

ABSTRACT

SUDWEEKS, JAYCE DEAN. *Should We Let Them Go: A Narrative Policy Framework Analysis of the Policy Narratives Surrounding the Release of Genetically Modified Mosquitos in Brazil and the Florida Keys.* (Under the direction of Dr. Jennifer Kuzma).

Genetically modified (GM) mosquitos have the potential to reduce the incidence of devastating mosquito borne diseases such as malaria, Zika, and dengue fever. The release of GM mosquitos is highly regulated requiring multiple stages of approval before unrestricted use is permitted. Both opponents and advocates of the technology have attempted to influence release decisions by organizing into policy coalitions. In Brazil, the approval for unrestricted use of GM mosquito technology has been granted, while in the Florida Keys the approval for trial releases has been delayed.

This dissertation uses the Narrative Policy Framework as a theoretical framework to analyze the policy narratives surrounding the decisions to release of GM mosquitos in Brazil and the Florida Keys and seeks to describe, compare and better understand the role of policy narrative in the policy debate regarding the release of genetically modified mosquitos.

Based on the NPF this dissertation investigates the use of narrative characters, narrative strategies and the role of evidence within these policy narratives. This study specifically analyzes the role of hero and villain characters as policy actors which are modeled on the ego-alter dyad construct which permits an examination of policy actors, as well as their actions. To examine narrative strategies this study investigates the use of NPF narrative strategies including the Distribution of Costs and Benefits, the use of Condensation Symbols, and the use of Policy Surrogates. To understand the role of evidence this study examines (a) the different types of evidence found in narratives and (b) how evidence is used.

The use of narrative characters, narrative strategies and the role of evidence are examined in three different ways: (i) from the perspective of winning and losing coalitions within each

country (ii) from the perspective of combined winning coalitions and the losing coalitions (iii) from the perspective of coalitions that supported or opposed GM mosquito releases across the Brazilian and US policy subsystems.

Research results highlight important ways in how NPF narrative components were used in GM mosquito policy narratives. Winning and losing coalitions within the Florida Keys and Brazil policy subsystems differed in the types of policy actors found in their coalitions and how they used hero and villain elements. In general, the use of hero narrative elements is more pronounced than the use of villain narrative elements.

Winning and losing coalitions in both policy subsystems differed in the types of evidence found in their policy narratives and how that evidence was used. The winning and losing coalitions did not significantly differ in the presence of scientific evidence in their policy narratives. The *ipso dictum* evidence type was the only type of evidence that demonstrated difference in usage between the winning and losing coalitions and was associated with winning policy coalitions.

The use of evidence was more closely associated with whether a coalition had a pro-GM or anti-GM stance toward the GM mosquito technology. Pro-GM coalitions used evidence to support their pro-GM mosquito policy solution while the anti-GM coalitions used evidence to refute or argue against the use of GM mosquitos.

The use of NPF narrative strategies in both regions often differed from what was postulated by traditional NPF hypotheses and was more closely aligned with pro-GM or anti-GM technology stances of the coalitions rather than whether they were a winning or losing coalition.

Few NPF narrative components were significantly associated with both winning coalitions' narratives in Brazil and the Florida Keys or in both losing coalitions' narratives across

the two countries. The potential influence of NPF narrative components to create winning policy narratives is context dependent including coalition membership and geographic location.

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Should We Let Them Go: A Narrative Policy Framework Analysis of the Policy Narratives
Surrounding the Release of Genetically Modified Mosquitos
in Brazil and the Florida Keys

by
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DEDICATION

This dissertation is dedicated to my family.

To my wife, Jen, I will be forever grateful for the support and love you have shown me during this graduate school adventure. I turned our life upside down and you stood by me every step of the way. There is no way I could have accomplished this lifelong dream of becoming a PhD. without your willingness to sacrifice so many things to support me.

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BIOGRAPHY

Jayce Dean Sudweeks was born in Murray, Utah and raised in Twin Falls, Idaho. He attended Brigham Young University in Provo, Utah where he earned a Bachelor of Science degree in Molecular Biology in 1992 and a Master of Science degree in Molecular Biology in 1995. Upon completing his master's degree, Jayce worked 15 years in various positions for a global supply chain management company. In the Fall of 2013, Jayce began the Doctor of Philosophy program in Public Administration at North Carolina State University. During his time as a Ph.D. student, Jayce was awarded an interdisciplinary NSF Fellowship to study the implications of using genetic engineering to control agriculturally important pests. Jayce's research interests focused on the regulation and governance of non-crop based genetically modified organisms. During his final year of his Ph.D. program, Jayce worked as the Genomics & Society Advisor for Genome BC, a Canadian nonprofit organization based in Vancouver, British Columbia, that funds genomics research. Jayce completed his Ph.D. in Public Administration in 2019 and will join the faculty at Georgia Southern University as an Assistant Professor in the fall of 2019.

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CHAPTER ONE: Introduction

1.1 Introduction

Mosquitos are the deadliest creatures in the world because they act as a vector for microorganisms and viruses that cause deadly human diseases such as malaria, dengue fever, zika, chikungunya and yellow fever (Ramsey, 2018; WHO, n.d.). According to the World Health Organization (WHO), over 3.2 billion people in 95 countries are exposed annually to malaria with 214 million infections and 438,00 deaths (“WHO | Malaria,” n.d.). It has been estimated that 3.9 billion people in 128 countries are exposed annually to dengue fever with 390 million infections per year (Bhatt et al., 2013; Brady et al., 2012).

For some mosquito-borne diseases such as yellow fever, cheap and effective vaccines exist, while for malaria and dengue fever, vaccines are still being developed, or for the most part are not yet effective (Arama & Troye-Blomberg, 2014; McArthur, Sztein, & Edelman, 2013). For diseases such as malaria, pharmaceutical compounds can be utilized to treat patients with the disease, although the effectiveness of these drugs are waning due to resistance (Ashley et al., 2014). Even with vaccines and pharmaceuticals, the recommended method to combat these diseases is through control mechanisms such as bed nets, routine pesticide application and removal of standing water where mosquitos breed and deposit their eggs (WHO, 2011). Most of these physical control mechanisms rely on the cooperation and assistance of individuals to use bed nets and keep their local surroundings clear of standing water. Individuals might not have the resources, time or inclination to perform these control mechanisms, which undermines the entire mosquito-control process (Tapia-Conyer, Betancourt-Cravioto, & Méndez-Galván, 2012).

The advent of biotechnology in the early 1990s brought hope that insect populations, including mosquitos, could be controlled through the application of genetic engineering techniques. Molecular biologists have inserted specific genetic sequences into some insects’

genomes that kill or severely disable females before they reach maturity (Fu et al., 2007; Horn & Wimmer, 2003). Scientists have hypothesized that if genetically modified (GM) mosquitos were released into the environment and allowed to breed with wild mosquito populations under the correct circumstances, the GM mosquitos could eliminate or greatly reduce the natural mosquito population, which should greatly reduce or eliminate mosquito borne diseases due to the loss of the mosquito vector (Alphey et al., 2002; Burt, 2003). Genetically modified mosquitos have been developed for the mosquito species that help cause dengue fever, Zika and chikungunya (Facchinelli et al., 2013; Harris et al., 2012).

Recently, two countries, Brazil and the United States, have attempted to apply GM mosquito technology to control the mosquito species that cause dengue fever, zika, and chikungunya. In both countries, because these mosquitos are genetically modified organisms, their release and usage are regulated by the government (Meghani, 2017; Meghani & Kuzma, 2018; Mendonça-Hagler, Souza, Aleixo, & Oda, 2008). One key stage in this governance process is the approval of trial releases of a small number of GM mosquitos directly into the wild to study the efficacy of the technology (Andrade, da Silva Ferreira, Muniz, & de Casto Lira-Neto, 2018; Kuzma, 2019; Lin, 2017; Meghani & Kuzma, 2018). If the trial releases demonstrate that the technology is effective in mosquito control another round of regulatory approval is required to allow unrestricted use of the mosquitos. Both trial releases and unrestricted use require approval from some type of local, regional or national governmental agency (Aldrich, 2015; Andrade et al., 2018). In both the United States and Brazil, coalitions composed of scientists, government regulators, health agencies, industry, universities, and various environmental and development non-governmental organizations (NGOs) are found that support or oppose the release of GM mosquitos.

In Brazil, trial releases of GM mosquitos started in 2011. This work was carried out through a three-group collaboration including (1) Oxitec, a for-profit corporation that supplied the GM mosquito technology, (2) Moscamed, a Brazilian nonprofit service provider that reared the mosquitos, provided outreach activities and released the mosquitos, and (3) the University of Sao Paulo who provided technical and field assistance in breeding and rearing the mosquitos. The results of a series of trial releases proved successful in decreasing the mosquito population, although no reduction in disease incidence was demonstrated. An unrestricted release permit was granted by the national governing body, National Technical Biosafety Commission (CTNBio), on April 10, 2014.

In the United States, several cases of Dengue fever appeared in the Florida Keys in 2014. To combat this potential health concern, the Florida Keys Mosquito Control District (FKMCD) contracted with Oxitec to provide genetically modified mosquitos as a control mechanism (Oxitec, 2016a). As part of the federal regulatory decision process for a trial release, the Food and Drug Administration (FDA) ruled that the Oxitec GM mosquito would have no significant impact on human health or the environment and approved the first trial release in the town of Key Haven in the Florida Keys (FDA, 2016; Oxitec, 2016b). Due to local resistance to the FDA release decision, the Florida Keys Mosquito Control Board decided to base their final decision to use GM mosquitos on the results of two nonbinding referendums; one voted on by the citizens of Key Haven and another voted on by the citizens of Montgomery County, where Key Haven is located. The citizens of Key Haven decided against the releases, while the county voters approved the release (Servick, 2016). After the results of the voting, the FKMCD decided against releasing the GM mosquitos in Key Haven. The FDA then ruled that the mosquito releases could not move forward in Key Haven and that if a new release site was proposed that

the federal approval process would need to be completed again (Friends of the Earth, 2016; Meghani & Kuzma, 2018).

1.2 Problem Statement

Based on the serious and deleterious effects of mosquito borne diseases and the potential for GM mosquito technology to overcome gaps present in current control methods it is somewhat surprising to some scientists and stakeholders that GM mosquito technology has received such a mixed response. Winneg et al. (2018) reported that only 58% of Americans were strongly or somewhat in favor of using genetically modified mosquitoes to fight Zika virus. A better understanding of the policy debates surrounding the release decisions could provide insight into the factors that potentially influenced the release decision, however, a general understanding of the policy debates surrounding the release of GM mosquitos is incomplete. This study can help policy makers, policy advocates and policy experts understand how to structure effective and successful policy narratives used in policy debates to help achieve their policy solutions and potentially identify potentially dishonest or unethical practices.

1.3 Policy Narratives

During the policy debates surrounding the release of GM mosquitos, coalition members on both sides used various types of written media including press releases, newsletters, reports and websites to articulate their viewpoints and promote their policy preference of supporting or opposing the release of GM mosquitos. When these organizations presented their viewpoints on the release of GM mosquitos it was more than just facts or tables of data. This information was organized into a written form which can be classified as a narrative. Narratives can be used to shape beliefs and motivate action, as has been noted in a variety of disciplines including communications (McComas & Shanahan, 1999), marketing (Mattila, 2000), neuroscience (Ash, Moore, Vesely, & Grossman, 2007), and psychology (Gerrig & Egidi, 2003).

The influence of narratives on public policy has been studied extensively by post-positivist policy researchers as a way for people to communicate their priorities, values and understanding of policy issues (Roe, 1994; D. A. Stone, 2002). Post-positivists view and study narratives as social constructs based on the concept “that it is the social act of assigning meaning to objects and processes that is of signal importance when analyzing public policy” (Jones & McBeth, 2010, p. 334). This research is performed using qualitative methods with very broad definitions of a narrative that make comparison between policy issues and generalizations difficult.

A more positivist approach to the role of narratives in the policy process is represented by the Narrative Policy Framework (NPF). According to the NPF, stakeholders strategically construct and distribute policy narratives to influence public opinion and policy outcomes (McBeth & Shanahan, 2005; E. A. Shanahan, McBeth, Hathaway, & Arnell, 2008). While NPF acknowledges that robust policy debates are influenced by traditional political resources such as money, rules, and votes, it proposes that in many policy conflicts, engagement occurs at the narrative level. Here, competing policy coalitions attempt to legitimize their policy position and gain success through a winning policy narrative (McBeth, Shanahan, Arrandale Anderson, & Rose, 2012).

1.4 Narrative Policy Framework

This study uses the Narrative Policy Framework as a theoretical framework to better understand the role of policy narratives in the policy debates regarding the release of GM mosquitos (Jones, Shanahan, & McBeth, 2014; E. Shanahan, Jones, McBeth, & Radaelli, 2017). The NPF postulates that policy narratives have defined and discernable characteristics that can be operationalized and quantitatively analyzed, enabling their description and permitting comparisons and identification of differences. The NPF has been used to describe policy

narratives and identify narrative differences between opposing coalitions in policy domains such as wildfire policy (D. A. Crow et al., 2017), gun control (Merry, 2015; Smith-Walter, Peterson, Jones, & Reynolds Marshall, 2016), hydraulic fracturing (Gupta, Ripberger, & Collins, 2014), health care (Smith-Walter, 2018), higher education policy (Price, 2018), and nuclear energy (Gupta et al., 2014). This collective research has shown that opposing coalitions structured their narratives differently and these differences can influence policy decision makers and the public. This study assumes that the policy narratives found in the debates regarding the release of GM mosquitos use the structural elements and narrative strategies identified in the NPF and that the differences in narrative elements and strategies can provide greater insight into the difference in release decisions.

NPF identifies three component parts of the policy narrative: narrative elements, narrative strategies, and policy beliefs. Narrative elements help portray a policy problem in a specific manner and then provide the author's proposed policy solution as the answer. Narrative elements can include a plot, a policy solution, setting, and characters such as a hero or villain. Narrative strategies represent the tactical use of narrative elements to expand or contain the scope of a policy issue in order to influence flow of resources and policy actors in the policy arena. Policy beliefs are akin to the moral compass embedded within narratives and form their normative dimension (Jones et al., 2014).

This study applies the NPF concepts of narrative characters and narrative strategies to describe and compare the GM mosquito policy narratives from the United States and Brazil. This study will also examine the role of evidence within these policy narratives as it is closely associated with both narrative characters and narrative strategies.

This study specifically focuses on the hero and villain narrative characters as policy actors. Both these characters can perform roles within the narrative and can be played by a variety of actors, including nonprofits, individuals, government organizations, for-profit corporations, and the public. In this study the hero and villain characters are modeled on the ego-alter dyad construct that is utilized in social network research. The ego-alter dyad construct contains an ego character that performs some type of action that affects an alter (Borgatti, Mehra, Brass, & Labianca, 2009). From an NPF perspective, the ego represents the hero or villain, that is played by an actor, that is paired to an alter through some type of action. A character actor has defined actions associated with it and the dyad represents the combination of the character actor and its action. (Weible, Olofsson, Costie, Katz, & Heikkila, 2016). The ego-alter dyad structure is useful beyond its ability to allow a comparison of characters within policy narratives. It provides the ability to examine specific character actors, and their associated actions. This level of detail can provide greater insight into the actions of policy actors and how they may influence policy narratives, policy debates and policy decisions.

To examine narrative strategies this study will use a subset of NPF narrative strategies previously used in other NPF research. These narrative strategies include the Distribution of Costs and Benefits (E. A. Shanahan, Jones, McBeth, & Lane, 2013), the use of Condensation Symbols (McBeth, Shanahan, Arnell, & Hathaway, 2007), and the use of a Policy Surrogate (McBeth et al., 2007). The use of these strategies is valuable as the NPF provides potential hypotheses and rationale as to why different coalitions would use a particular type of narrative strategy. A more in-depth explanation of the various narrative strategies will be provided in the literature review in Chapter 2.

