the Informed Consent Document. See http://irb.ufl.edu/irb02/samples.html for examples of consent.)

Participants will be given an informed consent form prior to their participation in the study. The consent form contains information about the study and requires a participant signature for participation.

(SIGNATURE SECTION)

Principal Investigator(s) Signature:		**Date:**
Co-Investigator(s) Signature(s):		**Date:**
Supervisor's Signature (if PI is a student):		**Date:**
Department Chair Signature:		**Date:**

UF | **Institutional Review Board**
UNIVERSITY of FLORIDA

PO Box 112250
Gainesville, FL 32611-2250
352-392-0433 (Phone)
352-392-9234 (Fax)
irb2@ufl.edu

DATE: October 18, 2012

TO: Briana Ozor
221A NW 12th Terrace
Gainesville, FL 32601

FROM: Ira S. Fischler, PhD; Chair
University of Florida
Institutional Review Board 02

SUBJECT: **Approval of UFIRB # 2012-U-1071**
The Effectiveness of Role-Play in Coastal Adaptation Planning

SPONSOR: None

I am pleased to advise you that the University of Florida Institutional Review Board has recommended approval of this protocol. Based on its review, the UFIRB determined that this research presents no more than minimal risk to participants. Your protocol was approved as an expedited study under category 7: *Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.*

Given this status, it is essential that you obtain signed documentation of informed consent from each participant. Enclosed is the dated, IRB-approved informed consent to be used when recruiting participants for the research. If you wish to make any changes to this protocol, *including the need to increase the number of participants authorized*, you must disclose your plans before you implement them so that the Board can assess their impact on your protocol. In addition, you must report to the Board any unexpected complications that affect your participants.

It is essential that each of your participants sign a copy of your approved informed consent that bears the IRB approval stamp and expiration date.

Your approval is valid through October 11, 2013. **If you have not completed the protocol by this date, please telephone our office (392-0433), and we will discuss the renewal process with you. Additionally, should you complete the study before the expiration date, please submit the study closure report to our office.** The form can be located at http://irb.ufl.edu/irb02/Continuing_Review.html. It is important that you keep your Department Chair informed about the status of this research protocol.

ISF:dl

Informed Consent

The Effectiveness of Role-Play in Coastal Adaptation Planning

Please read this consent form carefully before you decide to participate in this study.

Purpose of the research study: The purpose of this study is to examine the effectiveness of a role-play tool in planning for sea level rise.

What you will be asked to do in this study: You will be introduced to a scenario and asked to work together in groups of five in order to address the situation. You will adopt a persona for the game. At the conclusion of the game, groups will share their decisions and experiences. Before and after the activity you will be asked to complete questionnaires. You have the right to not answer any of the questions.

Time required: 1 hour

Risks and Benefits: There are no direct benefits or risks to you for participating in the study.

Compensation: None

Confidentiality: Your identity will be kept confidential. Your questionnaires will be grouped with the rest of the participants' from your workshop. Your name will not be used in any report.

Voluntary participation: Your participation in this study is entirely voluntary. There is no penalty for not participating.

Right to withdraw from the study: You have a right to withdraw from the study at anytime without consequence.

Whom to contact if you have questions about the study: Briana Ozor, Graduate Student or Dr. Kathryn Frank, Department of Urban and Regional Planning, PO Box 115706, Gainesville, FL 32611-2250. Dr. Frank is the supervisor of this study.

Whom to contact about your rights as a research participant in this study: IRB02 Office, Box 112250, University of Florida, Gainesville, FL 32611-2250; phone: (352) 392-0433

Agreement:

I have read the procedure described above. I voluntarily agree to participate in the study and I have received a copy of this description.

Participant: _____ Date: _____

Principal Investigator: _____ Date: _____

Approved by
University of Florida
Institutional Review Board 02
Protocol # 2012-U-1071
For Use Through 10-11-2013

APPENDIX B
GAME DESIGN

Objective: Players work together to develop strategic sea level rise adaptation plans for their community under economic, political, and time constraints.

Goals: (1) For the researchers: To introduce participants to the common (and uncommon) sea level rise adaptation strategies and opportunities, and discover their preferences in order to assess how participants see their community adapting to sea level rise.

(2) For participants: To gain an understanding of the vast undertaking that planning for sea level rise will be with the coordination of different stakeholders and adaptation strategies given the reality of economic limitations; to become familiar with the different strategies available for sea level rise adaptation.

Duration: 30 minutes of game play, plus 10 minutes for pre and post-evaluations.

Players: 5 players plus 1 supervisor per group

Scenario: Planning for the next 20 years

The effects of coastal dynamics are becoming increasingly apparent in your community. You have noticed more frequent beach erosion and more severe storm flooding than you can remember from years past. On the maps, you can see the areas of your community that are predicted to be vulnerable to habitat changes with 3 feet of sea level rise. In less than a century, this area will look drastically different. Such dramatic changes require equally dramatic responses, and implementing these responses should begin as soon as possible.

All of you come to this table representing the interests of larger groups: local residents, developers, government officials, business owners, and scientists. You have been nominated by your groups to manage the funds they have raised and allocate them towards appropriate adaptation strategies. As a community, you have $800 million to put towards sea level rise adaptation efforts. Given what you know about the future, but keeping in mind your economic limitations, what is the best way to adapt to the upcoming changes? Develop a strategic sea level rise adaptation plan for the next 20 years, keeping in mind changes likely to occur over the next century.

Rules for play:

1. Take a seat and turn over your stakeholder persona card.

2. Review the strategy cards on the table, as well as the map. Think about which strategies your stakeholder persona would advocate and develop arguments in favor of these strategies.

3. Take 5 minutes and fill out the individual pre-game worksheets.

4. Begin with the “Local Resident” player and proceed going clockwise. The “Local Resident” explains their preferred strategy or set of strategies to the group, noting which benefits the strategy offers.

5. Going clockwise, each subsequent player advocates for a strategy or set of strategies.

6. When the game supervisor announces that 10 minutes remain, the rounds of advocating for different strategies comes to an end. Groups should start making concrete decisions on a set of strategies they would like to implement for their community based on the economic limitations.

7. The game ends after 30 minutes of playing time. The goal is to have a strategy, or set of strategies that everyone can agree on but are also affordable by the end of the game.

8. After the timer goes off, fill out the post-evaluation sheet as a group and then fill out the post-game worksheets individually.

9. Elect one representative from each group to briefly share the decisions their group came to and briefly describe the decision-making and collaboration process. To wrap up, the game leader will provide feedback to the groups.

Materials:

- Stakeholder persona cards (5 cards; 1 for each player in the group)
- Strategy cards with benefits (7 cards, plus 1 blank card)
- Map: Vulnerable areas with 3 foot SLR
- Timer (cellphone)
- Pens & small notepads
- Small calculators
- Individual pre/post-evaluations
- Group post-evaluation

APPENDIX C
GAME MATERIALS

Local Resident — *$100 million*

- You have been selected to represent your community on this issue.
- Your community is a beach community.
- Members of your community enjoy living where they do because they enjoy seeing wildlife in their backyards, watching dolphins swim into the sunset, and going to the beach.
- Your houses are near the water and your neighborhood floods during heavy storms.

Government Official — *$350 million*

- As an elected official, you work in a position of power within your local government.
- You have lived in the area for many years and plan to continue living here because you are an amateur fisherman and you love the area.
- You have heard recent reports about the potential impact of sea level rise in your community but you find it difficult to dedicate the necessary resources towards this issue because more immediate issues weigh you down.

Ecotourism Business Owner — *$100 million*

- You are a born and raised resident of the area that owns a kayaking tour company.
- Recent storms have caused some damage to your business and you are beginning to worry about the intensification of coastal dynamics in the near future.
- You also notice increasing development pressures threatening marsh areas that you like to take some of your tours through.

Inland Developer *$150 million*

- You are not a full time local resident but you own large areas of land inland from the present communities.
- You anticipate that as people begin to worry about sea level rise they will be looking to move further inland and you would like to build a community to accommodate this anticipated demand.

Environmental Scientist *$100 million*

- You are not a Florida native but you came to this area and continue living here because you recognize the uniqueness of the ecosystem and biodiversity of the area.
- You worry about the wellbeing of the local ecosystem, especially threatened species, with the pressures of development and now the threat of sea level rise.
- You are particularly interested in sea turtles and manatees.

Beach Nourishment

$100 million

- Replacing sand lost through erosion to re-widen a beach
- Lifespan: 5 years
- $3-15/cubic meter, depending on dredge site; $100 million for a large beach

***Key benefits*: Protect existing infrastructure, protect recreation and tourism**

Habitat Migration Corridors

$50,000/acre

- Acquiring tracts of land connecting different wildlife habitats to allow for the safe migration of species, via purchases and conservation easements.

***Key benefits:* Allow migration of wetlands and threatened species**

Ecosystem Conservation

$50,000/acre

- Government purchases relatively undeveloped land from coastal property owners to put into conservation. This conservation land will act as a buffer for retreating shorelines, protect habitats, and increase resiliency along the shoreline by preventing development in high-risk areas.

***Key benefits:* Protect private property rights, allow migration of wetlands and threatened species**

Seawalls — *$4.24 million/mile*

- Installing physical barriers between the sea and land to prevent flooding of developed areas.

Key benefits: **Protect existing infrastructure**

Elevating Structures — *$150,000**

- Elevating existing and future structures on stilts to protect them from storm surge and flooding.
- *$150,000 for 2300 sq. ft. building

Key benefits: **Protect existing infrastructure**

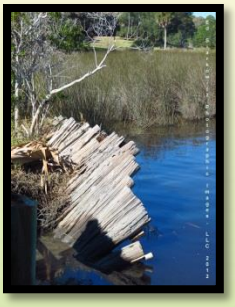
Planned Relocation — *$700 million*

- Gradually moving infrastructure away from high-risk areas, primarily through the use of rolling conservation easements. Land will be acquired inland to allow for infrastructure to be rebuilt outside of highly vulnerable areas.
- $700 million over the next 20 years

Key benefits: **Protect future infrastructure, allow migration of wetlands and threatened species**

Water Storage Easement: *$50,000/acre*

(Conceptual Strategy)



- Conservation easements of at least 10 acres on private lands to provide ecosystem services, mainly water storage. As sea levels rise, freshwater is susceptible to saltwater contamination. Water storage easements will help protect the community's freshwater supply, while supporting ecosystem health and allowing for habitat migration.