Evidence plays a key role in the policy process. Weible (2008) compared several policy process theories and identified that different types of evidence are present and that evidence can be used in different ways. When examining the role of evidence in policy narratives this study will look at (a) the different types of evidence found in the narrative and (b) how the evidence is used within the policy narrative.

To study the types of evidence found in the GM mosquito policy narratives this study will adopt a classification schema proposed by Smith-Walter et al. (2016) that identified five types of evidence used in policy narratives. These types of evidence include; Public Opinion Polls, Scientific Studies, Statistics, *ipso dictum*, and Laws and Legal Authority. An additional evidence type, localized knowledge, which is often used in the discussions on the use of GM organisms will also be used in this analysis. A more in-depth explanation of these types of evidence will be provided in the literature review in Chapter 2.

To understand how the five types of evidence are used within the GM mosquito policy narratives this study will apply a classification model introduced by Schlaufer (2016). This model identifies seven ways in which evidence can be used in policy narratives. These uses include: (a) demonstrating the policy problem, (b) downplaying the policy problem, (c) supporting the policy solution, (d) refuting the solution of opponents, (e) embellishing the hero, (f) demonizing the villain, and (g) evidence as the focus of the narrative. A more detailed explanation of the various use of evidence in policy narratives will be provided in Chapter 2 literature review.

Figure 1.1 identifies the various methods that will be used to describe and compare GM mosquito policy narratives.

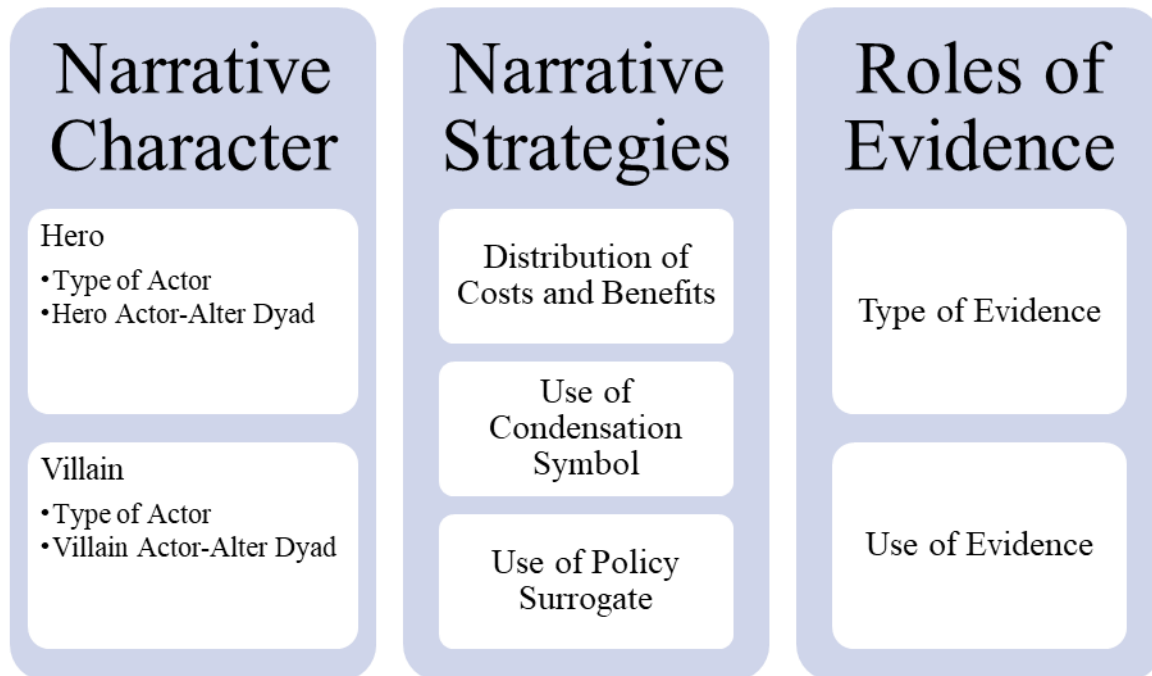


Figure 1.1: Methods to Describe and Compare Policy Narratives.

The ability to examine the policy narratives surrounding the release of GM mosquitos in both Brazil and the Florida Keys provides an opportunity to explore the role of policy narratives in release decisions in three different ways.

First, the policy narratives of coalitions within Brazil and the Florida Keys will be compared from the perspective of winning and losing coalitions. Because release decisions have been determined it is possible to identify policy winners and losers in each country. A policy winner is defined as the coalition that supported and advocated for the policy decision ultimately approved by the authorized decision maker. A policy loser is the coalition that opposed the policy decision approved by the authorized decision maker. In the case of Brazil, where approval was granted for GM mosquito releases, the winning coalition was the group that supported releases while the losing coalition was the group that opposed releases. In the United States, where release approval was denied, the winning coalition was the group that opposed the

release while the losing coalition was the group that supported releases. This analysis will identify policy narrative differences between policy coalitions within each country.

Second, the policy narratives of the winning coalitions from Brazil and the Florida Keys will be combined to create a “combined winning” coalition category. A similar grouping of policy narratives of the losing coalitions from Brazil and the Florida Keys will be used to create a “combined losing” coalition category. The policy narratives of the combined winning and combined losing coalitions can be compared to identify narrative elements that might be associated with winning or losing policy decisions regardless of location.

Third, the policy narratives will be compared from the perspective of coalitions that supported the release of GM mosquitos (pro-GM) or opposed the release of GM mosquitos (anti-GM). The difference in release decisions between Brazil and the Florida Keys is unique in that the winning coalition in Brazil supported the release of mosquitos (pro-GM) while the winning coalition in the Florida Keys opposed the release of GM mosquitos (anti-GM). To gain a better understanding of how this difference in release decision might have occurred the policy narratives of the coalition that supported releases in Brazil will be compared to the supporting coalition in the Florida Keys. A similar comparison will be conducted for the coalitions that opposed releases. This cross-subsystem comparison can potentially identify policy narrative differences that might be specific to Brazil or the United States and that possibly contribute to the variation in release decisions. Figure 1.2 displays the various GM mosquito policy coalitions and policy subsystems that will be described and compared in this research.

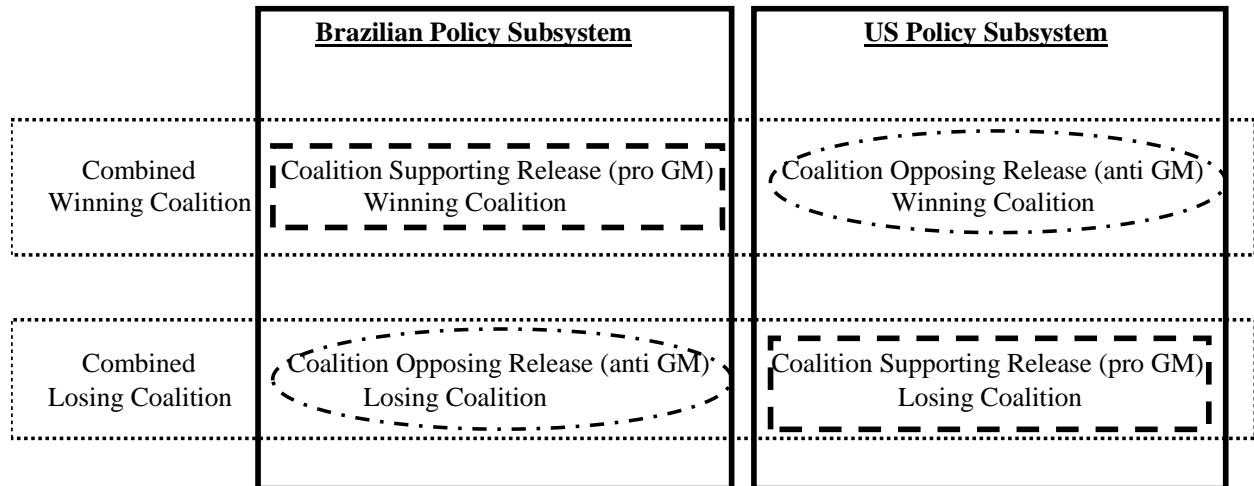


Figure 1.2: GM Mosquito Policy Coalitions and Policy Subsystems.

1.5 Research Purpose and Research Questions

This study applies the Narrative Policy Framework to analyze the policy narratives surrounding the decisions to release of GM mosquitos in Brazil and the Florida Keys for two purposes. First, this dissertation will describe the policy narratives of coalitions involved in the debate regarding the release of genetically modified mosquitos. Second, this dissertation seeks to determine if there are significant differences in policy narratives in terms of narrative characters, narrative strategies and the role of evidence and why differences might exist.

This dissertation seeks to describe, compare and better understand the role of policy narrative in the policy debate regarding the release of genetically modified mosquitos and was guided by the following research questions.

1. What influence does the composition of the policy coalitions have on the policy narratives relating to GM mosquito release decisions in Brazil and the Florida Keys?
 - a. What is the membership composition of the policy coalitions in Brazil and the Florida Keys?
 - b. What differences in coalitional composition exist across the Brazilian and Florida Keys policy subsystems?

2. What is the role of narrative characters in the policy narratives related to GM mosquito releases in Brazil and the Florida Keys?
 - a. What differences exist in how character actors, character dyads and character actor actions were utilized in the policy narratives of the following groups:
 - i. winning and losing coalitions in Brazil and the Florida Keys?
 - ii. combined winning coalitions versus combined losing coalitions?
 - iii. pro-GM coalitions as compared to anti-GM coalitions across the Brazilian and Florida Keys policy subsystems?
3. What is the role of evidence in the policy narratives related to GM mosquito releases in Brazil and the Florida Keys?
 - a. What differences exist in how the types and uses of evidence were utilized in the policy narratives of the following groups:
 - i. winning and losing coalitions in Brazil and the Florida Keys?
 - ii. combined winning coalitions versus combined losing coalitions?
 - iii. pro-GM coalitions as compared to anti-GM coalitions across the Brazilian and Florida Keys policy subsystems?
4. What is the role of narrative strategies in the policy narratives related to GM mosquito releases in Brazil and the Florida Keys?
 - a. What difference exists in how narrative strategies were utilized in the policy narratives of the following groups:
 - i. winning and losing coalitions in Brazil and the Florida Keys?
 - ii. combined winning coalitions versus combined losing coalitions?

- iii. pro-GM coalitions as compared to anti-GM coalitions across the Brazilian and Florida Keys policy subsystems?

1.6 Significance of the Study

This dissertation advances the study of the Narrative Policy Framework and the policy process in three significant ways.

First, this study will apply policy process theory to GMO policy. Previous policy studies on biotechnology and genetically modified organisms were conducted from a variety of research perspectives including comparative policy analysis (M. Howlett & Migone, 2010; Michael Howlett & Laycock, 2012; Migone & Howlett, 2009; Montpetit, 2005; Sheingate, 2009), political economy (R. Herring & Paarlberg, 2016), framing (R. J. Herring, 2008), multi-criteria policy analysis (Kuzma, Najmaie, & Larson, 2009), and discourse analysis (Tourangeau, 2017). There appears to be only one instance where a policy process theory, the Advocacy Coalition Framework (ACF), was applied to study the policy processes surrounding the use of biotechnology and was used to analyze the role of science in biotechnology subsystems (Montpetit, 2011). This dissertation directly applies the Narrative Policy Framework, a policy process theory, to examine several important factors in the biotechnology policy process including the role of policy narratives and provides the ability to compare differences between winning and losing coalitions. By using the NPF it will be possible to apply policy process theories to better understand the biotechnology and GMO policy process.

Second, this study extends the scope of the Narrative Policy Framework. In their concluding remarks on the NPF McBeth et. al (2014) stated that they "hope[d] policy process scholars will assist in fanning out to test NPF hypotheses in different policy contexts (e.g., international, across substantive policy areas)" (p. 256). This research helps meet this goal. It is

the first NPF study to perform an international comparison of policy narratives and the first NPF study to examine the policy narratives regarding the use of a genetically modified organism.

Third, this study improves and informs GMO policy practice. The GM mosquito policy subsystem is very similar to the policy subsystems debating the use of other genetically modified organisms. Additionally, the GM mosquito is one of the first genetically engineered organisms that is not agriculturally based that will be released into the environment and not harvested. The policy debates and use of policy narratives surrounding the release of GM mosquitos is a good model to potentially understand the policy debates that will occur with the release of these new types of GM organisms. This study provides insight into how proponents and those opposed to the release of genetically modified mosquitos used narrative characters and narrative strategies in their policy narrative. As Crow and Jones (2018) noted, effective policy narratives require correct usage of narrative elements and strategy and avoiding narrative pitfalls.

1.7 Overview

This dissertation is written in seven chapters. Chapter Two provides a literature review of the Narrative Policy Framework with special emphasis on narrative characters, narrative strategies, and the role of evidence. Hypotheses based on relevant NPF concepts will be presented. Chapter Three discusses the methodology used in the research including the document collection process, operationalization of variables, the content analysis coding process and how the data were analyzed. Chapter Four presents the results of the narrative character analysis. Chapter Five presents the result of the analysis based on the role of evidence. Chapter Six presents the results of the analysis based on narrative strategies. Chapter Seven concludes the dissertation with a summary of the study's major findings, contributions and limitations of the study and direction for future research.

CHAPTER TWO: Literature Review

2.1 Introduction

This dissertation seeks to describe, compare and better understand the role of policy narrative in the policy debate regarding the release of genetically modified mosquitos in Brazil and the Florida Keys. This chapter provides a literature review of the key theories, frameworks and typologies that will be used to address this dissertation's research questions.

The remainder of the chapter is organized in the following manner. Sections 2.2 and 2.3 provide an overview of the Narrative Policy Framework and how it will be applied in this dissertation. Section 2.4 reviews the role of characters in the Narrative Policy Framework and describes how narrative characters will be modeled on the ego-alter dyad. Section 2.5 discusses the role of evidence in policy narratives and provides detailed information regarding the types of evidence that will be investigated, how this evidence is used and hypotheses predicting which types of evidence will be present in the narratives of coalitions that support or oppose the release of GM mosquitos. Section 2.6 explains how narrative strategies are used in policy narratives and provides greater detail on the three narrative strategies that will be used in this dissertation: Distribution of Costs and Benefits, Condensation Symbols, and Policy Surrogates including hypotheses that predict their use by winning and losing coalitions.

2.2 Overview of Narrative Policy Framework

Narratives produced by stakeholders, citizens and the mass media that depict policies, problems, and opponents can shape public opinion and policy agendas (Baumgartner & Jones, 2009; McBeth, Shanahan, & Jones, 2005; D. A. Stone, 2002; Zaller, 1992). The Narrative Policy Framework has been developed over time as a framework to empirically and quantitatively investigate the role and influence of policy narratives in the policy process (Jones & McBeth, 2010). The NPF stipulates that policy narratives have a generalized structure and content that

can vary based on the policy viewpoint of the author which allows quantification and application across different policy contexts (Jones et al., 2014; E. Shanahan et al., 2017).

The Narrative Policy Framework's theoretical foundations are varied and include Stone's (2002) narrative policy analysis, Schattschneider's (1960) issue containment theory, and Jenkins-Smith and Sabatier's (1994) Advocacy Coalition Framework. To make policy narratives amenable to empirical observation, the Narrative Policy Framework identifies three components of policy narratives: narrative elements, narrative strategies, and policy beliefs (E. Shanahan et al., 2017).