***Key benefits*: Support ecosystem services, protect freshwater supply**

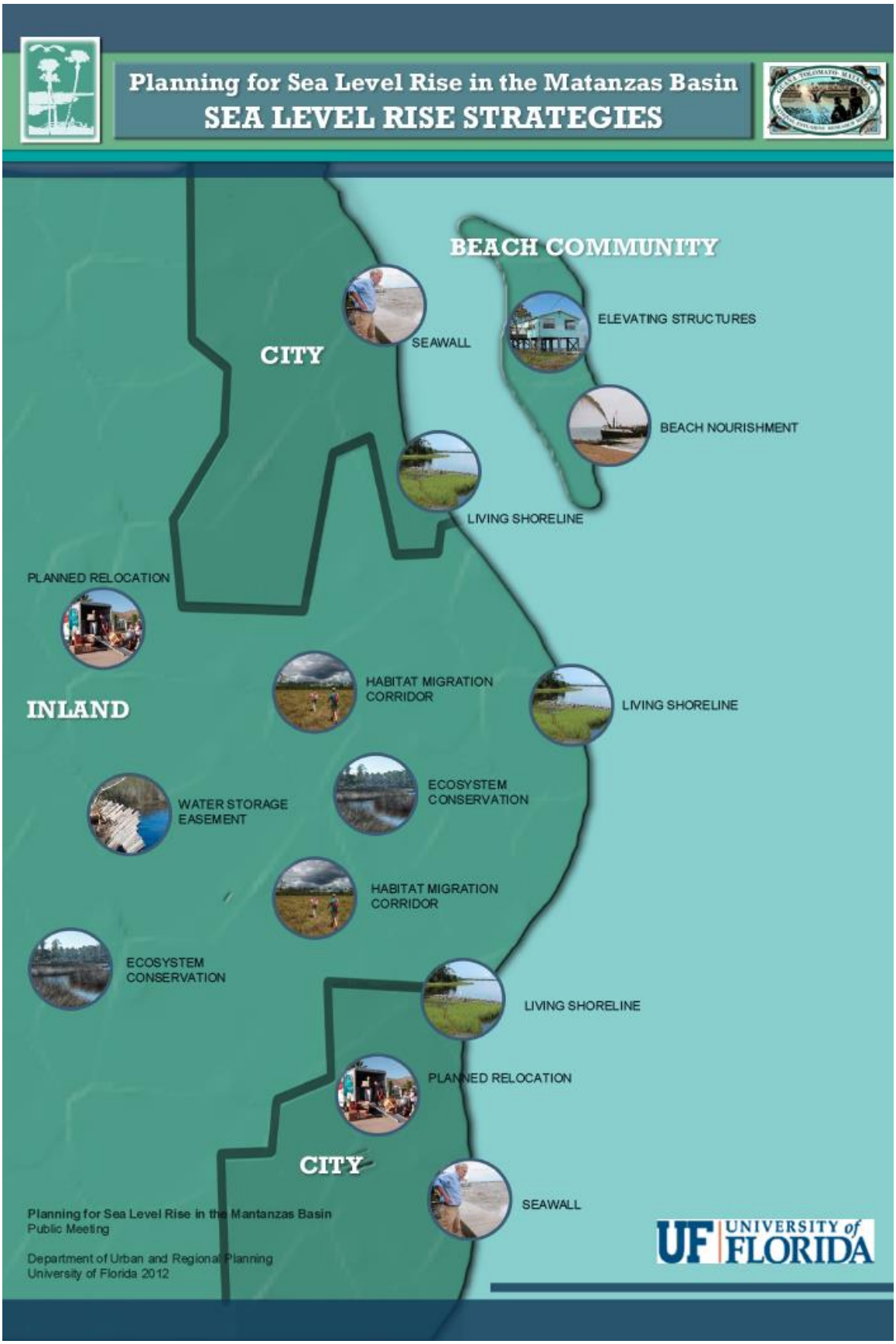
Living Shoreline *$25,000/acre*

- Maintaining natural vegetation along the shoreline.

1. Reintroducing wetlands to areas that have lost them. Wetlands help absorb the impact of coastal dynamics by providing a place for the water to go, acting as a buffer between the sea and development.
2. Using organic and structural materials like wetland plants, sand, aquatic vegetation, oyster reefs and stone to create a protective shoreline and maintain valuable habitat.

***Key benefits:* Allow migration of habitats and threatened species, protect recreation and tourism, protect fisheries and rookeries; improve water quality via filtration of upland runoff**

Planning for Sea Level Rise in the Matanzas Basin
Study Area Low-Lying Places


Planning for Sea Level Rise in the Matanzas Basin
SEA LEVEL RISE STRATEGIES
BEACH COMMUNITY
SEAWALL
ELEVATING STRUCTURES
CITY
BEACH NOURISHMENT
LIVING SHORELINE
PLANNED RELOCATION
INLAND
HABITAT MIGRATION CORRIDOR
LIVING SHORELINE
ECOSYSTEM CONSERVATION
WATER STORAGE EASEMENT
HABITAT MIGRATION CORRIDOR
ECOSYSTEM CONSERVATION
LIVING SHORELINE
PLANNED RELOCATION
CITY
SEAWALL
Planning for Sea Level Rise in the Mantanzas Basin
Public Meeting
Department of Urban and Regional Planning
University of Florida 2012
UF UNIVERSITY of FLORIDA

APPENDIX D
DATA COLLECTION INSTRUMENTS

Individual PRE-Game Worksheet

Stakeholder persona: _____

Please answer the following questions ***before*** playing the game:

1. *In your own opinion,* rank the strategies from most appealing (1) to least appealing (8):

Beach nourishment __	Seawalls __	Planned relocation __
Elevating structures __	Living shoreline __	Ecosystem conservation __
Habitat migration corridors __		Water storage easement __

2. *Taking on the perspective of your stakeholder persona*, rank the strategies from most appealing (1) to least appealing (8):

Beach nourishment __	Seawalls __	Planned relocation __
Elevating structures __	Living shoreline __	Ecosystem conservation __
Habitat migration corridors __		Water storage easement __

Please rank the extent to which you agree with the following statements:

	Do not agree at all				Agree completely
3. It will be easy to portray my stakeholder persona.	1	2	3	4	5
4. It will be easy to negotiate with my group members.	1	2	3	4	5
5. I expect to learn something meaningful from the game.	1	2	3	4	5
6. I expect to reach a satisfactory outcome with my group members.	1	2	3	4	5
7. I think other group members equally understand the importance of this issue.	1	2	3	4	5
8. The amount of money available to my persona is sufficient.	1	2	3	4	5
9. My persona needs more money.	1	2	3	4	5
10. Sitting with other stakeholders is important in solving this issue.	1	2	3	4	5
11. Planning for sea level rise will be a vast undertaking.	1	2	3	4	5

12. What percentage of your personal income are you ready to put aside for planning for this issue? _____%

Individual POST-Game Worksheet

Stakeholder persona: _____

Please answer the following questions ***after*** playing the game:

1. *In your own opinion,* rank the strategies from most appealing (1) to least appealing (8):

Beach nourishment __	Seawalls __	Planned relocation __
Elevating structures __	Living shoreline __	Ecosystem conservation __
Habitat migration corridors __		Water storage easement __

2. *Taking on the perspective of your stakeholder persona*, rank the strategies from most appealing (1) to least appealing (8):

Beach nourishment __	Seawalls __	Planned relocation __
Elevating structures __	Living shoreline __	Ecosystem conservation __
Habitat migration corridors __		Water storage easement __

Please rank the extent to which you agree with the following statements:

	Do not agree at all				Agree completely
3. It was easy to portray my stakeholder persona.	1	2	3	4	5
4. It was easy to negotiate with my group members.	1	2	3	4	5
5. I learned something meaningful from the game.	1	2	3	4	5
6. I reached a satisfactory outcome with my group members.	1	2	3	4	5
7. I think other group members equally understood the importance of this issue.	1	2	3	4	5
8. The amount of money available to my persona was sufficient.	1	2	3	4	5
9. My persona needed more money.	1	2	3	4	5
10. Sitting with other stakeholders is important in solving this issue	1	2	3	4	5
11. Planning for sea level rise will be a vast undertaking.	1	2	3	4	5

12. What percentage of your personal income are you ready to put aside for planning for this issue? _____%

Sea Level Rise Adaptation Role-Play Game: Group Post-Evaluation Sheet

Stakeholder group & team #: _____

Date and location: _____

Please answer the following questions as a team:

1. Which strategy or set of strategies did you decide on and why?

2. If you were unable to reach a decision, what prevented you?

3. In a sentence or two, describe your team's ability to reach a consensus:

4. What was the most challenging aspect of the game?

5. What was the most meaningful thing that you learned from the game?

6. In your opinion, what is one way to improve the game?

Observer Journaling Guidance: Sea Level Rise Adaptation Role-Play Game

When observing the game, please pay special attention to the following items:

- How are participants doing playing their personas? Do they seem to be struggling at all?
- What ways are participants negotiating?
- What things do participants care about? What adaptation strategies are the groups adopting?
- Is there a general agreement that planning for ecosystems as well as people is important?
- What are participants' values and preferences?

APPENDIX E
DEVELOPMENT OF STRATEGY COSTS

A key aspect of the Sea Level Rise Adaptation Game is introducing participants to the economic costs of implementing various adaptation strategies. It was difficult to assign costs to the adaptation strategies, however, given the numerous variables that go into implementation costs. For seawalls, for instance, variables include cost of materials, height of the wall, labor costs, land payments, cost for consultation and design, etc. Additionally, costs will vary based on location. An obvious example of this variability is with planned relocation. It will cost more to relocate larger, denser urban areas than it would to relocate smaller communities. Hence, all economic costs used in the game are rough estimates, intended to give participants an idea of the magnitude of financial investments in adaptation planning.

Keeping in mind these limitations, I assigned costs to the adaptation strategies based on data for implementation costs and translated these costs to the context of the Matanzas Basin. Data came primarily from Climate Tech Wiki and the GTM NERR. Climate Tech Wiki is a web-based platform for sharing information about clean technologies. Partners involved with Climate Tech Wiki include the United Nations Developing Programme, United Nations Environmental Programme Division of Technology, Industry, and Economis, Energy Research Center of the Netherlands, and the Renewable Energy and Energy Efficiency Partnership. Sources for data on Climate Tech Wiki are transparent and referenced.

Seawalls

As mentioned, the cost of implementing a seawall depends on many variables including the height of the wall, potential land acquisition, cost of labor, estimated wave

action, and cost of materials. According to a study by Linham (2010), the cost of constructing one kilometer of seawall can range from $0.4-$27.5 million. A study by the English Environment Agency (2007) found the average construction costs for seawalls to be $2.56 million (at 2009 prices). Although this figure is in a United Kingdom context, I considered it in figuring an estimate for a seawall cost for the game.

I decided upon the figure of $4.24 million per mile by using an average of the cost of a seawall per kilometer and converting it to miles. This average was $8.42 million per mile, which is much higher than the estimated average of $2.56 million found by the English Environment Agency. Hence, I reduced the figure by half, becoming $4.24 million per mile. Since the cost is highly variable, $4.24 million per mile seemed like a reasonable estimate.

Elevating Structures

There cannot be one cost for elevating a structure since the cost will depend on the size of the structure, which varies throughout a community. Thus, I used the cost for elevating an average sized home as the cost of elevating a structure. According to FEMA (2009), elevating structures can range from $29-$96 per square foot, depending on the type of foundation and the type of elevation. An average cost $67 per square foot multiplied by an average house size of 2,300 square feet generated an average cost of $154,100. For ease of playing the game, I rounded down the cost to $150,000 per 2,300 square foot structure.

Beach Nourishment

The cost for beach nourishment varies widely depending on location of dredge site, project size, tidal patterns, and type of dredger used. Additionally, the lifespan of the project must be considered. Depending on use and frequency of storm events,

beach nourishment projects vary in lifespan. I chose an average of five years for the project based on research of local beach nourishment projects. I determined the cost for beach nourishment by researching the cost of recent beach nourishment projects in Florida and adopting the cost of nourishing a large beach in Florida since the Matanzas Basin area contains a few large beaches.

Costs for beach nourishment can vary from \$3-\$15/m^3, depending on the location of the dredge site (Linham & Nicholls, 2010). The average of this is \$9/m^3, which spread over a relatively large beach, like St. Augustine Beach, I estimated to be \$100 million. In retrospect, this figure seems too high, especially for the Matanzas Basin location. For the purposes of the game, however, it was beneficial to have a unit cost easy to work with. Now, given the recent news of sand depletion off the shores of Florida, this cost may not be too far off (Alvarez, 2013).

Living Shorelines

For the living shoreline, I based on the cost on an estimation for constructing a living shoreline from scratch. The cost will vary based on length of shoreline, permitting costs, type of materials used, level of protection desired, and labor. The cost will also vary depending on the type and extent of vegetation already present along the shore. The Center for Coastal Resources Management (2013) finds that living shoreline projects can range from \$50-\$100 per foot using nonstructural methods and from \$150-\$500 per foot using structural methods. Using an average and estimation based on these costs, I chose the cost of \$25,000 per acre for the game. In reality, I think that this cost is more accurate for installing a living shoreline along one acre of land, rather than installing an acre of living shoreline. This distinction between units should have been made clear on the strategy card.

Habitat Migration Corridor, Ecosystem Conservation, and Water Storage Easement

For these three ecosystem-based strategies, the cost was the same: $50,000 per acre. I discussed the costs for these strategies with researchers from GTM NERR. The water storage easement strategy was an idea from researchers at GTM NERR who wanted to introduce participants to innovative strategies. The GTM NERR is currently working on using water storage easements to protect water quality in the Basin.

I determined the cost of $50,000 by researching recent conservation easements purchased in St. Johns and Flagler counties, where the Matanzas Basin is located. Again, this cost is simply a rough estimate. Conservation easements vary widely based on the type and quality of the land under consideration.

Planned Relocation

Planned relocation, otherwise known as managed retreat, involves a number of sub-strategies including buyouts, reconstruction of buildings and roads, rolling easements, rezoning, etc. Since the scenario for the game had a timeframe of planning for the next 20 years, the planned relocation strategy encompassed 20 years' worth of planned relocation strategies, the specifics of which were not addressed. Given that planned relocation can involve many sub-strategies, some of which are very costly like building roads, I created a very rough estimate the cost of planned relocation. It is important to note that in the Matanzas Basin area, there is relatively low development in comparison to other coastal communities around the state.

For planned relocation in the Matanzas area, I decided on the estimate of $700 million. It is a round number, making it easier for players to work with. It also fits in with the amount of money provided to players, which had to be in relation to the much lower

costs of the other strategies. Hence $700 million is purely an estimate and in practice, planned relocation will likely cost much more.