Narrative elements purposely portray a particular problem and provide the author's proposed policy solution as the answer (Benford & Snow, 2000). The use of narrative elements allows the creation of a story in the policy narrative and makes it different from other message structures such as lists, chronologies, discourse or memes. Narrative elements include setting, characters, plot, and a moral of the story (policy solution). The setting is the context in which the policy problem occurs. Elements of the setting typically include relatively fixed factors that are rarely disputed such as legal rules and parameters, demographics, geography and environmental characteristics. Plots are typically structured with a beginning, middle and end. They are used to establish relationships between the characters in the narrative and situate the character within the policy setting (Abell, 2004). When examining plots, the NPF typically draws from Stone's (2002) story types. The moral of the story is the recommended policy solution. It is important to note that a policy solution or moral of the story can be to simply maintain the status quo and make no policy change. The main characters identified in policy narratives include heroes, villains, and victims. A more detailed discussion of how narrative characters were used is discussed in Section 2.4 Narrative Characters.

Narrative strategies, the second component of a policy narrative, represent the tactical utilization of narrative elements by policy actors to expand or contain a policy arena. The three most common types of narrative strategies used in policy narratives include: (a) expansion or maintenance of the scope of conflict, (b) the ascription of causal mechanisms, and (c) the devil/angel shift. Narrative strategies and how they applied to this research is discussed in greater detail in Section 2.5 Narrative Strategies.

The third component of policy narratives described by the NPF is policy beliefs or the belief systems of the policy actors. These can be imagined as a shared understanding of the world and is informed by ACF scholarship. The NPF incorporates policy beliefs as key components of policy narratives. Policy beliefs are akin to the moral compass embedded within narratives and form their normative dimension. As identified by Shanahan et al. (2013), “policy beliefs can be thought of as a set of values and beliefs that critically link the “is’s” and “ought’s” of the world to form coalitional actors’ interpretations of reality” (pg. 460). Shared policy beliefs act as the glue that holds policy coalitions together (Weible, 2005; Weible, Sabatier, & McQueen, 2009).

2.3 Level of Analysis

The NPF studies policy narratives at three levels of analysis: the individual level (micro), the group level (meso) and the cultural and institutional level (macro) (Jones et al., 2014). Each level emphasizes a distinct unit of analysis with its own relevant theories and related hypotheses. Focusing on the individual at the micro level, NPF describes how individuals are potentially affected by policy narratives. At the meso-level, NPF focuses on the strategic construction of policy narratives by groups and coalitions in a policy subsystem. At the macro level, NPF theorizes about the policy narratives of institutions and cultures and the role they play in shaping

policy processes and outcomes over substantial periods of time. This research focused on meso-level analysis.

Public policy scholars have recognized that policy making occurs within “subsystems” or “issue networks.” Here groups compete with each other to achieve their preferred solution (Baumgartner & Jones, 2009; Hecl, 1978; Kingdon, 2010; P. A. Sabatier & Jenkins-Smith, 1993). Policy subsystems are an important element of the NPF and can be defined as “semiautonomous decision-making networks of policy participants that focus on a particular policy issue usually within a geographic boundary” (Sabatier, 1987). A policy subsystem contains a variety of policy actors, who group together into different coalitions based on policy preferences, to compete against each other to control a policy issue.

The NPF utilizes policy subsystems as the unit of analysis for meso level studies with analyses focused on the policy narratives created by competing coalitions within the policy subsystem. From an NPF perspective, coalitions strategically construct policy narratives focused on a policy goal or solution in an effort to influence decision makers, a specific constituency, or the public. When constructing their policy narratives coalitions use narrative elements, narrative strategies and beliefs to describe their understanding of the policy problem and how their policy solution can solve the issue. The intent of a coalition’s policy narratives is to make its policy solution the preferred solution within the policy subsystem. The NPF recognizes the importance of other variables in the policy process such as resources, issue salience, and coalition cooperation, but recognizes that effective communication is required for success at the meso level of policy systems (Jones et al., 2014).

2.4 Narrative Characters

Policy narratives differ from other forms of policy communication in that they contain narrative characters. As identified by Jones et al. (2014) a policy narrative should contain at

least one character. The role and function of characters in the NPF is mostly derived from the works of Stone (2002) and Ney (2006). Typical characters studied by the NPF include heroes, villains, and victims. A new type of character, a beneficiary, has been identified by Weible (2016). A hero is portrayed as a protagonist or champion that can fix the policy problem. A villain opposes heroes and is often portrayed as having caused the policy problem or deserves blame for their actions or policy positions. Victims are characters that are affected by the policy problem, helped by the hero, or harmed by the villain. A beneficiary is an “individual or collective that is actually or potentially the receiver of the action by a hero, but is not being hurt or in a position of distress” (Weible et al., 2016, p. 422).

NPF research has shown that characters play an important role in policy narratives. Jones (2013) demonstrated that the hero is the most important character in influencing citizen perceptions of climate change. Crow and Berggren (2014) identified that policy winners are more likely to use villains as characters in their narrative constructs.

This study focused on characters that acted as policy actors. This implies that narrative characters have the agency or ability to take action to solve a specific policy problem. To fulfill this requirement this study used a definition of narrative character presented by Weible (2016). In this formulation a distinction was made between animate and inanimate objects. Characters in policy narratives can only be animate objects, which were defined as "individuals and various forms of collectives (e.g., groups, organizations, countries) that have the ability to take deliberate action or receive action" (Weible et al., 2016, p. 422). Inanimate objects, which are nonhuman individuals and collective objects, lacked agency and "do not have the capacity to play a role as a character in a policy narrative." (Weible et al., 2016, p. 422). Inanimate objects can receive the action of an animate object. For example, in this study, a politician (animate object) could voice

support for the use of genetically modified mosquitos (inanimate object). Inanimate objects can also “shape [the] action [of] animate objects by structuring the settings under which animate objects act” (Weible et al., 2016, p. 422). For example, in this study, a genetically modified mosquito (inanimate object) might shape the behavior of a nonprofit organization (animate object) to take action in protesting against the company (animate object) that produces the mosquito. The animate and inanimate categorization used for this NPF analysis differs from how these terms are used in common language where a mosquito would be considered “animate.”

As a distinction was made between animate and inanimate objects a method was required to relate them to each other. Weible et. al (2016) applied the concept of egos and alters, commonly used in social network analysis (Borgatti et al., 2009). As identified by Weible "egos are actors (animate objects) that have the ability to take action" (Weible et al., 2016, p. 422). Ego actors can play the role of two types of characters: heroes and villains. Characters (heroes and villains) and their ego actors require an alter to receive their action. Alters can either be an alter character or an alter object. A victim is an example of alter character that is hurt by a villain or helped by a hero in a policy narrative. Alter objects are inanimate objects such as mosquitos, the environment, public policy, public health, etc. As an example, in this study, a nonprofit organization (hero actor) can protest against GM mosquitos (alter object) by rallying citizens (alter victims) in the areas where the mosquitos will be released. In this study the hero and villain characters are defined and structured on the ego-alter dyad.

As shown in Figure 2.1 an ego actor plays the role of a character such as a hero or villain and relates to the alter, either another character or an object, through an action. The actor can be

an individual or a collective like governments, nonprofits organizations, for-profit corporations, and the public.

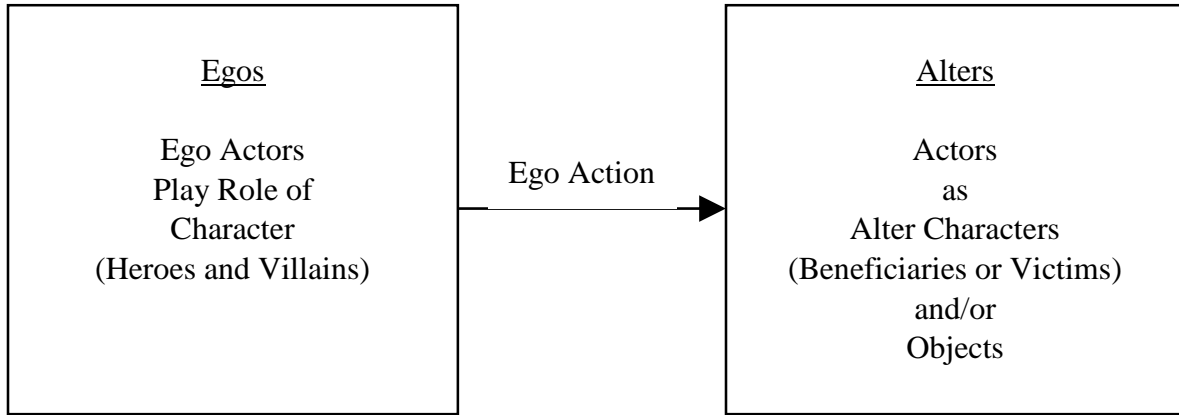


Figure 2.1: Ego-Alter Dyad adapted from Weible et. al (2016).

The application of the ego-alter dyad to define characters in the Narrative Policy Framework is a recent development. As this is the case there is no predefined lists of character actors, actions or alters readily available. To identify these items in the context of the GM mosquito policy debates, an inductive analysis of academic literature and mass media was performed. A variety of sources that discussed both genetically modified organisms in general and GM mosquitos were reviewed. These sources included academic articles and books, government reports and news media articles (Kinchy, 2012; National Academies of Sciences, Engineering, and Medicine, 2016; Schurman & Kelso, 2003; Schurman & Munro, 2010; G. D. Stone, 2010, 2015). From this analysis nine hero actor types, 11 hero actions, and 13 alter categories were identified and are listed in Table 2.2.

Table 2.1: Hero Actors, Actions and Alters.

<u>Potential Hero Actors</u>	<u>Potential Hero Actions</u>	<u>Potential Hero Alters</u>
Foundation	Combat	Mosquitoes
NGO-Activist Organization	Educate	Disease
Company	Resist	Public
Nonprofit Service Provider	Endorse	Scientific Experts
Public	Approve	Government- Non-Regulatory Org
Scientific Expert	Warn	Government-Regulatory Agency
Government- Non-Regulatory Org	Admonish	Industry
Government- Regulatory Agency	Assemble	Regulation
University	Inspect	Technology
	Save	Government Leaders
	Protect	Human Lives
		Human Health
		Environment

From these hero categories 235 hero-alter dyads were created. A list of the hero-alter dyads can be found in Appendix E.

For the villain character, nine actor types, six actions and ten alter categories were identified and are listed in Table 2.3.

Table 2.2: Villain Actors, Actions and Alters.

<u>Potential Villain Actors</u>	<u>Potential Villain Actions</u>	<u>Potential Villain Alters</u>
Foundation	Endangers	Human Lives
NGO- Activist Organization	Resist	Human Health
Company	Collude	Environment
Nonprofit Service Provider	Ignore	Regulation
Public	Deceives	Technology
Scientific Expert	Approve	Government- Non-Regulatory
Government- Non-Regulatory		Department
Government- Regulatory		Government- Regulatory
University		Agency
		Scientific Experts
		Industry
		Public

From these villain categories, 45 villain-alter dyads were created. A list of the villain-alter dyads can be found in Appendix F.

This study described and compared policy narratives by identifying the presence or absence of hero and villain actor types and hero and villain dyads. As this is a new conceptualization of the narrative character in the NPF no predefined hypotheses were postulated.

2.5 Evidence

Evidence plays a key role in public policy (Weible, 2008). In order to understand how evidence can influence the policy process it is necessary to make a distinction between the different types of evidence found in policy debates and how that evidence is used.

2.5.1 Types of Evidence

Types of Evidence in Public Policy

Weible (2008) identified two broad types of evidence used in the policy process: expert-based information and local or community information. Expert-based information is defined as “content generated by professional, scientific, and technical methods of inquiry” (Weible, 2008, p. 616). Typically, expert-based information is generated by applying agreed upon analytical approaches that are defined and validated by professional peers. As identified by Weible (2008), the sources of expert-based information include “the social and natural sciences, policy analyses, government reports, and research coming from universities, think tanks, and consulting firms” (pg. 616). Additional sources of expert-based information include engineering and the humanities. For this study, expert-based information and science or scientific evidence are equivalent and will be used interchangeably.

Local or community-based evidence can be defined as knowledge and information gathered and understood about a topic through experiential learning experiences in relation to a specific place that is not codified and often shared through non-written communication (Adams, 2004; Huntington et al., 2002; van Kerkhoff & Lebel, 2006). From a policy perspective,

localized evidence is usually believed to be of lesser importance than scientific evidence because the latter is legitimized from perceptions that science is neutral and dispassionate (Ozawa, 1991). Adams (2004) and Smith-Walter (2016) have identified that additional types of evidence beyond the dichotomy of scientific and localized evidence can be found in the policy process. Descriptions of these additional types of evidence and their role in the policy process and policy narratives will be introduced in a later section.

Types of Evidence in the NPF

Most NPF studies have focused exclusively on knowledge-based or scientific evidence (Smith-Walter et al., 2016). Recently Smith-Walter (2016) proposed a typology of the different types of evidence that could be found in policy narratives. This typology was used to investigate the different types of evidence found in policy narratives surrounding the policy debates regarding firearms safety. They found that the types of evidence used by the opposing coalitions were significantly different (Smith-Walter et al., 2016). To describe and analyze of the types of evidence found in the GM mosquito policy narratives this study adapted this categorization. The typology contains five different types of evidence including: Scientific Studies, Statistics, *ipso dictum*, Public Opinion Polls and Laws and Legal Rulings. This typology lacked any reference to localized or community-based knowledge as a potential type of evidence, so a sixth type of evidence, Tacit or Localized Knowledge, was added. A brief description and operationalization of each evidence type are found in Table 2.3.

Table 1.3: Types of Evidence.

Type of Evidence	Description and Operationalization
Scientific Studies	Narrative uses a scientific study or scientific research as a source of facts.
Statistics	Narrative uses any numbers or figures/graphs that represent numbers, that is not connected to a scientific study or public opinion poll.

Table 1.3: (Continued).

<i>ipso dictum</i>	Narrative appeals to an individual as an authority owing to their fame, position or title as a piece of evidence.
Public Opinion Polls	Narrative uses any citation or reference to a public opinion poll.
Laws and Legal Rulings	Narrative refers to any law, legal ruling or regulatory decision as evidence.
Tacit or Localized Knowledge	Narrative appeals to a knowledge source outside of scientific and legal origin that could be based on indigenous or experiential learning experience.

Adapted from Smith-Walter et al. (2016)

The science and technology surrounding the development and use of GM mosquitos is complex and highly technical. In an attempt to explain and defend this technology it is expected that the coalitions that support the use of GM mosquitos (pro-GM) will contain more references to scientific studies (Sarewitz, 1996). In the debates surrounding the use of genetically modified crops it has been noted that localized and tacit farming knowledge was a key component of agricultural success in less developed countries and that the application of GM technology could disrupt this cycle (G. D. Stone, 2004). A potentially similar argument can be made for insect control methods and it is expected that coalitions that oppose GM mosquitos (anti-GM) will contain more references to tacit or localized knowledge.

The following hypotheses predict the types of evidence that will be found in the policy narratives of the coalitions that support or oppose the release of GM mosquitos.

Hypothesis 1: Coalitions supporting the use of GM mosquitos will have more references to scientific studies.

Hypothesis 2: Coalitions opposing the use of GM mosquitos will have more references to tacit or localized knowledge.

2.5.2 Uses of Evidence

Uses of Evidence in Public Policy

After a review of the use of evidence in public policy literature, Weible (2008) summarized that evidence can be used in policy making in three general ways including: (a)

instrumental- where evidence has a direct impact on policy, (b) political- where evidence is used to manipulate policy actors in a policy debate (Knorr, 1977; Pelz, 1978; Rich, 1975) and (c) to foster learning, belief change, and policy change over long periods of time (P. A. Sabatier, 1987; Weiss, 1977).