APPENDIX F
PILOT TESTING

Pilot testing was a key aspect of game development, resulting in many important changes to the game. I conducted the first pilot test on September 2, 2012 with five college-age adults. All individuals were vaguely familiar with the issue of sea level rise, but were unfamiliar with the adaptation strategies presented. It was very helpful to test the game on a group of sea level rise novices because it underscored the importance of using as much nontechnical language as possible. After this test, I edited the game instructions to be more detailed and provide more time for discussion among players.

On September 10, 2012, I conducted the second pilot test with the students in Dr. Kathryn Frank's Advanced Environmental Planning class in the University of Florida Department of Urban and Regional Planning. I conducted the third pilot test on October 5th, 2012 with the students in Dr. Frank's Environmental Planning and Management class. Both classes of students were fairly familiar with sea level rise concepts and adaptation strategies. These students also had a background in urban planning, unlike the individuals of the first pilot test and individuals of the study sample. Being in environmental planning classes, the students played the game with a more critical eye towards how the strategies related to the physical environment compared to a group of non-environmental planning students. Despite the students' evident bias towards environmental concerns and background in urban planning, the classes provided good testing grounds for the game from a practical standpoint, offering many suggestions to improve the game content and make it easier to play. Below I discuss the major changes and developments in the game. (See Appendix B and Appendix C for the final game design and materials.)

Scenario Development

One of the main changes to the game after pilot testing was the addition of more information to enhance the game and provide context for the players to make more informed decisions. The students from Dr. Frank's Advanced Environmental Planning class suggested providing players with a detailed planning scenario as close to reality as possible to set the scene and help players put the adaptation strategies and their stakeholder personas in context. Thus, the scenario subsequently developed reflected the actual planning scenario in the Matanzas Basin. For the purpose of the game, the planning scenario is limited to a 20-year timeframe, making it easier for participants to grasp the situation and focus on choosing strategies. A timeframe helps limit the uncertainty that would normally effect decision-making in a long-run planning scenario.

Playing Cards

The students from the pilot tests suggested adding information to the stakeholder persona and adaptation strategy cards to make it easier for players to adopt their role and better understand the strategy options available. The students closely examined the names originally assigned to the strategies. They suggested that the strategy of relocation, initially entitled "managed retreat" be changed to "planned relocation." One student explained that in climate change discussions, "managed retreat" has a negative connotation. The term "retreat" can make people feel like they are giving up, whereas "planned relocation" gives the strategy a positive spin and makes it seem more proactive.

The playing cards are the primary material players use in the game. There are five persona cards and eight strategy cards. Not only did the pilot tests illustrate the

importance of providing adequate supplemental information on the cards, but they also demonstrated the need to provide players with something visually appealing and professional looking. Mia Renquesens, a graduate student from the University of Florida's Department of Landscape Architecture, designed the cards based on my suggestions. It was important to include images on the cards to illustrate the strategies. We incorporated local images of the Matanzas Basin whenever possible to reinforce the connection between the game and the place. Using local images helped emphasize the aspect of reality in the game. It is important for players to feel that aspect of reality because the game should resonate with participants. Connecting it to the local community allows the game to transcend its position as a simulation and better represent the real world, helping participants grasp the reality of the situation.

Displaying Costs

Initially, I provided costs to participants as an overall cost. For instance, participants were told it would cost $25 million to install seawalls in the area. Initially, I thought that dealing with an overall cost would be easier for participants, reducing the amount of arithmetic involved in playing the game. Participants of the pilot tests, however, expressed a desire to implement the strategies partially in order to employ a wider variety of strategies with their limited amount of money. Given this preference, I converted the costs of the strategies to unit costs. Thus, the cost to install seawalls became $4.25 million per mile.

Using a unit cost rather than a fixed overall cost is a tradeoff. Unit costs demand more of players, requiring the use of calculations in developing their strategic plans. Providing one fixed cost per strategy helps avoid the need for this in depth accounting,

which may become a distraction in the game. However, unit costs bring an additional element of reality to the game. Unit costs offer participants another level of decision making, allowing them to determine how much of each adaptation strategy they see as appropriate for their community. Thus, I decided that despite the slight increase in complexity of the game, unit costs would be the preferable way for displaying the costs of the strategies.

Maps

Along with the need for additional information, pilot testing emphasized the importance of visual aids to enhance the participants' experience playing the game. To supplement the written scenario, participants received two maps. The first map depicts one-foot and three-foot elevations in the study area. The *Planning Matanzas* project team generated this map and uses it as part of the workshop presentation. This map provides a rough visualization for where sea level rise effects may be felt given a one-to-three feet rise in sea levels. Using the elevation map for the study area helps educate participants about sea level rise in their area while providing them with a basis on which to make their decisions in the game. In this way, the game furthers its purpose as an educational tool.

The second map was developed specifically for the game based on the suggestion of Dr. Frank. It is a conceptual map and does not correspond geographically to the study area. This map, drawn in Adobe Photoshop, illustrates a fictional shoreline and contains icons representing the adaptation strategies. The map shows participants where different strategies can be employed. For instance, either a seawall or a living shoreline can be used on the shoreline. The map assists participants

with understanding how the strategies interrelate. Participants can see how the seawall acts as a physical obstruction, hindering the implementation of other strategies, like a habitat migration corridor.

Data Collection Instruments

Although case studies and theoretical articles by researchers about role-play and simulations influenced the development of the data collection instruments, I found the pilot tests very useful for the refinement of these instruments. Initially, I only asked participants to fill out a post-evaluation with their group after playing the game. To enhance the scope and breadth of data collection, I determined that the game should include individual pre and post-surveys. The pre and post-surveys allow the researcher to collect data about individual stakeholders' preferences. Additionally, the pilot tests demonstrated that many interesting results from the game could not be easily quantified. I determined that I needed a method for collecting a broad scope of qualitative data. Participant observation allows for such qualitative results to be obtained and assessed. In this way, the pilot tests helped me prepare to collect better data when I conducted the actual game.

APPENDIX G
DATA ANALYSIS FOR GROUP INTERVIEWS AND OBSERVATIONS

To consolidate data from the group interviews, I summarized the responses to each interview question and arranged them by groups according to workshops. For example:

Group B: Marineland Evening – Team 1

Used an array of strategies, *recognizing that different stakeholders have different needs*. Found it difficult to agree because they were dealing with strong mindsets, different goals, and different responsibilities. Learned that there is not enough money to come up with the plans they want.