Focusing specifically on how evidence is used in policy process research, Weible (2008) examined four major policy process theories and highlighted some key uses of evidence in policy formation and change that are listed below:

- Evidence is used by policy actors to identify policy problems and evaluate policy solutions
- Policy actors use knowledge-based information for political gain
- Differences in how evidence is used and interpreted can lead to the creation, maintenance, or alteration of policy images
- Evidence can be used to expand the scope of conflict of a policy debate and influence the mobilization of resources
- Scientific evidence is a key element in many types of policy change as it can be used to legitimize a proposed policy solution and also discredit or refute a competing policy solution
- Agreement on the interpretation and application of scientific evidence is only possible when the policy community is unified
- Coalitions can use evidence to recruit allies and fight opponents
- Scientific evidence is a key component of policy debates in complex or highly technical policy domains

These uses of evidence are very similar to how knowledge-based information is used in the Narrative Policy Framework.

Use of Evidence in the NPF

According to NPF theory when evidence is used in policy discussions it isn't just presented as scientific facts and technical information but is incorporated into policy narratives (Schlaufer, 2018). NPF studies have used evidence as a narrative element to study policy narratives in a variety of ways. This includes using it as a proxy to measure and uncover differences in policy beliefs between different coalitions (McBeth, Shanahan, Hathaway, Tigert, & Sampson, 2010; McBeth et al., 2005; E. A. Shanahan, Jones, & McBeth, 2011; E. A. Shanahan et al., 2013, 2008), as a control for coalitional policy learning (McBeth et al., 2007; O'Bryan, Dunlop, & Radaelli, 2014), and as a way to measure scientific uncertainty as a narrative strategy (Gupta et al., 2014; McBeth et al., 2007). The results of NPF studies exploring the role of evidence in policy narratives have been mixed. At the meso level, researchers found that sometimes evidence influences policy (McBeth & Shanahan, 2005; Radaelli, Dunlop, & Fritsch, 2013) and in other contexts it does not (E. A. Shanahan et al., 2013, 2008). At the micro-level, NPF studies demonstrated that in certain contexts policy narratives with evidence are more persuasive (Jones, 2014; Veselkova, 2014).

To understand how evidence is used in the policy narratives of coalitions interested in the release of GM mosquitos, this study applied a typology of the uses of evidence proposed by Schlaufer (2018). While Schlaufer's work focused exclusively on scientific evidence, the typology is also applicable to other types of evidence. Schlaufer (2018) states that "previous NPF scholarship has not used a consistent approach in describing how evidence is embedded in a policy narrative and, to date, no attempt has been made to systematize how evidence is used in

narratives” (pg. 91). In contrast to previous uses of evidence within the NPF, Schlaufer (2018) postulates that evidence could be linked to all narrative elements. Schlaufer (2018) explained the various relationships:

When evidence is used to demonstrate a policy problem, it is associated with the setting; when used to support a coalition’s preferred policy solution, evidence is linked with the moral of the story; but evidence may also be associated with characters, or become the center of the plot of a narrative (pg. 91).

This typology of the narrative uses of evidence stipulates that how evidence is used depends on which narrative element it is associated with and evidence may be “embedded in a narrative in different ways” (Schlaufer, 2018, p. 94). Schlaufer presented seven different uses of evidence in policy narratives which included: (a) demonstrating the policy problem, (b) downplaying the policy problem, (c) supporting the policy solution, (d) refuting the solution of opponents, (e) embellishing the hero, (f) demonizing the villain, and (g) evidence as the focus of the narrative. A brief description of each type of evidence is found in Table 2.4.

Table 2.4: Uses of Evidence.

Use of Evidence	Description
Demonstrating the Policy Problem	Evidence is used to argue/identify/validate that a problem exists and that a policy change is needed.
Downplaying the Policy Problem	Evidence is used to argue/invalidate that a problem exists, or the policy problem defined by the opposing coalition is not problematic.
Supporting the Policy Solution	Evidence is used to demonstrate the superiority of the proposed policy solution such that the problem can be solved, and the situation controlled.
Refuting the Solution of Opponents	Evidence is used to identify the faults and issues of an alternative policy solution.
Embellishing the Hero	Evidence is used to embellish the hero as a character that uses evidence to fix the policy problem. Hero uses evidence to control the situation and to find the best possible policy solution.

Table 2.4: (Continued).

Demonizing the Villain	Evidence is used to demonize the narrative’s villain or buttress the villain’s evilness. Narrative suggests that evidence is misused by villain.
Evidence as the Focus of the Narrative	The evidence itself is the focal point of the narrative. Narrative can be used to question/critique the evidence or undermine the evidence presented by an opposing coalition.

Adopted from Schlauffer 2018

In this analysis each of the different types of evidence identified in Table 2.6 will be paired with each of the different uses of evidence. This pairing will permit an examination of each type of evidence and how it may be used. This combination of Smith-Walter’s (2016) types of evidence with Schlauffer’s (2018) characterization of types of evidence should provide a comprehensive view of the role of evidence in GM mosquito policy narratives. As this is the first use of these typologies together it is difficult to hypothesize any particular result, however, it is expected that the winning and losing coalitions will differ in the types of evidence found in their narratives and how that evidence is used. Another expectation is that coalitions will differ in how they use each type of evidence.

2.6 Narrative Strategies

Narrative strategies represent the tactical utilization of narrative elements to expand or contain the scope of a policy issue in order to influence flow of resources and policy actors in the policy arena (McBeth et al., 2007, 2010; E. A. Shanahan et al., 2011). Coalitions employ narrative strategies in their policy narratives in an attempt to influence the public’s and decision-makers’ policy preferences. The narrative strategies used by coalitions can help explain how policy actors achieve their policy objectives within the policy process. NPF research has typically focused on three strategies: causal mechanisms, the angel/devil shift, and the scope of conflict.

As described by Shanahan et. al (2017) causal mechanisms (CM) “strategically arrange narrative elements to assign responsibility and blame for a policy problem” (p. 178). The NPF’s understanding and coding of causal mechanism is based on Stone’s (2002) discussion of narrative battles over causes. Stone (2002) identified four causal mechanisms including: intentional, mechanical, inadvertent, and accidental. Shanahan et al. (2013) adapted these causal mechanisms for the NPF and provided some basic descriptions. An intentional CM has an actor who is purposefully causing harm for narrow benefit. The mechanical CM denotes an arrangement where actions are unguided, but consequences intended such as when a system naturally produces harmful results. The inadvertent CM depicts a story where some act intended to produce good is producing unforeseen negative side effects. Finally, the accidental CM is a situation where there was no intended outcome guided by directed behavior; fate has simply placed upon us an unfortunate circumstance. Casual mechanism strategies are not explored in this analysis.

The angel/devil shift, a strategy borrowed from the Advocacy Coalition Framework, stipulates that political actors will describe or portray their opponents in ways to overstate the power and “evilness” of their opponents while simultaneously understating their own power (P. Sabatier, Hunter, & McLaughlin, 1987). NPF scholarship postulates that devil shift and angel shift are political and narrative strategies that coalitions use to build or maintain support for their policy solutions (Merry, 2017). This is also not explored in this analysis.

NPF narrative strategies based on the scope of conflict are influenced by the work of Schattschneider (1960), Pralle (2006) and Baumgartner and Jones’ (2009). When coalitions employ scope of conflict based narrative strategies, they construct policy narratives to either expand or contain policy issues (McBeth et al., 2007; McBeth, Shanahan et al., 2010). When

policy coalitions find themselves on the losing side of a policy issue, they employ narrative strategies that aim to expand the scope of conflict to mobilize indifferent citizens and groups in an attempt to alter the policy status quo. When a coalition is winning a policy battle, they use narrative strategies to contain the scope of conflict in an effort to maintain the policy conditions favorable to them and minimize chance of other policy actors becoming involved in the policy debate.

McBeth et al. (2007) identified several different narrative strategies based on the expansion or maintenance of the scope of conflict that coalitions could employ. The strategies investigated in this study include the (a) distribution of costs and benefits of preferred and opposing policy solutions, (b) the use of condensation symbols, (c) and the use of policy surrogates. Each of these narrative strategies will be discussed in greater detail below.

2.6.1 Distribution of Costs and Benefits

Introduced by McBeth et al. (2007) and based on Stone's (2002) concept of "distributions," the narrative strategy of distribution of costs and benefits examines how a policy coalition constructs and portrays who benefits from a policy solution and who pays the costs as a way to expand or maintain the scope of conflict of a policy debate. Coalitions use policy narratives to portray the distribution of costs and benefits. When utilizing the distribution of costs and benefits, coalitions will portray the distribution of costs and benefits differently depending on whether they are describing their own policy preference or an opposing policy solution (E. A. Shanahan et al., 2013).

A losing coalition, when focused on the winning coalition's policy solution, will attempt to expand the conflict by portraying the winning solution in such a way that only a few groups benefit from the status quo solution while many groups end up paying the costs. By diffusing costs (many pay) and concentrating benefits (few benefit), a losing coalition attempts to bring

more attention to the policy issue by mobilizing the public and attracting new policy actors into the coalition. When referring to their own policy solution, a losing coalition will portray a situation where the policy solution diffuses benefits to the many and concentrates the costs on the few. This creates a situation where many groups benefit from the solution while only a few pay for it.

When a winning coalition describes their policy solution, they diffuse the benefits to many groups and concentrate the costs to a smaller number of groups in an attempt to maintain the status quo policy solution and reduce the chance of a wide-scale mobilization. When addressing the losing policy solution, they will either ignore it or identify situations where the costs are diffused, and the benefits concentrated. The following hypotheses identifies how distribution of costs and benefits will be used in the GM mosquito policy narratives (Gupta et al., 2014; McBeth et al., 2007).

Hypothesis 3a: When describing their own policy solution winning and losing coalitions will stress the diffusion of benefits in their narrative.

Hypothesis 3b: When describing their own policy solution winning and losing coalitions will stress the concentration of costs in their narrative.

Hypothesis 4a: When describing the winning policy solution, the losing coalition will stress the concentration of benefits in their narrative.

Hypothesis 4b: When describing the winning policy solution, the losing coalition will stress the diffusion of costs in their narrative.

Hypothesis 5a: When describing the losing policy solution, the winning coalition will ignore the losing policy solution.

Hypothesis 5b: When describing the losing policy solution, the winning coalition will stress the concentration of benefits in their narrative.

Hypothesis 5c: When describing the losing policy solution, the winning coalition will stress the diffusion of costs in their narrative.

2.6.2 Condensation Symbols

This narrative strategy was introduced by (McBeth et al., 2007) and refers to the importance of symbols in the policy process. When discussing the importance of a policy image in the policy process Baumgartner and Jones (2009) noted that “every public policy problem is usually understood, even by the politically sophisticated, in simplified and symbolic terms” (p. 26). The use of images and symbols helps reduce or condense complicated policy issues into simple and memorable forms that are understandable to non-policy experts and the general public (Achter, 2004).

Coalitions can use condensation symbols to influence the scope of conflict surrounding a policy issue by defining the policy issue and characterizing their opponents. A recent example of a condensation symbol is President Donald Trump’s use of the border wall between Mexico and the United States as a symbol of safety and protection from invaders that closely ties to isolationist immigration policies. Winning coalitions will seldom use condensation symbols because they work to limit the scope of conflict and do not want to attract potentially new policy actors or provoke the opposition. Stone (2002) argued that losing coalitions are likely to use symbols in an attempt to increase mobilization and expand the scope of conflict. For example, they can use condensation symbols to portray the issue and their opponents in such a way as to bolster their own supporters and activate additional policy actors that have an interest in the policy problem. The following hypothesis identifies how condensation symbols will be used in the policy narratives of the GM mosquito winning and losing coalitions.

Hypothesis 6: The losing coalition will use condensation symbols more frequently in their policy narratives as compared to the winning coalition.

2.6.3 The Policy Surrogate

This narrative strategy was introduced by Nie (2003) when examining the intractable policy debates surrounding certain resource based policy decisions. He suggested that some policy debates become more complex when policy actors employ the strategy of a “policy surrogate.” This occurs when political actors and coalitions use a less complex policy problem as a surrogate or proxy to “debate larger and more controversial problem” (Nie, 2003, p. 314). In other words, a policy surrogate is a “tactic where a group wraps a narrow issue in a larger issue and often more controversial one” (McBeth et al., 2010, p. 403). The larger issue is most often controversial as it is focused on normative concerns surrounding a difference in values rather than a specific policy issue. An example of the use of a policy surrogate strategy was highlighted by Primm and Clark (1996: p. 1037) when they noted:

Wrangling over carnivore conservation is also often a “surrogate” for broader cultural conflicts: preservation versus use of resources, recreation-based economies versus extraction-dependent economies, urban versus rural values, and states’-rights versus federalism. (p. 1037)

Some examples of policy surrogates identified in NPF studies include anti-vaccination coalitions stating that required vaccinations violates individual rights (Veselkova, 2014), and a pro-wind coalition in the Chesapeake Bay suggesting that using wind power is a stand against terrorism (E. A. Shanahan et al., 2011).

A losing coalition might use a policy surrogate in their policy narratives to envelop their less complex policy issue inside a larger, more contentious issue in an attempt to expand the scope of policy issue to mobilize additional resources and attract new groups to their coalition that might not have been interested in the smaller, less complex issue. In contrast, winning coalitions will want to maintain the status quo and try to isolate the policy issue in an effort to

not attract additional policy actors. The following hypothesis identifies how policy surrogates will be used in the policy narratives of the GM mosquito winning and losing coalitions.

Hypothesis 7: The losing coalition will use policy surrogates more frequently in their policy narratives as compared to the winning coalition.

To simplify the content analysis a predefined list of policy surrogates that could potentially be used in the GM mosquito policy narratives was constructed. These four policy surrogates were identified in the inductive analysis previously described to identify narrative character and their actions. The policy surrogates include (a) the importance of innovation, (b) the GMO regulatory process is not transparent, (c) the GMO regulatory process is not participatory and (d) the GMO regulatory process provides security and safety. These policy surrogates and a brief description are listed in Table 2.5.

Table 2.5: GM Mosquito Policy Surrogates.

Policy Surrogate	Brief Description
Importance of Innovation	Due to the ineffectiveness of current mosquito control methods it is argued that governments, scientists and businesses need unfettered access to use cutting edge technology, like genetic engineering, to innovate new control strategies. Without greater freedom to innovate, current control strategies will become obsolete without an appropriate replacements.
GMO Regulatory Process Not Transparent	The regulatory process that federal governments use to approve the release of GM organisms is not transparent to the general public. The approval process is seen as secretive and much of the data used is protected intellectual property or trade secrets that isn't accessible by the public.

Table 2.5: (Continued).

GMO Regulatory Process Not Participatory	The regulatory process that federal governments use to approve the release of GM organisms is not democratic in that it doesn't allow the public to participate in the decision making process or express concerns with the technology. Even in instances when public input is sought regulators often ignore certain types of concerns.
GMO Regulatory Process Provides Security and Safety	The current federal regulatory approval process for genetically modified organisms adequately evaluates concerns about human health and environmental protection. Citizens and consumers should feel secure that GM technology is safe to use.

2.7 Summary of Hypotheses

Types of Evidence

Hypothesis 1: Coalitions supporting the use of GM mosquitos will have more references to scientific studies.

Hypothesis 2: Coalitions opposing the use of GM mosquitos will have more references to tacit or localized knowledge.

Distribution of Cost and Benefits

Hypothesis 3a: When describing their own policy solution winning and losing coalitions will stress the diffusion of benefits in their narrative.

Hypothesis 3b: When describing their own policy solution winning and losing coalitions will stress the concentration of costs in their narrative.

Hypothesis 4a: When describing the winning policy solution, the losing coalition will stress the concentration of benefits in their narrative.

Hypothesis 4b: When describing the winning policy solution, the losing coalition will stress the diffusion of costs in their narrative.

Hypothesis 5a: When describing the losing policy solution, the winning coalition will ignore the losing policy solution.

Hypothesis 5b: When describing the losing policy solution, the winning coalition will stress the concentration of benefits in their narrative.

Hypothesis 5c: When describing the losing policy solution, the winning coalition will stress the diffusion of costs in their narrative.

Condensation Symbols

Hypothesis 6: The losing coalition will use condensation symbols more frequently in their policy narratives as compared to the winning coalition.

The Policy Surrogate

Hypothesis 7: The losing coalition will use policy surrogates more frequently in their policy narratives as compared to the winning coalition.

CHAPTER THREE: Methodology

3.1 Introduction

This dissertation seeks to describe, compare and better understand the role of policy narrative in the policy debate regarding the release of genetically modified mosquitos in Brazil and the Florida Keys. This chapter addresses the study's research design and methodology, content analysis and coding, the operationalization of variables and data analysis.

This chapter is organized in the following manner. Section 3.2 describes how the various policy coalitions were identified and structured. Section 3.3 defines how narrative characters and policy narratives were used in this dissertation. Section 3.4 outlines the document collection process. Section 3.5 details the content analysis and document coding process. Section 3.6 describes how the various narrative element variables were operationalized for this study. Section 3.7 outlines statistical procedures used to analyze the collected data.

3.2 Construction of Policy Coalitions

As described in Shanahan et al. (2013) this dissertation defines a coalition as “an aggregate of those groups that share the same desired policy output” (p. 464). To identify organizations interested in the release of genetically modified mosquitos, a multiple step search strategy was performed. A LexisNexis search was conducted to identify key newspaper and magazine articles, as well as web postings that discussed GM mosquito releases. The key words used in this search include *Oxitec*, *transgenic mosquito*, *GM mosquito*, *genetically modified mosquito* and *genetically engineered mosquito*. The intent of the search was to identify organizations involved in policy debates regarding the release of GM mosquitos in Brazil and the Florida Keys. Through a review of these articles, additional policy actors were identified and a search for a corresponding website was conducted. This process was iterated until no additional interested parties were identified.

The information gathered from these sites often identified organizations that collaborated on GM mosquito related topics and organizations that might oppose them. Collaborating organizations often issued joint press releases and policy briefs or posted other organizations' documents to their websites. For each organization identified a determination was made as to whether it supported or opposed the release of GM mosquitos. Based on this stance the organization was placed in a coalition that either supported the release of GM mosquitos (pro-GM) or opposed the release of GM mosquitos (anti-GM). Opposing coalitions were created for both the Brazilian and the Florida Keys policy subsystems. Two subject matter experts, one involved in the Brazilian trial releases and another who was an employee of the Florida Keys Mosquito Control District reviewed the proposed coalitions and provided feedback on additional organizations that should be included or organizations that should be removed.

3.3 Defining Narrative Characters and Policy Narratives

The definition of policy characters and policy narratives is based on Weible et al. (2016). As described previously in Section 2.4, narrative characters are policy actors that have the agency or ability to take action to solve a specific policy problem. The narrative character was modeled on the ego-alter dyad construct where the character, played by a character (ego) actor, performs some type of action that affects an alter (Borgatti et al., 2009). This study focused on the hero and villain narrative characters that were defined by the ego-alter dyad construct.

Beyond the presence of a narrative character Weible et al. (2016) stipulated that four other elements were required for a policy narrative. These elements included a topic, setting, locale, and time period. The topic is an issue that is the focus of a policy narrative which could be resolved through policy action. Setting is the context in which the topic is embedded and can include socioeconomic conditions, culture, environment conditions, and institutions. Locale is the geographic location of the policy issue. Time identifies when the policy actions occurred.

According to these criteria, the minimum definition of a policy narrative consists of a narrative character constructed as an ego-alter dyad addressing a specific topic, during a specific time period, situated in a defined locale and setting. Table 3.1 defines the topic, time period and locale for this study. The Brazilian setting for mosquito releases occurred in poor, rural locations where mosquito borne diseases are endemic with many cases occurring during mosquito season. In the Florida Keys the proposed release site is a small, wealthy town located in an end destination tourist location where the occurrence of mosquito borne diseases are very infrequent.

Table 3.1: Policy Narrative Requirement for GM Mosquito Releases.

Categories	Items Measured
Locale	Brazil and Florida Keys
Topic	Release of Genetically Modified Mosquitoes
Time Period	Brazil- 2008 through April 10, 2014; Florida Keys 2008 through Dec 10, 2016

3.4 Document Collection

To identify documents for this analysis, each coalition member’s website was searched utilizing any built-in website search function with the following key words: *Oxitec*, *transgenic mosquito*, *GM mosquito*, *genetically modified mosquito* and *genetically engineered mosquito*. For websites in Portuguese and Spanish, the appropriately translated key words were utilized. For websites that didn’t possess a search functionality, key website sections such as press releases, In the News, and program areas were manually reviewed. Websites and documents in Portuguese and Spanish were translated to English utilizing Google Translate. Documents and website content identified through this search methodology were downloaded and reviewed. Not all websites contained documents discussing the coalition member’s view on GM mosquitos. The document types included reports, press releases, newsletters, blog posts, editorials, op-eds, congressional testimony and website content. These types of documents are classified as public consumption documents as they are disseminated to the public domain (McBeth et al., 2005; E.

A. Shanahan et al., 2013). To be included in the analysis, the document had to specifically identify mosquito releases in Brazil or the Florida Keys and have a publication date on or before the official release decision in each country. The release decision date for Brazil was April 10, 2014, while the release decision date for the Florida Keys was Dec 10, 2016.

Tables 3.2 and 3.3 provide a breakdown of the documents gathered for Brazil and the Florida Keys.

Table 3.2: Breakdown of Brazil Public Consumption Documents by Coalition Type, Document Type and Coalition Member

<i>Brazil Opposition Coalition</i>	Report	Press Release	Newsletter	Letter	Blog Post	Editorial	Letter to Editor	OP-ED	Testimony	Website Content	Total
Food and Water Watch	0	1	0	0	0	0	0	0	0	0	1
GeneWatch UK	2	5	0	0	0	0	0	0	0	0	7
Agricultura Familiar e Agroecologia (AS-PTA)	0	3	5	0	0	0	0	0	0	0	8
Anti-GM Total	2	9	5	0	0	0	0	0	0	0	16
	13%	56%	31%	0%	0%	0%	0%	0%	0%	0%	100%
<i>Brazil Proponent Coalition</i>	Report	Press Release	Newsletter	Letter	Blog Post	Editorial	Letter to Editor	OP-ED	Testimony	Website Content	Total
Moscamed	0	49	0	0	0	0	0	0	0	0	49
Oxitec	0	4	12	0	0	0	0	0	0	0	16
University of Sao Paulo	0	1	2	0	0	0	0	0	0	0	3
Pro-GM Total	0	54	14	0	0	0	0	0	0	0	68
	0%	79%	21%	0%	0%	0%	0%	0%	0%	0%	100%

Table 3.3: Breakdown of Florida Keys Public Consumption Documents by Coalition Type, Document Type and Coalition Member.

<i>Florida Keys Opposition Coalition</i>	Report	Press Release	Newsletter	Letter	Blog Post	Editorial	Letter to Editor	OP-ED	Testimony	Website Content	Total
Center for Food Safety	0	2	0	0	0	0	0	0	0	0	2
ETC Group	0	0	0	0	1	0	0	0	0	0	1
Food and Water Watch	0	6	1	1	0	0	0	0	0	0	8
Friends of the Earth	0	8	1	0	0	0	0	0	0	0	9
GeneWatch UK	3	4	0	0	0	0	0	0	0	0	7
International Center for Technology Assessment (ICTA)	0	1	0	0	0	0	0	0	0	0	1
Third World Network	0	0	1	0	0	0	0	0	0	0	1
Anti-GM Total	3	21	3	1	1	0	0	0	0	0	29
	10%	72%	10%	3%	3%	0%	0%	0%	0%	0%	100%
<i>Florida Keys Proponent Coalition</i>	Report	Press Release	Newsletter	Letter	Blog Post	Editorial	Letter to Editor	OP-ED	Testimony	Website Content	Total
Oxitec	0	11	3	0	0	1	0	1	0	0	16
FDA	2	3	0	0	0	0	0	0	1	0	6
Florida Chamber of Commerce	0	0	0	0	0	0	1	0	0	1	2
Pro-GM Total	2	14	3	0	0	1	1	1	1	1	24
	8%	58%	13%	0%	0%	4%	4%	4%	4%	4%	100%

For the mosquito releases in Brazil and the Florida Keys, this collection of documents defined by release location, coalition membership and a release date represent an enumerated population.

3.5 Content Analysis and Coding Process

Content analysis was used to analyze the public consumption documents identified for this study. Coding was performed at the document level and coders were asked to identify the presence or absence of each variable. The coding structure for this study was complex and involved many variables. To streamline and simplify the coding process two separate coding exercises were performed. The first coding exercise focused on the identification of NPF narrative characters, character (ego) actors and actor-action dyads. The second coding exercise focused on the identification of narrative strategies and the role of evidence. Both coding exercises used the same coding process explained below.

A standardized process was used to code the documents. A script was created to assist and guide the coders. The script highlighted the variables that the coder should attempt to identify in the document. If the variable was found, additional prompts were potentially provided to code additional features of the variable. The script was implemented in Qualtrics to create a coding tool that allowed the coders to step through a selection of prompts to identify the various variables. The script for the narrative character analysis can be found in Appendix A. The script for the narrative strategies and evidence can be found in Appendix B. To assist the coders during the coding process a help sheet was created that contained descriptions of the variables, coding rules, and coding examples. The help sheet for the narrative character analysis can be found in Appendix C. The help sheet for the narrative strategies and role of evidence analysis can be found in Appendix D.

For both coding exercises all documents were analyzed by a single coder using the predefined coding process previously outlined. As a reliability check, a second coder analyzed 50 randomly selected documents (36% of total). Due to the substantial number of variables in both coding exercises there was a high probability that the presence of a specific variable would

be a rare event with potentially only one or two instances where the two coders could confirm the presence of the variable. When utilizing interrater reliability metrics such as Cohen's kappa or Krippendorff's alpha this type of coding situation gives rise to a phenomenon known as Cohen kappa paradox where there is high agreement between coders, but the corresponding interrater reliability metric is often quite low (Wongpakaran, Wongpakaran, Wedding, & Gwet, 2013). This difference is due to the algorithm utilized to determine agreement between coders that could happen by chance. In an effort to overcome any potential issues with Cohen's kappa paradox, Gwet's AC1 was used to assess interrater reliability as the algorithm utilized to determine chance agreement between coders takes into consideration the rare occurrence of a variable due to the large number of potential variables (Gwet, 2008; Wongpakaran et al., 2013).

An interrater reliability analysis using Gwet's AC1 was performed for variables used in the NPF character analysis. To facilitate the subsequent χ^2 analysis, only variables that had five or more occurrences in the coding process were included in the intercoder reliability calculations. Based on agreement criteria presented by Landis and Koch (1977) intercoder agreement was near perfect (0.81 – 1.00) for 56 variables, substantial (0.61 – 0.80) for 29 variables, moderate (0.41 – 0.60) for five variables and fair (0.21 – 0.40) for three variables. Only those character variables that had near perfect, substantial or moderate intercoder agreement were used in subsequent Pearson's Chi-Square analysis. This resulted in the use of six hero actor variables, 45 hero dyad variables, three villain actor variables and 18 villain dyad variables. Table 3.3 presents the interrater reliability results for all narrative character variables that will be used in the χ^2 analysis.

Table 3.4: Interrater Reliability Results for Narrative Character Variables.

Variable Name	Gwet's AC₁	Percent Agreement
NGO Activist Organization Acts as Hero	0.76	0.84
Company Acts as Hero	0.77	0.88
Nonprofit Service Provider Acts as Hero	0.92	0.96
University Acts as Hero	0.83	0.90
Public Acts as Hero	0.43	0.64
Government- Regulatory Agency Acts as Hero	0.53	0.72
NGO Activist Organization Educates the Public	0.91	0.92
NGO Activist Organization Resists Regulations	0.81	0.84
NGO Activist Organization Resists Technology	0.74	0.82
NGO Activist Organization Warns the Public	0.80	0.86
NGO Activist Organization Warns Government Leaders	0.91	0.92
NGO Activist Organization Admonishes Governmental Non-Regulatory Org	0.94	0.94
NGO Activist Organization Admonishes Company	0.76	0.82
NGO Activist Organization Admonishes Governmental Regulatory Agency	0.93	0.94
NGO Activist Organization Protects the Environment	0.92	0.94
NGO Activist Organization Protects Human Health	0.84	0.88
Company Combats Mosquitos	0.48	0.74
Company Combats Disease	0.61	0.80
Company Educates Public	0.80	0.84
Company Endorses Regulation	0.73	0.78
Company Inspects Technology	0.94	0.94
Company Protects Environment	0.94	0.94
Company Protects Human Health	0.91	0.92
Nonprofit Service Provider Combats Mosquitoes	0.92	0.96
Nonprofit Service Provider Combats Disease	0.80	0.90
Nonprofit Service Provider Educates Public	0.81	0.88
Nonprofit Service Provider Educates Scientific Experts	0.81	0.86
Nonprofit Service Provider Educates Governmental Non-Regulatory Org	0.80	0.84
Nonprofit Service Provider Advocates for Technology	0.61	0.80
Nonprofit Service Provider Endorses Regulation	0.96	0.96
Nonprofit Service Provider Assembles the Public	0.89	0.90
Nonprofit Service Provider Assembles Scientific Experts	0.89	0.90
Nonprofit Service Provider Assembles Governmental Non-Regulatory Org	0.81	0.84
Nonprofit Service Provider Inspects Technology	0.98	0.98
Nonprofit Service Provider Protects Environment	0.94	0.94
Nonprofit Service Provider Protects Human Health	0.94	0.94
Public Resists Technology	0.88	0.90
Public Endorses Technology	0.89	0.90

Table 3.4: (Continued)

Public Admonishes Governmental Regulatory Agency	0.96	0.96
Public Inspects Technology	0.66	0.74
Public Protects the Environment	0.98	0.98
Governmental Regulatory Agency Endorses Technology	0.89	0.90
Governmental Regulatory Agency Endorses Regulations	0.89	0.90
Governmental Regulatory Agency Approves Technology	0.84	0.88
Governmental Regulatory Agency Assembles the Public	0.86	0.88
Governmental Regulatory Agency Protects Environment	0.91	0.92
University Combats Mosquito	0.85	0.90
University Combats Disease	0.89	0.92
University Educates Scientific Experts	0.93	0.94
University Endorses Technology	0.77	0.84
University Inspects Technology	0.94	0.94
Company Acts as Villain	0.79	0.86
Governmental Non-Regulatory Org Acts as Villain	0.89	0.90
Governmental Regulatory Agency Acts as Villain	0.89	0.92
Company Endangers the Environment	0.89	0.92
Company Endangers Human Health	0.79	0.84
Company Ignores Regulation	0.89	0.90
Company Ignores Scientific Experts	0.94	0.94
Company Ignores Public	0.70	0.76
Company Deceives Governmental Regulatory Agency	0.74	0.80
Company Deceives Governmental Non-Regulatory Org	0.72	0.78
Company Deceives Public	0.73	0.80
Company Deceives Scientific Experts	0.80	0.84
Governmental Non-Regulatory Org Ignores Regulations	0.94	0.94
Governmental Regulatory Agency Endangers the Environment	0.94	0.94
Governmental Regulatory Agency Endangers Human Health	0.96	0.96
Governmental Regulatory Agency Colludes with Company	0.91	0.92
Governmental Regulatory Agency Ignores Regulations	0.86	0.88
Governmental Regulatory Agency Ignores Scientific Experts	0.94	0.94
Governmental Regulatory Agency Ignores the Public	0.96	0.96
Governmental Regulatory Agency Deceives the Public	0.98	0.98
Governmental Regulatory Agency Approves Technology	0.94	0.94

An interrater reliability analysis using Gwet's AC1 was performed for all variables used in the NPF strategy and role of evidence analysis. Based on agreement criteria presented by Landis and Koch (1977) intercoder agreement was near perfect (0.81 – 1.00) for 65 variables,

substantial (0.61 – 0.80) for nine variables, moderate (0.41 – 0.60) for two variables. Ten variables did not have a Gwet’s AC1 coefficient. This occurred because no instances of these variables were identified by the two coders in the 50 documents that they coded for the interrater reliability analysis. A percent agreement calculation is provided as a measure of interrater reliability. All variables were used in the subsequent χ^2 analysis. Table 3.4 presents the interrater reliability results for the narrative strategy and evidence variables.