Next, I analyzed the summarized responses for similarities and differences. Noting the similar responses among groups helped determine the general response of the participants. In reading through the response summaries, I italicized similar responses. I highlighted unique answers to examine as potentially interesting outcomes of the game.

Then, I grouped the answers to each group interview question based on similarities and listed them according to most common answer:

How many teams reached a consensus? Did not?

Consensus: 7

No consensus: 7

Generally, what was challenging?

- Challenging to coordinate the different perspectives, needs, and viewpoints.
- The limitations introduced by the financial aspect, hard to grasp and hard to deal with.
- Hard to grasp the entirety of the situation – all the effects that sea level rise will have.
- Prioritizing strategies – what should be taken care of first?
- Several teams found taking on the persona and sticking to character being challenging.
- Logistics of the game, like dealing with acreages.

What was learned?

- The importance of others perspectives and having a diverse representation of stakeholders on the issue.
- The importance of having an open discussion to approach this issues.
- Learned how strategies interacted and interrelated. Learned how a strategy can benefit multiple stakeholders in ways that are not initially apparent. Several benefits can be realized through one approach.
- It's a difficult situation to approach and resolve because it's so vast.
- Learned how expensive the options are and the financial reality of the situation.
- Learned about planned relocation as a feasible option.
- One group noted that they will pay better attention to this issue in the future because their voice is important.
- "We need to pay attention to the planning process."
- (negatively) learned that government official and inland developer will dominate the situation – felt helpless.

Suggestions for improving the game:

- Increase the time allowed to play the game.
- Clearer representation of strategies, maybe adding other strategies and including the disadvantages.
- Better navigating the acreage/miles for economic costs.
- Increase the amount of money given to players, although one group noted how a limited amount of money helped spur negotiation.
- Adding other personas, like lobbyist or business owner from St. Augustine. One group suggested diversifying stakeholders further into age and socioeconomic groups.

I analyzed data from the observations in a similar way to the group interviews.

First, I summarized each group's observation. Then I combined similar responses and

highlighted unique responses. The data instrument for observations provided journaling guidance in the form of five questions:

- How are participants doing playing their personas? Do they seem to be struggling?
- What ways are participants negotiating?
- What things do participants care about? What adaptation strategies are the groups adopting?
- Is there a general agreement that planning for ecosystems as well as for people is important?
- What are the participants' values and preferences?

Similar and unique observations were organized based on how they answered these journaling guidance questions.

APPENDIX H
DATA ANALYSIS FOR INDIVIDUAL SURVEYS

To begin analysis, I assigned a number to each pre and post-survey was assigned. From the workshops, I collected a total of 74 completed surveys. For data analysis, I divided the data by workshop into four groups: 1) Group A: Marineland morning, 2) Group B: Marineland evening, 3) Group C: St. Augustine morning, 4) and Group D: St. Augustine evening. I arranged the data according to these four groups in a Microsoft Excel spreadsheet.

The first question on the surveys asked participants to rank their top three most preferred adaptation strategies. For analysis, I assigned the answers to these questions weights. The first choice was assigned a weight of three, the second choice a weight of two, and the third choice a weight of one. I coded the remaining strategies with a zero. Weights allowed for me to distinguish the most preferred strategies. Then, I totaled the preferences for each group and for the entire set of surveys. Comparing the totals for the participants' preferences before they played the game to their preferences after they played the game allowed me to determine the change in participants' preferences from playing the game. For the purpose of this research, I compared the preferences compared on the study sample level, rather than on an individual participant level.

To determine if the difference in before and after preferences is significant, I used the Paired Samples T-Test in SPSS Statistics 21:

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before Beach Nourishment	.27	74	.782	.091
	After Beach Nourishment	.23	74	.768	.089
Pair 2	Before Elevating Structures	.39	74	.889	.103
	After Elevating Structures	.32	74	.760	.088
Pair 3	Before Habitat Migration Corridor	.93	74	.926	.108
	After Habitat Migration Corridor	.82	74	.912	.106
Pair 4	Before Seawalls	.19	74	.676	.079
	After Seawalls	.22	74	.647	.075
Pair 5	Before Living Shorelines	1.23	74	1.141	.133
	After Living Shoreline	1.12	74	1.097	.128
Pair 6	Before Planned Relocation	.53	74	.996	.116
	After Planned Relocation	.89	74	1.256	.146
Pair 7	Before Ecosystem Conservation	1.84	74	1.228	.143
	After Ecosystem Conservation	1.53	74	1.337	.155
Pair 8	Before Water Storage Easement	.45	74	.830	.096
	After Water Storage Easement	.53	74	.895	.104

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Before Beach Nourishment & After Beach Nourishment	74	.511	.000
Pair 2	Before Elevating Structures & After Elevating Structures	74	.681	.000
Pair 3	Before Habitat Migration Corridor & After Habitat Migration Corridor	74	.375	.001
Pair 4	Before Seawalls & After Seawalls	74	.469	.000
Pair 5	Before Living Shorelines & After Living Shoreline	74	.349	.002
Pair 6	Before Planned Relocation & After Planned Relocation	74	.418	.000
Pair 7	Before Ecosystem Conservation & After Ecosystem Conservation	74	.537	.000
Pair 8	Before Water Storage Easement & After Water Storage Easement	74	.620	.000

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Before Beach Nourishment - After Beach Nourishment	.041	.766	.089	-.137	.218	.455	73	.650
Pair 2	Before Elevating Structures - After Elevating Structures	.068	.669	.078	-.087	.223	.869	73	.388
Pair 3	Before Habitat Migration Corridor - After Habitat Migration Corridor	.108	1.028	.119	-.130	.346	.905	73	.369
Pair 4	Before Seawalls - After Seawalls	-.027	.682	.079	-.185	.131	-.341	73	.734
Pair 5	Before Living Shorelines - After Living Shoreline	.108	1.277	.149	-.188	.404	.728	73	.469
Pair 6	Before Planned Relocation - After Planned Relocation	-.365	1.234	.143	-.651	-.079	-2.544	73	.013
Pair 7	Before Ecosystem Conservation - After Ecosystem Conservation	.311	1.238	.144	.024	.598	2.160	73	.034
Pair 8	Before Water Storage Easement - After Water Storage Easement	-.081	.754	.088	-.256	.094	-.925	73	.358

From these results, the changes in preference for planned relocation and ecosystem conservation were statistically significant.