Table 3.5: Interrater Reliability Results for Narrative Strategy and Evidence Variables.

Variable Name	Gwet's AC₁	Percent Agreement
Preferred Policy Solution- Benefits Concentrated	Not Calculated	1.00
Preferred Policy Solution- Benefits Diffused	0.65	0.82
Preferred Policy Solution- Benefits Not Mentioned	0.64	0.80
Opposing Policy Solution- Benefits Concentrated	Not Calculated	1.00
Opposing Policy Solution- Benefits Diffused	0.98	0.98
Opposing Policy Solution- Benefits Not Mentioned	0.98	0.98
Preferred Policy Solution- Costs Concentrated	0.93	0.94
Preferred Policy Solution- Costs Not Mentioned	0.93	0.94
Opposing Policy Solution- Costs Concentrated	0.96	0.96
Opposing Policy Solution- Costs Diffused	0.91	0.92
Opposing Policy Solution- Costs Not Mentioned	0.90	0.92
Ability to Innovate is Important	0.96	0.96
Regulatory Process not Transparent	0.96	0.96
Regulatory Process not Participatory	0.95	0.96
Regulatory Process Provides Safety	0.96	0.96
Condensation Symbol	0.72	0.86
Scientific Studies as Type of Evidence	0.62	0.78
Scientific Studies- Support Policy Solution	0.56	0.78
Scientific Studies- Refute Opposing Policy Solution	0.91	0.94
Scientific Studies- Embellish the Hero	0.84	0.86
Scientific Studies- Demonize the Villain	1.00	1.00
Scientific Studies- Center of the Study	1.00	1.00
Statistics as Type of Evidence	0.77	0.86
Statistics- Demonstrate Policy Problem	0.86	0.88
Statistics- Support Policy Solution	0.87	0.90
Statistics- Refute Opposing Policy Solution	1.00	1.00

Table 3.5: (Continued).

Statistics- Embellish the Hero	Not Calculated	1.00
Statistics- Demonize the Villain	1.00	1.00
Public Opinion Polls as Type of Evidence	0.96	0.96
Public Opinion Polls- Support Policy Solution	0.94	0.94
Public Opinion Polls- Refute Opposing Policy Solution	Not Calculated	1.00
Public Opinion Polls- Embellish the Hero	Not Calculated	1.00
Public Opinion Polls- Center of the Study	1.00	1.00
<i>ipso dictum</i> as Type of Evidence	0.81	0.90
<i>ipso dictum</i> - Support Policy Solution	0.60	0.76
<i>ipso dictum</i> - Refute Opposing Policy Solution	1.00	1.00
<i>ipso dictum</i> - Embellish the Hero	0.74	0.84
<i>ipso dictum</i> - Demonize the Villain	1.00	1.00
<i>ipso dictum</i> - Center of the Study	0.98	0.98
Laws and Legal Authority as Type of Evidence	0.88	0.90
Laws and Legal Authority- Support Policy Solution	0.89	0.90
Laws and Legal Authority- Refute Opposing Policy Solution	1.00	1.00
Laws and Legal Authority- Embellish the Hero	0.96	0.96
Laws and Legal Authority- Demonize the Villain	0.98	0.98
Laws and Legal Authority- Center of the Study	Not Calculated	1.00

3.6 Operationalization of Variables

In order to provide structure for this section the variables described will be split into three separate sections (a) variables used to describe and analyze narrative characters (b) variables used to describe and analyze narrative strategies and (c) variables used to describe and analyze the role of evidence in policy narratives. All variables were binary in nature where coder(s) identified the presence or absence of the variable in the document. The following sections will describe the variables and provide insight on how they were operationalized. Coding rules and additional information for each variable can be found in the respective help sheets previously described and located in Appendices C and D.

3.6.1 Variables for Narrative Characters

Character (Ego) Actors

This study described and analyzed the hero and villain characters. These characters are based on the ego-alter dyad described by Weible (2016) which contain an ego actor playing the role of a hero or villain, taking an action that affects an alter. The ego actors, their actions and the alters were identified in an inductive analysis as previously described. Table 3.6 contains the different ego actors as well as definitions and how they were operationalized. The same actors can play the role of a hero or a villain.

Table 3.6: Description and Operationalization of Ego Actors.

Variable Name	Definition and Operationalization
Foundation	Foundations are nonprofit organizations that provide funding for research and implementation of important social and health related policy and projects. Only code an organization as a foundation if it is described as a foundation or has the word foundation in its title.
NGO-Activist Organization	These are civil society organizations that are mostly funded by donations or grants. They actively advocate for a specific policy solution through press releases, issuing reports and briefs, communicating with government leaders and organizing public events.
Company	A for-profit organization that receives some type of financial benefit from a policy decision regarding the release of GM mosquitos.

Table 3.6: (Continued).

Nonprofit Service Provider	These are civil society organizations that are mostly funded through government grants and contracts. Usually associated with a government agency. They provide services and outreach on important public health and social issues.
Public	Group of individuals that will be affected by the policy decision regarding the release of GM mosquitos. When a group of people are identified in a narrative, but don't fall into the any of the other hero or villain categories, they should be coded as public.
Scientific Expert	This is an individual or collective that has been identified as possessing greater scientific knowledge about a specific topic due to formal education or training. They can be described as scientists, professors, technicians, or professionals like doctors or lawyers.
Government- Non-Regulatory Org	Government departments and personnel that aren't part of a regulatory agency. This category can include civil servant positions such as school teachers, police, sanitation workers etc., or politically elected officials such as mayors, members of parliament or government board members.
Government-Regulatory Agency	Government agencies and their personnel that make legislatively defined approval decision regarding the use of GM mosquitos.
University	Organizations that are mainly focused on formalized undergraduate/graduate education and research. Only code an organization as a university if it has university in its name or is a commonly known university.

Character (Ego) Actions and Alters

The actor's actions and the alter they affected were combined into a single variable. As previously identified, a script was produced to facilitate the coding process. The first step was to identify an ego actor in the narrative. The next step entailed determining whether the identified actor undertook specific types of actions with respect to a specific alter. The combination of the actor, action and alter created a character as an ego-alter dyad. Table 3.7 operationalizes the specific actions and alters for the hero ego-alter dyad.

Table 3.7: Heroic Actions and Alters.

Variable Name	Operationalization
Combat Mosquitos	Narrative identifies that the hero is taking action to kill, combat, or eliminate mosquitos.
Combat Disease	Narrative identifies that the hero is acting to combat or eliminate disease.
Educate Public	Narrative identifies that the hero is taking action to educate the public about GM mosquitos. Education can be in the form of a presentation at meetings or events, flyers, briefs or reports, media advertising, or jingle.
Educate Scientific Experts	Narrative identifies that the hero is taking action to educate scientific experts about GM mosquitos. Education can be in the form of a presentation at meetings/events and briefs/reports.
Educate Government- Non-Regulatory Org	Narrative identifies that the hero is taking action to educate non-regulatory government personnel about GM mosquitos. Education can be in the form of a presentation at meetings/events and briefs/reports.
Educate Company	Narrative identifies that the hero is taking action to educate industry/company employees about GM mosquitos. Education can be in the form of a presentation at meetings/events and briefs/reports.

Table 3.7: (Continued).

Educate Government- Regulatory Agency	Narrative identifies that the hero is taking action to educate regulatory agency personnel about GM mosquitos. Education can be in the form of a presentation at meetings/events and briefs/reports.
Resist Regulation	Narrative identifies that the hero is taking specific actions to resist current regulation regarding GM mosquitos. These actions can include identifying issues with the regulation, attempting to revise the current regulation, participating in organized protests (meetings or petitions) or performing actions in violation of current regulation. The focus of this action is the regulations, not the technology.
Resist Technology	Narrative identifies that the hero takes specific action to resist the GM mosquito technology. This can include identifying issues with the technology, highlighting/recommending other technologies that perform similar functions or participating in organized protests. The focus of this action is the technology, not the regulation of it.
Endorse Technology	Narrative identifies that the hero takes specific action to support the use of the GM mosquito technology. Support could be in form of providing financial and/or technical resources, political backing or providing favorable comments about the GM mosquito technology.
Endorse Regulation	Narrative identifies that the hero takes specific action to support the regulations that govern GM mosquito technology. Support could be in the form of complying with regulations, politically backing the regulations or speaking favorably about the regulations governing GM mosquito technology.

Table 3.7: (Continued).

Approve Technology	Narrative identifies that a government regulatory agency, either local or national, has approved the use of GM mosquito technology. Only Government- Regulatory Agency can take this action.
Warn Public	Narrative identifies that the hero takes specific action to warn the public about the potential harm or danger of GM mosquito technology.
Warn Government Leaders	Narrative identifies that the hero takes specific action to highlight to government leaders the potential harm or danger of GM mosquito technology.
Admonish Scientific Experts	Narrative identifies that the hero takes specific action to call out scientific experts for inappropriate behavior or lack of responsibility with respect to GM mosquitos.
Admonish Government- Non-Regulatory Org	Narrative identifies that the hero takes specific action to call out non-regulatory government department and/or its personnel for inappropriate behavior or lack of responsibility with respect to GM mosquitos.
Admonish Industry	Narrative identifies that the hero takes specific action to call out a company and/or its employees for inappropriate behavior or lack of responsibility with respect to GM mosquitos.
Admonish Government- Regulatory Agency	Narrative identifies that the hero takes specific action to call out a government regulatory agency and/or its personnel for inappropriate behavior or lack of responsibility with respect to GM mosquitos.
Assemble Public	Narrative identifies that the hero takes specific action to gather the public so that additional activity can occur with them regarding GM mosquitos. This can include events like conferences and rallies or soliciting responses to petitions or feedback.

Table 3.7: (Continued).

Assemble Scientific Experts	Narrative identifies that the hero takes specific action to gather scientific experts so that additional activities relating to GM mosquitos might occur.
Assemble Government- Non-Regulatory Org	Narrative identifies that the hero takes specific action to gather non-regulatory government personnel so that additional activity relating to GM mosquitos might occur.
Assemble Government- Regulatory Agency	Narrative identifies that the hero takes specific action to gather regulatory agency personnel so that additional activity relating to GM mosquitos might occur.
Inspect Technology	Narrative identifies that the hero takes specific action to inspect and/or observe the technology associated with GM mosquitos. This could be a visit to a laboratory, rearing facility or release site. The public also inspects the technology if education events contain samples of mosquitos or discussions of the GM mosquito technology.
Inspect Regulations	Narrative identifies that the hero takes specific action to inspect, investigate or review regulations related to GM mosquitos. This is typically a meeting of some sort.
Save Human Lives	Narrative identifies that the hero takes specific action to save human lives.
Protect Environment	Narrative identifies that the hero takes specific action to protect the environment. Some type of reference to specific protection of the environment needs to be present in the narrative to use this code.
Protect Human Health	Narrative identifies that the hero takes specific action to protect human health. Some type of reference to specific protection of human health needs to be present in the narrative to use this code.

Table 3.8 operationalizes the actions and alters for the villain ego-alter dyad.

Table 3.8: Villains Actions and Alters.

Variable Name	Operationalization
Endangers Human Lives	Narrative identifies that the villain is taking action that will put at risk or harm human life.
Endangers Environment	Narrative identifies that the villain is taking action that will harm or damage the environment.
Endangers Human Health	Narrative identifies that the villain is taking action that will harm or put at risk human health.
Resist Regulation	Narrative identifies that the villain is taking specific actions to resist current regulation regarding GM mosquitos. These actions can include identifying issues with the regulation, attempting to revise the current regulation, participating in organized protests (meetings or petitions) or performing actions in violation of current regulation. The focus of this action is the regulations, not the technology.
Resist Technology	Narrative identifies that the villain takes specific action to resist the GM mosquito technology. This can include identifying issues with the technology, highlighting/recommending other technologies that perform similar functions or participating in organized protests. The focus of this action is the technology, not the regulation of it.
Collude with Government- Non-Regulatory Org	Narrative identifies that the villain secretly plans and cooperates with non-regulatory government personnel to advance their preferred solution for GM mosquitos.
Collude with Scientific Experts	Narrative identifies that the villain secretly plans and cooperates with scientific experts to advance their preferred solution for GM mosquitos.

Table 3.8: (Continued).

Collude with Government- Regulatory Agency	Narrative identifies that the villain secretly plans and cooperates with government regulatory personnel to advance their preferred solution for GM mosquitos.
Collude with Company	Narrative identifies that the villain secretly plans and cooperates with a company to advance their preferred solution for GM mosquitos.
Ignore Regulations	Narrative identifies that the villain performed actions that violate regulatory requirements. This could include not filing correct documentation to blatantly disregarding regulatory requirements.
Ignore Scientific Experts	Narrative identifies that the villain performed actions that are contrary to scientific findings or recommendations.
Ignore Public	Narrative identifies that the villain performed actions that ignore public concerns such as: <ul style="list-style-type: none"> • human health and environmental concerns • the need for public participation in the decision-making process • informed consent from the public.
Deceives Government- Regulatory Agency	Narrative identifies that the villain attempts to deceive regulatory agencies by performing any of the following actions <ul style="list-style-type: none"> • Not providing results of experiments or review • Not allowing an independent third party to review results • Not divulging conflicts of interest • Using fear of Zika virus to push for accelerated regulatory decisions • Not properly identifying and addressing certain risks of GM mosquito technology.

Table 3.8: (Continued).

Deceives Government- Non-Regulatory Org	Narrative identifies that the villain attempts to deceive non-regulatory government personnel by performing any of the actions listed in Deceives Government- Regulatory Agency.
Deceives Public	Narrative identifies that the villain attempts to deceive the personnel by performing any of the actions listed in Deceives Government- Regulatory Agency.
Deceives Scientific Experts	Narrative identifies that the villain attempts to deceive scientific experts by performing any of the actions listed in Deceives Government- Regulatory Agency.
Approve Technology	Narrative identifies that a government regulatory agency has approved the use of GM mosquito technology.

3.6.2 Variables for Narrative Strategies

This section provides the description and operationalization of the variables examined in the narrative strategy analysis. The variables are categorized based on narrative strategy they represent.

Distribution of Costs and Benefits

The narrative strategy of distributing of costs and benefits examines how coalitions portray who benefits from a policy solution and who pays the costs for using the solution. Table 3.9 notes the variables used in this analysis and describes how they are operationalized.

Table 3.9: Variables Studied for Distribution of Costs and Benefits.

Variable Name	Operationalization
Concentrate Benefits	Narrative identifies that only a few (if any) groups will gain benefits with the proposed policy solution.
Diffuse Benefits	Narrative identifies that many groups will gain benefits from proposed policy solution.

Table 3.9: (Continued).

Concentrate Costs	Narrative identifies that only a small number of groups are will incur costs (monetary and other) from the proposed policy solution.
Diffuse Costs	Narrative identifies that many separate groups will incur costs (monetary and other) with the proposed policy solution.

Policy Surrogates

This narrative strategy occurs when political actors and coalitions use their less complex policy problem as a surrogate or proxy to “debate larger and more controversial problem” (Nie, 2003, p. 314). Four potential policy surrogates that could be found in GM mosquito narratives were introduced previously and include: (a) the importance of innovation, (b) the GMO regulatory process is not transparent, (c) the GMO regulatory process is not participatory and (d) the GMO regulatory process provides security and safety. Table 3.10 provides the operationalization of these four policy surrogates.

Table 3.10: Policy Surrogate Variables.

Policy Surrogate	Operationalization
Ability to Innovate is Important	Narrative identifies that governments, scientists and companies need an environment that is conducive to innovation and have greater access to genetic engineering technologies to create innovative mosquito control tools.
Regulatory Process not Transparent	Narrative identifies that the current regulatory approval process for the release of GM mosquitos is not transparent. The regulatory process is confusing and convoluted and important information used in the regulatory decision is not available to the public.

Table 3.10: (Continued).

Regulatory Process not Participatory	Narrative identifies that the current regulatory approval process for the release of GM mosquitos doesn't allow the public to participate in the decision making process or public concerns are ignored.
Regulatory Process Provides Safety	Narrative identifies that the current regulatory approval process for the release of GM mosquitos safeguards human health and environmental protection. Citizens and consumers should feel safe and secure about GM mosquitos as they passed regulatory approval.

Condensation Symbol

This narrative strategy occurs when coalitions use images and symbols to help reduce or condense complicated policy issues into simple and memorable forms that are understandable to non-policy experts and the general public. Table 3.11 provides the description and operationalization of condensation symbols.

Table 3.11: Variable for Condensation Symbol

Variable Name	Description and Operationalization
Condensation Symbol	The narrative contains a symbol, image or language that “reduce[s] complicated concepts into simple, manageable, or memorable forms.”

3.6.3 Variables for the Role of Evidence

This section provides the description and operationalization the variables examined when investigating the role of evidence in policy narratives. The variables are categorized by whether they identify a type of evidence found in a policy narrative or how evidence is used in a policy narrative.

Types of Evidence

When examining the role of evidence in policy narratives a key factor is the type of evidence that coalitions deploy in their narratives. This study adapted a typology created by Smith-Walter (2016) that identifies the types of evidence found in policy narratives. Table 3.14 presents the various variables used to determine the type of evidence and discusses their operationalization.

Table 3.14: Variables for Types of Evidence

Variable Name	Description and Operationalization
Scientific Studies	Narrative uses a scientific study or scientific research as a source of facts.
Statistics	Narrative uses any numbers or figures/graphs that represent numbers, that is not connected to a scientific study or public opinion poll.
<i>ipso dictum</i>	Narrative appeals to an individual as an authority owing to their fame, position or title as a piece of evidence.
Public Opinion Polls	Narrative uses any citation or reference to a public opinion poll.
Laws and Legal Rulings	Narrative refers to any law, legal ruling or regulatory decision as evidence.
Tacit or Localized Knowledge	Narrative appeals to a knowledge source outside of scientific and legal origin that could be based on indigenous or experiential learning experience.

Uses of Evidence

The second factor to investigate when describing and analyzing the role of evidence in policy narratives is how evidence is used. This study adapted a typology of how evidence is used in policy that was proposed by Schlauffer (2018). Table 3.15 presents the variables used to determine the uses of evidence and discusses their operationalization.

Table 3.15: Variables for Uses of Evidence.

Variable Name	Description and Operationalization
Demonstrating the Policy Problem	In the narrative evidence is used to argue/identify/validate that a problem exists and that a policy change is needed.
Downplaying the Policy Problem	In the narrative evidence is used to argue/invalidate that a problem exists, or the policy problem defined by the opposing coalition is not problematic.
Supporting the Policy Solution	In the narrative evidence is used to demonstrate the superiority of the proposed policy solution such that the problem can be solved, and the situation controlled.
Refuting the Solution of Opponents	In the narrative evidence is used to identify the faults and issues of an alternative policy solution.
Embellishing the Hero	In the narrative evidence is used to embellish the hero as a character that uses evidence to fix the policy problem. The hero uses evidence to control the situation and to find the best possible policy solution.
Demonizing the Villain	In the narrative evidence is used to demonize the narrative's villain or buttress the villain's evilness. The narrative can suggest that evidence is misused by villain.
The Center of the Narrative	In the narrative the evidence itself is the focal point of the narrative. Narrative can be used to question/critique the evidence or undermine the evidence presented by an opposing coalition.

3.7 Data Analysis

A Pearson chi-square test of independence was performed for each variable previously described to determine if there were significant differences in the presence or absence of the variable between the winning and losing coalitions in Brazil and the Florida Keys and the combined winning and losing coalitions. For variables that have a defined hypothesis identifying their presence in a specific coalition a significant result will be identified at a p value of 0.05 or less. This includes the variables for the three policy surrogates. For those variables without predefined hypotheses and where many comparisons were made, an appropriate Bonferroni correction was applied. The resulting alpha values ranged from 0.02 to 0.006. For any significant relationships identified by chi-square analysis a Cramer's V was calculated to identify

the strength of the relationship where 0.01 identifies a weak effect size, 0.3 identifies a moderate effect size, and 0.5 identifies a strong effect size.

CHAPTER FOUR: NPF CHARACTER ANALYSIS AND RESULTS

4.1 Introduction

This dissertation seeks to describe, compare and better understand the role of policy narrative in the policy debate regarding the release of genetically modified mosquitos in Brazil and the Florida Keys. Narrative characters play a key role in policy narratives. Coalitions differ in how they portray characters such as heroes and villains in their policy narratives in an effort to influence the public and policy decision makers. In this study narrative characters are viewed as policy actors and are derived from the members of the policy coalitions involved in the debate over the release of GM mosquitos. This chapter examines the role of coalition membership and the use of hero and villain narrative elements in the policy narratives debating the release of GM mosquitos in Brazil and the Florida Keys. The analysis was guided by and addresses the following research questions:

1. What influence does the composition of the policy coalitions have on the policy narratives relating to GM mosquito release decisions in Brazil and the Florida Keys?
 - a. What is the membership composition of the policy coalitions in Brazil and the Florida Keys?
 - b. What differences in coalitional composition exist across the Brazilian and Florida Keys policy subsystems?
2. What is the role of narrative characters in the policy narratives related to GM mosquito releases in Brazil and the Florida Keys?
 - a. What differences exist in how character actors, character dyads and character actor actions were utilized in the policy narratives of the following groups:
 - i. winning and losing coalitions in Brazil and the Florida Keys?
 - ii. combined winning coalitions versus combined losing coalitions?

- iii. pro-GM coalitions as compared to anti-GM coalitions across the Brazilian and Florida Keys policy subsystems?

The remainder of the chapter proceeds as follows. Section 4.2 describes and compares the membership of winning and losing policy coalitions in Brazil and the Florida Keys, the combined winning and losing coalitions, and the pro-GM and anti-GM coalitions. Section 4.3 reports the results for the hero character actors and hero-alter dyad analysis. Section 4.4 presents the results for the villain character actors and villain-alter dyad analysis. Section 4.5 presents a summary of research findings and discusses the various implications.

4.2 Policy Coalitions

This section describes and compares the membership composition of the Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos. First, membership composition will be compared across the winning and losing policy coalitions in Brazil and the Florida Keys. Next, membership of the combined winning and losing coalitions will be discussed. Finally, the coalitions and their members are compared across pro-GM (supported the release of GM mosquitos) and anti-GM (opposed GM mosquito releases) coalitions. This allows a comparison across the two geographic regions or policy subsystems. The focus of the membership analysis is to identify differences in membership that might explain differences in policy narratives and release decisions.

Comparison of Winning and Losing Coalitions

Brazil

Table 4.1 displays the Brazilian GM mosquito policy coalitions. In Brazil, the winning coalition supported the release of the GM mosquitos (pro-GM). Members of this coalition included Oxitec, Moscamed, the National Biosafety Technical Commission, the University of Sao Paulo, the State Health Department of Bahia (SESAB) and the Brazilian Ministry of Health.

Oxitec is the for-profit company that developed and provided the GM mosquito used in Brazil. They also provided genetic engineering technical expertise (Oxitec, n.d.). In the narrative policy analysis Oxitec was coded as a Company. Moscamed was a Brazilian civil society organization that provides pest control solutions to the Brazilian government that eliminates the use of pesticides. Instead, Moscamed uses insects, modified in a variety of ways, as a biocontrol method to reduce insect populations (Moscamed, n.d.). Moscamed was contracted by the Brazilian State of Bahia to conduct trial releases of GM mosquitos in several different locations (Moscamed, 2013a). Moscamed was coded as a Nonprofit Service Provider. The National Biosafety Technical Commission is the main Brazilian regulatory agency authorized to approve the commercial release of genetically modified organisms, including the GM mosquito (CTNBio, n.d.). CTNBIO was coded as a Government- Regulatory Agency. The Brazilian Ministry of Health and the State Health Department of Bahia are federal and state level agencies responsible to monitor, control and combat mosquitos and mosquito borne diseases (Araújo, Carvalho, Ioshino, Costa-da-Silva, & Capurro, 2015). Both were coded as Governmental-Non-Regulatory Orgs. The University of Sao Paulo is a Brazilian public university whose faculty and staff helped Moscamed develop a field laboratory for the GM mosquitos and provided technical expertise for the breeding and rearing of the GM mosquitos (Moscamed, 2011). The University of Sao Paulo was coded as a University.

Table 4.1: Brazil GM Mosquito Policy Coalitions.

Winning Coalition (Support Release)	Losing Coalition (Oppose Release)
Oxitec	Third World Network
Moscamed	Food and Water Watch
National Biosafety Technical Commission (CTNBio)	GeneWatch UK
University of Sao Paulo	ETC Group
State Health Department of Bahia (SESAB)	Agricultura Familiar e Agroecologia (AS-PTA)
Brazilian Ministry of Health	Red América Latina Libre de Transgénicos (RALLT)

In Brazil, the losing coalition opposed the release of GM mosquitos (anti-GM). Members of the losing coalition included Third World Network, Food and Water Watch, GeneWatch UK, ETC Group, Agricultura Familiar e Agroecologia, and Red América Latina Libre de Transgénicos. Third World Network is an international nongovernment organization (INGO) that researches and advocates on development related policy issues for less developed or Southern countries (Third World Network, n.d.). Food and Water Watch is an INGO that focuses on policy issues related to healthy food, clean water and environmental protections (Food and Water Watch, 2015). GeneWatch UK is an INGO that monitors the development and use of genetic technologies from the perspective of human rights, environmental protection and animal welfare (GeneWatch UK, n.d.). The ETC Group is an INGO that addresses socioeconomic and environmental issues surrounding the use of new technology like genetic engineering (ETC Group, 2005). Agricultura Familiar e Agroecologia is a Brazilian based civil society organization that focuses on family farming and sustainable rural development in Brazil (AS-PTA, n.d.). Red América Latina Libre de Transgénicos is a Latin America based civil society organization that resists the use of transgenic organisms in Latin America (RALLT, n.d.). All of these organizations were coded as NGO- Activist Organizations. A larger discussion about the role of these nonprofits and civil society organizations in the GM mosquito debate will be presented later.

Florida Keys

Table 4.2 displays the Florida Keys GM mosquito coalitions. The winning coalition opposed the release of GM mosquitos (anti-GM). Members of this coalition included Third World Network, Food and Water Watch, GeneWatch UK, ETC Group, Center for Food Safety, Florida Keys Environmental Coalition, and GMO Free Florida. The first four coalition members

have been described previously. The Center for Food Safety is a US based nonprofit organization that works to protect human and environmental health by advocating against the use of potentially harmful food production systems such as genetically modified organisms (Center for Food Safety, 2019). The Florida Keys Environmental Coalition is a Florida Keys based nonprofit organization that works to protect Florida Keys' reefs and ecosystems (Florida Keys Environmental Coalition, 2014). GMO Free Florida is a grassroots nonprofit organization that resists the release of genetically modified organisms into the environment ("About GMO Free Florida," 2019). In the narrative policy analysis, all these organizations were coded as NGO-Activist Organization.

The losing coalition supported the release of GM mosquitos (pro-GM). Members of this coalition included Oxitec, Florida Keys Mosquito Control District, FDA, Florida Chamber of Commerce, and the Florida Chapter of Sierra Club. Oxitec is the for-profit company previously described in the Brazilian GM mosquito coalition and would have supplied GM mosquitos and technical expertise to the Florida Keys Mosquito Control District. The FDA is the US federal agency that was responsible for evaluating the potential human health and environmental impacts of GM mosquitos and authorized the trial releases in the Florida Keys (FDA, 2016; Oxitec, 2016b). The FDA was coded as a Government- Regulatory Agency. The Florida Keys Mosquito Control District (FKMCD) is the local government agency responsible for the monitoring and control of mosquitos throughout the Florida Keys.

FKMCD contracted with Oxitec to evaluate the effectiveness of GM mosquitos as a population control method and made the final decision to not allow the release of GM mosquitos in the Florida Keys. (Florida Keys Mosquito Control District, n.d.). FKMCD was coded as Government- Regulatory Agency. The Florida Chamber of Commerce is a nonprofit business

association that focuses on Florida’s economic growth and development. They supported the release of GM mosquitos due to potential economic impacts of Zika (Florida Chamber of Commerce, 2016). The Florida Chapter of Sierra Club is the Florida chapter of the national nonprofit environmental activist organization that focuses on environmental and ecological policy issues. The Florida Chapter supported the release of GM mosquitos in the Florida Keys (Florida Chapter of Sierra Club, 2016). This organization was coded as an NGO-Activist Organization.

Table 4.2: Florida Keys GM Mosquito Policy Coalitions.

Winning Coalition (Oppose Release)	Losing Coalition (Support Release)
Third World Network	Oxitec
Food and Water Watch	Florida Keys Mosquito Control District
GeneWatch UK	Food and Drug Administration (FDA)
ETC Group	Florida Chamber of Commerce
Center for Food Safety	Florida Chapter of Sierra Club
Florida Keys Environmental Coalition	
GMO Free Florida	

Comparison of Combined Winning and Losing Coalitions

Table 4.3 displays the winning and losing coalitions created by combining the winning coalitions from Brazil and the Florida Keys into a single combined winning coalition and combining the losing coalitions from Brazil and the Florida Keys into a similar combined losing coalition. This arrangement provides the opportunity to look across the two regions to determine if certain narrative characters, narrative strategies and the role of evidence were more likely to be used by winning coalitions or losing coalitions in the policy debates regardless of the geographic location (D. A. Crow & Berggren, 2014).

Table 4.3: Combined Winning and Losing Policy Coalitions.

Combined Winning Coalition	Combined Losing Coalition
Oxitec	Oxitec
CTNBio	FDA
State Health Department of Bahia (SESAB)	Florida Keys Mosquito Control District
Moscamed	Florida Chamber of Commerce
University of Sao Paulo	Florida Chapter of the Sierra Club
Brazilian Ministry of Health	Center for Food Safety
Third World Network	Third World Network
Food & Water Watch	Food & Water Watch
GeneWatch UK	GeneWatch UK
ETC Group	ETC Group
Florida Keys Environmental Coalition	Agricultura Familiar e Agroecologia
GMO Free Florida	Red América Latina Libre de Transgénicos

Comparison of pro-GM and anti-GM Coalitions

The difference in release decisions between Brazil and the Florida Keys offers a unique opportunity to study and understand the role of policy actors, policy narratives and the role of evidence in the GM mosquito policy debate. The winning coalition in Brazil supported the release of GM mosquitos (pro-GM), however, in the US, the winning coalition opposed mosquito releases (anti-GM). The difference in release decisions and the coalitions that supported them allows for a side by side comparison of the supporting and opposing coalitions across policy domains to identify narrative differences that might have an influence on release decisions. This section compares the membership composition of the coalitions that supported the GM mosquito releases (pro-GM), as well as the membership composition of the coalitions that opposed the GM mosquito releases (anti-GM). Any differences in coalition membership

could be a factor in the difference of policy narratives. The coalitions that supported or opposed the release of GM mosquitos in Brazil and the Florida Keys are displayed side by side in Table 4.4.