The next set of questions asked for responses on a Likert scale. I compared the responses to the pre and post-questions to determine the extent of the game's impact on participant attitudes. For data analysis, I used SPSS Statistics 21 data analysis. Two tests were run and both provided compatible results.

To get an overall sense for the results of the surveys, I used SPSS to generate descriptive statistics:

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
BQ1	74	0	5	3.36	1.309
BQ2	74	0	5	2.73	1.185
BQ3	74	0	5	4.00	1.098
BQ4	74	0	5	3.14	1.231
BQ5	74	0	5	3.82	1.243
BQ6	74	0	5	2.57	1.425
BQ7	74	0	5	3.46	1.387
BQ8	74	0	5	4.41	1.097
BQ9	74	0	5	4.81	.715
AQ1	74	0	5	3.69	1.480
AQ2	74	0	5	3.01	1.350
AQ3	74	0	5	3.91	1.316
AQ4	74	0	5	3.03	1.462
AQ5	74	0	5	3.80	1.404
AQ6	74	0	5	2.26	1.453
AQ7	74	0	5	3.09	1.737
AQ8	74	0	5	4.39	1.412
AQ9	74	0	5	4.36	1.448
Valid N (listwise)	74				

Here, the mean response of each question is of interest. Comparing the before mean responses to the after mean responses provides a sense for the general

response of the study sample to the game. For instance, the first question states that playing the stakeholder persona will be difficult. The average response before the game was 3.36 and the average response after the game increases slightly to 3.69. One generalization that I can make from this slight increase is that players had a more difficult time portraying their stakeholder persona than they initially expected.

Next, I ran the Paired Samples T-Test to determine the difference between the before and after responses:

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	BQ1 - AQ1	-.324	1.664	.193	-.710	.061	-1.676	73	.098
Pair 2	BQ2 - AQ2	-.284	1.700	.198	-.678	.110	-1.436	73	.155
Pair 3	BQ3 - AQ3	.095	1.776	.206	-.317	.506	.458	73	.648
Pair 4	BQ4 - AQ4	.108	1.855	.216	-.322	.538	.501	73	.618
Pair 5	BQ5 - AQ5	.027	1.587	.185	-.341	.395	.146	73	.884
Pair 6	BQ6 - AQ6	.311	1.384	.161	-.010	.631	1.932	73	.057
Pair 7	BQ7 - AQ7	.365	1.610	.187	-.008	.738	1.950	73	.055
Pair 8	BQ8 - AQ8	.014	1.548	.180	-.345	.372	.075	73	.940
Pair 9	BQ9 - AQ9	.446	1.346	.156	.134	.758	2.850	73	.006

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	BQ1 & AQ1	74	.293	.011
Pair 2	BQ2 & AQ2	74	.105	.373
Pair 3	BQ3 & AQ3	74	-.076	.521
Pair 4	BQ4 & AQ4	74	.059	.618
Pair 5	BQ5 & AQ5	74	.285	.014
Pair 6	BQ6 & AQ6	74	.537	.000
Pair 7	BQ7 & AQ7	74	.488	.000
Pair 8	BQ8 & AQ8	74	.259	.026
Pair 9	BQ9 & AQ9	74	.385	.001

According to the results in the Paired Samples Correlations table, Pairs 6 and 7 have a moderate correlation, Pairs 1, 5, 8, and 9 have a slight correlation, and the remaining pairs have weak correlations. At the 95% confidence level, Pairs 1, 5, 6, 7, 8, and 9 are statistically significant as the significance values are less than 0.05. Hence, Pairs 6 and 7 have statistically significant moderate correlations. Pairs 1, 5, 8, and 9 have statistically significant slight correlations.

Since I collected my data on a Likert scale, the data is ordinal. Hence, a nonparametric test is more appropriate for data analysis. I ran the Wilcoxon Signed Ranks Test and used the results to verify my results from the Paired Samples T-Test:

Ranks

		N	Mean Rank	Sum of Ranks
AQ1 - BQ1	Negative Ranks	15[a]	22.50	337.50
	Positive Ranks	29[b]	22.50	652.50
	Ties	30[c]		
	Total	74		
AQ2 - BQ2	Negative Ranks	16[d]	34.00	544.00
	Positive Ranks	37[e]	23.97	887.00
	Ties	21[f]		
	Total	74		
AQ3 - BQ3	Negative Ranks	21[g]	23.83	500.50
	Positive Ranks	22[h]	20.25	445.50
	Ties	31[i]		
	Total	74		
AQ4 - BQ4	Negative Ranks	24[j]	32.88	789.00
	Positive Ranks	30[k]	23.20	696.00
	Ties	20[l]		
	Total	74		
AQ5 - BQ5	Negative Ranks	16[m]	19.72	315.50
	Positive Ranks	20[n]	17.53	350.50
	Ties	38[o]		
	Total	74		
AQ6 - BQ6	Negative Ranks	27[p]	21.24	573.50
	Positive Ranks	14[q]	20.54	287.50
	Ties	33[r]		
	Total	74		
AQ7 - BQ7	Negative Ranks	27[s]	22.35	603.50
	Positive Ranks	16[t]	21.41	342.50
	Ties	31[u]		
	Total	74		
AQ8 - BQ8	Negative Ranks	11[v]	16.73	184.00
	Positive Ranks	17[w]	13.06	222.00
	Ties	46[x]		
	Total	74		
AQ9 - BQ9	Negative Ranks	11[y]	7.73	85.00
	Positive Ranks	2[z]	3.00	6.00
	Ties	61[aa]		
	Total	74		

Test Statistics[a]

	AQ1 - BQ1	AQ2 - BQ2	AQ3 - BQ3	AQ4 - BQ4	AQ5 - BQ5	AQ6 - BQ6	AQ7 - BQ7	AQ8 - BQ8	AQ9 - BQ9
Z	-1.875[b]	-1.551[b]	-.342[c]	-.408[c]	-.281[b]	-1.914[c]	-1.604[c]	-.442[b]	-2.796[c]
Asymp. Sig. (2-tailed)	.061	.121	.733	.683	.779	.056	.109	.659	.005

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

c. Based on positive ranks.

APPENDIX I
REVISED INDIVIDUAL SURVEY

Sea Level Rise Adaptation Role-Play Game
PRE-Survey
(Revised 10/2013)

Demographics:
Age (years): Under 18 18-24 25-34 35-44 45-54 55-64 65-74 75 or older

Gender: Female/Male

Occupation: _____

Relation to the coast (select all that apply):

Own property ☐	Own business ☐	Work private for-profit ☐ sector	Work public sector ☐
Work nonprofit sector ☐	Reside ☐	Visit ☐	None ☐

Length of involvement in the Matanzas Basin (in years): _____

Please answer the following questions to the best of your ability.

1. For each strategy, select how familiar you are:

	Not familiar	Somewhat familiar	Very familiar
Seawalls	☐	☐	☐
Beach nourishment	☐	☐	☐
Elevating structures	☐	☐	☐
Living shorelines	☐	☐	☐
Planned relocation	☐	☐	☐
Ecosystem conservation	☐	☐	☐
Habitat migration corridors	☐	☐	☐
Water storage easement	☐	☐	☐
Direct future development away from the coast	☐	☐	☐

2. For each strategy, select how important you think it is for the Matanzas Basin in the next 20 years:

	Not important	Somewhat important	Very important
Seawalls	☐	☐	☐
Beach nourishment	☐	☐	☐
Elevating structures	☐	☐	☐
Living shorelines	☐	☐	☐
Planned relocation	☐	☐	☐
Ecosystem conservation	☐	☐	☐
Habitat migration corridors	☐	☐	☐
Water storage easement	☐	☐	☐
Direct future development away from the coast	☐	☐	☐

3. Briefly describe planned relocation.

4. Which stakeholders might planned relocation appeal to? Select all that apply.

Local resident ☐	Government official ☐	Environmental scientist ☐
Inland developer ☐	Ecotourism business owner ☐	Other: _____

5. <u>Select the three most important things</u> that need to happen for proactive sea level rise planning to occur:

More, better information and technical assistance ☐	Political leadership ☐	Open discussions among stakeholders ☐	Increased awareness and education ☐
More funding ☐	Policies and programs ☐	Adaptation strategy design and analysis ☐	Economic and social innovation and entrepreneurship ☐
Other: _____			

6. How well do you think your community can work together to plan for sea level rise?

Not well ☐	Fairly well ☐	Very well ☐	Not sure ☐

Why? _____

7. We need to begin sea level rise adaptation planning in the Matanzas Basin now:
8.

Disagree ☐	Neutral ☐	Agree ☐	Not sure ☐

Why? _____

9. Which best describes your attitude: Proactive planning to sea level rise is….

Overwhelming and hopeless ☐	Conceivable and hopeful ☐
Something that does not concern me ☐	Not sure ☐

10. What do you believe your role in sea level rise planning will be? Select all that apply.

More, better information and technical assistance ☐	Political leadership ☐	Open discussions among stakeholders ☐	Increased awareness and education ☐
More funding ☐	Policies and programs ☐	Adaptation strategy design and analysis ☐	Economic and social innovation and entrepreneurship ☐
Other: _____			

Sea Level Rise Adaptation Role-Play Game
POST-Survey
(Revised 10/2013)

Please answer the following questions to the best of your ability.

1. For each strategy, select how familiar you are:

	Not familiar	Somewhat familiar	Very familiar
Seawalls	☐	☐	☐
Beach nourishment	☐	☐	☐
Elevating structures	☐	☐	☐
Living shorelines	☐	☐	☐
Planned relocation	☐	☐	☐
Ecosystem conservation	☐	☐	☐
Habitat migration corridors	☐	☐	☐
Water storage easement	☐	☐	☐
Direct future development away from the coast	☐	☐	☐

2. For each strategy, select how important you think it is for the Matanzas Basin in the next 20 years:

	Not important	Somewhat important	Very important
Seawalls	☐	☐	☐
Beach nourishment	☐	☐	☐
Elevating structures	☐	☐	☐
Living shorelines	☐	☐	☐
Planned relocation	☐	☐	☐
Ecosystem conservation	☐	☐	☐
Habitat migration corridors	☐	☐	☐
Water storage easement	☐	☐	☐
Direct future development away from the coast	☐	☐	☐

3. Briefly describe planned relocation.

4. Which stakeholders might planned relocation appeal to? Select all that apply.

Local resident ☐	Government official ☐	Environmental scientist ☐
Inland developer ☐	Ecotourism business owner ☐	Other: _____

5. <u>Select the three most important things</u> that need to happen for proactive sea level rise planning to occur:

More, better information and technical assistance ☐	Political leadership ☐	Open discussions among stakeholders ☐	Increased awareness and education ☐
More funding ☐	Policies and programs ☐	Adaptation strategy design and analysis ☐	Economic and social innovation and entrepreneurship ☐
Other: _____			

6. How well do you think your community can work together to plan for sea level rise?

Not well ☐	Fairly well ☐	Very well ☐	Not sure ☐

Why? _____

7. We need to begin sea level rise adaptation planning in the Matanzas Basin now:

Disagree ☐	Neutral ☐	Agree ☐	Not sure ☐

Why? _____

8. Which best describes your attitude: Proactive planning to sea level rise is….

Overwhelming and hopeless ☐	Conceivable and hopeful ☐
Something that does not concern me ☐	Not sure ☐

9. What do you believe your role in sea level rise planning will be? Select all that apply.

More, better information and technical assistance ☐	Political leadership ☐	Open discussions among stakeholders ☐	Increased awareness and education ☐
More funding ☐	Policies and programs ☐	Adaptation strategy design and analysis ☐	Economic and social innovation and entrepreneurship ☐
Other: _____			

10. How did your view of adaptation planning change through playing the game?

11. Did you learn anything surprising or unexpected?

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BIOGRAPHICAL SKETCH

Briana Ozor was born in Tampa, Florida and primarily raised in the Tampa Bay area. After graduating from St. Petersburg High School in 2008, Briana came to the University of Florida where she earned her Bachelor of Arts in economics with a minor in sustainability studies. It was during her courses in sustainability that Briana developed her interest in managing the relationship between humans and the natural environment. Briana continued her education at the University of Florida, earning her Master of Arts in urban and regional planning in 2013. She plans to continue her career in environmental planning. Outside of university, she enjoys hiking, cooking, reading, and crafting.