Coalitions Supporting Release of GM Mosquitos

The coalitions that supported the release of GM mosquitos (pro-GM) share some similar members including Oxitec and the federal regulatory agencies that authorize the release of GM mosquitos, FDA and CTNBIO. There are some differences. In Brazil, the supporting coalition contained two governmental health agencies, the State Health Department of Bahia and the Brazilian Ministry of Health that supported the release of the GM mosquitos. No corresponding support from government health agencies was found in the policy narratives of the Florida Keys coalition. The Brazilian coalition contained the University of Sao Paulo which provided technical expertise and participated in outreach activities. No similar university support was found in the policy narratives of the Florida Keys coalition.

A major difference between the Brazilian coalition and the Florida Keys coalition was the presence of Moscamed, a nonprofit service provider that supplied the Bahian state government with agricultural pesticide services. Moscamed played a significant role in the release of GM mosquitos in Brazil. Together with Oxitec, the University of Sao Paulo, and the Brazilian government, Moscamed organized and managed the Transgenic Aedes Project (PAT) which provided the education and public engagement efforts to support the release of GM mosquitoes (Moscamed, 2013b, 2013c, 2013d). Moscamed, under the aegis of PAT, also bred, raised, released and monitored the GM mosquitos that were used during the trial releases in Brazil (Moscamed, 2013a). Moscamed was the driving force behind PAT. Although Oxitec was

deeply involved in the project, the public face of the GM mosquito releases in Brazil was PAT and Moscamed.

The Florida Keys coalition supporting the release of GM mosquitos (pro-GM) contained coalition members not seen in the Brazilian coalition. Two nonprofit organizations, the Florida Chamber of Commerce and the Florida Chapter of Sierra Club, supported the release of the GM mosquitos in the Florida Keys. Their minimal support was provided late in the project and was focused on using GM mosquitos to combat Zika. No similar nonprofit or civil society support was found in Brazil. The other major difference in the Florida Keys coalition was the presence of the Florida Keys Mosquito Control District. Although the FKMCD originally contracted with Oxitec to investigate the use of GM mosquitos as an alternative mosquito control process, due to public pressure and a referendum vote FKMCD decided to stop any trial releases in Key Haven, Florida. This is type of local government organization and regulatory control point wasn't found in Brazil.

Table 4.4: Comparison of Opposing Coalitions between Brazil and the Florida Keys.

<u>Brazil</u>	<u>Florida Keys</u>
<u>Support Releases (Winning)</u>	<u>Support Releases (Losing)</u>
Oxitec	Oxitec
Moscamed	FDA
CTNBio	Florida Keys Mosquito Control District
State Health Department of Bahia (SESAB)	Florida Chamber of Commerce
Brazilian Ministry of Health	Florida Chapter of Sierra Club
University of Sao Paulo	
<u>Oppose Releases (Losing)</u>	<u>Oppose Releases (Winning)</u>
Third World Network	Third World Network
Food & Water Watch	Food & Water Watch

Table 4.4: (Continued).

GeneWatch UK	GeneWatch UK
ETC Group	ETC Group
Agricultura Familiar e Agroecologia	Center for Food Safety
Red América Latina Libre de Transgénicos	Florida Keys Environmental Coalition
	GMO Free Florida

Coalitions Opposing Release of GM Mosquitos

In both the Florida Keys and Brazil, the efforts to oppose the release of GM mosquitos (anti-GM) was undertaken solely by nonprofit and civil society organizations. However, the types and locations of the organizations often differed between the regions. An INGO or international focused effort to oppose the use of GM mosquitoes occurred in both regions and was conducted by Third World Network, Food & Water Watch, GeneWatch UK, and the ETC Group. These organizations resist the use of GM organisms worldwide and become involved wherever a genetic engineering solution, like GM mosquitos, is proposed. In Brazil, Latin American based NGOs such as Agricultura Familiar e Agroecologia and Red América Latina Libre de Transgénicos focused some effort toward resisting GM mosquitos. Normally these organizations are focused on regional development and agricultural issues but became involved in the GM mosquito debate over concerns with the use of genetic engineering technology. There appeared to be no localized or grassroots level resistance to GM mosquitos in Brazilian locales where trial releases occurred.

In the Florida Keys, there was substantial national and local resistance to GM mosquito releases. The Center for Food Safety, a US based NGO concerned with the use of GMOs, threatened the US Food and Drug Administration (FDA) with a lawsuit claiming that the FDA was negligent in performing the proper environmental assessment (Center for Food Safety,

2016). At the local level, the Florida Keys Environmental Coalition and GMO Free Florida were actively involved in campaigning against the releases. In general, the national and local resistance to GM mosquito releases was much more prevalent in the Florida Keys than in Brazil.

4.3 Hero Narrative Elements

This section describes and compares the use of hero characters actors, hero actor dyads and hero actions (hero narrative elements) in the Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos. First, the use of hero narrative elements will be compared across the winning and losing policy coalitions in Brazil and the Florida Keys. Next, the use of hero narrative elements in the combined winning and losing coalitions will be discussed. Finally, the use of hero narrative elements are compared across pro-GM coalitions (supported the release of GM mosquitos) and anti-GM coalitions (opposed GM mosquito releases). This allows a comparison across the two geographic regions or policy subsystems.

In this dissertation the hero character was modeled and identified based on the ego-alter dyad. From an NPF perspective, the ego represents the hero, that is played by an actor and is paired to an alter through some type of action. A character actor has defined actions associated with it and the dyad represents the combination of the character actor and its action. (Weible et al., 2016).

As noted in the Methodology section nine different type of character actors were originally identified for the hero analysis. However, the Scientific Expert and Government-Non-Regulatory Org character actor type did not meet the minimum interrater reliability requirements for the hero analysis and aren't included in this study. Additionally, the Foundation character actor type was only identified once in all the policy narratives and won't be included in the analysis.

Comparison of Winning and Losing Coalitions

Brazil

Hero Actor

For the hero actor category, documents were coded for the presence or absence of six hero actor types. Table 4.5 displays the results of how hero actors were used in the Brazilian coalitions. The number in the Yes column indicates how many times the hero actor was present in the narrative. The value in χ^2 column is the result of the Pearson chi-square test of independence identifying whether there are any significant differences in the use of the hero actor found between the coalitions. The df column represents the degrees of freedom for the χ^2 test and p-value column presents the corresponding p-value. The term “Not Sig” means not significant. The C.’s V column represents the Cramer’s V value that is used to describe the strength of the relationship between the hero actor and a specific coalition where 0.1 identifies a weak effect size, 0.3 identifies a moderate effect size, and 0.5 identifies a strong effect size.

Four hero actors, NGO Activist Organization (NGOs), Nonprofit Service Provider (Moscamed), Public and Government- Regulatory Agency (CTNBio) showed significant difference in usage between the winning coalition (Oxitec, Moscamed, CTNBio, and health agencies) and losing coalition (NGOs) in Brazil. Moscamed (Nonprofit Service Provider) was found in 94% of the winning coalition’s (pro-GM) narratives and in only 29% of the losing coalition’s (anti-GM) narratives. The Cramer’s V value indicates a strong relationship between the presence of Moscamed and the winning coalition (pro-GM). Public was mentioned in 34% of the winning coalition’s (pro-GM) narrative and was not found in any losing coalition’s narratives. The Cramer’s V value indicates a moderate relationship between the presence of the Public hero actor and the winning coalition. NGO Activist Organization was found in 82% of

the losing coalition’s (anti-GM) narratives and was not found in any of the winning coalition’s narratives. The Cramer’s V value indicates a strong relationship between the presence of the NGO Activist Organization hero actor and the losing coalition. CTNBio was found in 47% of the losing coalition’s narratives and in only 16% of the winning coalition’s narratives. The Cramer’s V value indicates a weak relationship between the presence of the CTNBio and the losing coalition.

Table 4.5: Brazil Hero Actors.

Narrative Element	Policy Coalition						Statistics			
	Brazil Winning (Support) % (n)			Brazil Losing (Oppose) % (n)			χ^2	df	p value	C.’s V
Hero Actor	Yes	No	Total	Yes	No	Total				
NGO Activist Organization	0(0)	100(67)	100(67)	82(14)	18(3)	100(17)	66.212	1	< 0.001	0.888
Nonprofit Service Provider	94(63)	6(4)	100(67)	29(5)	71(12)	100(17)	36.718	1	< 0.001	0.661
Public	34(23)	66(44)	100(67)	0(0)	100(17)	100(17)	8.036	1	0.005	0.309
Government-Regulatory Agency	16(11)	84(56)	100(67)	47(8)	53(9)	100(17)	7.273	1	0.007	0.294
Company	61(41)	39(26)	100(67)	53(9)	47(8)	100(17)	0.383	1	Not Sig	
University	37(25)	63(42)	100(67)	18(3)	82(14)	100(17)	2.36	1	Not Sig	

Hero-Alter Dyad and Actions

Documents were coded for the presence or absence of 45 hero-alter dyads. Table 4.6 identifies that 15 hero-alter dyads differed significantly in the policy narratives examined for the Brazilian policy subsystem. Ten NGO Activist Organization dyads were found in varying frequency, from 76% to 29%, within the narratives of the losing coalition (anti-GM) and were not present in the narratives for the winning coalition (pro-GM). Six of the NGO Activist Organizations dyads exhibited a strong relationship with the losing coalition, while four exhibited a moderate relationship.

Three Nonprofit Service Provider (Moscamed) dyads were found in a high percentage, from 70% to 93%, of the winning coalition's (pro-GM) narrative. Only a very small percentage of the losing coalition's (anti-GM) narratives, from 12% to 29%, contained Moscamed dyads. Two of the dyads exhibited a strong relationship while the remaining dyad had a moderate relationship with the winning coalition. One Public dyad was found in 30% of the winning coalition's (pro-GM) narratives and was not found in the losing narratives. It exhibited a weak relationship with the winning coalition. One Government- Regulatory Agency (CTNBio) dyad was found in 47% of the losing narratives and only 16% of the winning narratives. It exhibited a weak relationship with the losing coalition.

Table 4.6: Brazil Hero-Alter Dyads.

Narrative Element	Policy Coalition						Statistics			
	Brazil Winning (Support) % (n)			Brazil Losing (Oppose) % (n)			χ^2	d f	p value	C.'s V
Hero Dyad	Yes	No	Total	Yes	No	Total				
NGO Activist Organization Educates the Public	0(0)	100(67)	100(67)	29(5)	71(12)	100(17)	20.953	1	< 0.001	0.499
NGO Activist Organization Resists Regulations	0(0)	100(67)	100(67)	53(9)	47(8)	100(17)	39.727	1	< 0.001	0.688
NGO Activist Organization Resists Technology	0(0)	100(67)	100(67)	76(13)	24(4)	100(17)	60.616	1	< 0.001	0.849
NGO Activist Organization Warns the Public	0(0)	100(67)	100(67)	53(9)	47(8)	100(17)	39.727	1	< 0.001	0.688
NGO Activist Organization Warns Government Leaders	0(0)	100(67)	100(67)	29(5)	71(12)	100(17)	20.953	1	< 0.001	0.499
NGO Activist Organization Admonishes Governmental Non-Regulatory Orgs	0(0)	100(67)	100(67)	29(5)	71(12)	100(17)	20.953	1	< 0.001	0.499
NGO Activist Organization Admonishes Company	0(0)	100(67)	100(67)	53(9)	47(8)	100(17)	39.727	1	< 0.001	0.688
NGO Activist Organization Admonishes Government-Regulatory Agencies	0(0)	100(67)	100(67)	29(5)	71(12)	100(17)	20.953	1	< 0.001	0.499

Table 4.6: (Continued).

NGO Activist Organization Protects the Environment	0(0)	100(67)	100(67)	47(8)	53(9)	100(17)	34.848	1	< 0.001	0.644
NGO Activist Organization Protects Human Health	0(0)	100(67)	100(67)	47(8)	53(9)	100(17)	34.848	1	< 0.001	0.644
Nonprofit Service Provider Combats Mosquitoes	91(61)	9(6)	100(67)	12(2)	88(15)	100(17)	45.454	1	< 0.001	0.736
Nonprofit Service Provider Combats Disease	70(47)	30(20)	100(67)	12(2)	88(15)	100(17)	19.017	1	< 0.001	0.476
Nonprofit Service Provider Endorses for Technology	93(62)	7(5)	100(67)	29(5)	71(12)	100(17)	33.473	1	< 0.001	0.631
Public Inspects Technology	30(20)	70(47)	100(67)	0(0)	100(17)	100(17)	6.66	1	0.01	0.282
Government-Regulatory Agency Inspects Technology	16(11)	84(56)	100(67)	47(8)	53(9)	100(17)	7.273	1	0.007	0.294

After demonstrating that certain character actors were portrayed as heroes in policy narratives the next goal is to understand why. This can be done by examining the actions associated with the hero actors in the hero-alter dyad. Table 4.6 identifies the actions that each hero actor performed. The NGO Activist Organization actor was portrayed as engaging in five different types of hero actions: Educate (public), Resist (regulation and technology), Warn (public and government leaders), Admonish (government non-regulatory orgs, Oxitec, CTNBio), and Protect (environment and human health). The NGO Activist Organization dyads were found only in the narratives of the losing coalition (anti-GM) which was completely composed of NGO organizations. These hero actions are how these activist organizations chose to portray themselves in their narratives. From the perspective of a building a winning policy narrative these portrayals may not be the most effective way to portray NGO organizations.

The Nonprofit Service Provider (Moscamed) dyad was associated with Combat (mosquitos and disease) and Endorse (technology) hero actions. Public and Government-Regulatory Agency (CTNBio) were associated with the Inspect Technology hero action. It is

interesting that the winning coalition (pro-GM) highlighted the role of the public in inspecting the GM technology while the losing coalition (anti-GM) emphasized the role of a government regulatory agency doing the inspection. Perhaps an important component of the winning policy narrative in Brazil is that the public was portrayed as a hero by inspecting the technology rather than just relying on the regulatory agency.

Florida Keys

Hero Actor

Table 4.7 displays the results of how hero actors were used in the Florida Keys coalitions. An organization filling the role of a Nonprofit Service Provider was not identified in the Florida Keys policy narratives, so this hero actor type is not included in the description and analysis.

Three hero actors, NGO Activist Organization (NGOs), Company (Oxitec), and Government- Regulatory Agency (FDA) showed significant difference in usage between the winning coalition (anti-GM) and losing coalition (pro-GM) in the Florida Keys. NGO Activist Organization was found in 100% of the winning coalition's narratives (anti-GM) and in only 13% of the losing coalition's (pro-GM) narratives. The Cramer's V value indicates a strong relationship between the presence of the NGO Activist Organization hero actor and the winning coalition. Oxitec was mentioned in 96% of the losing coalition's (pro-GM) narrative and in 64% of the winning coalition's (anti-GM) narratives. The Cramer's V value indicates a moderate relationship between the presence of the Company hero actor and the losing coalition. The FDA was found in 87% of the losing coalition's (pro-GM) narratives and in only 43% of the winning coalition's (anti-GM) narratives. The Cramer's V value indicates a moderate relationship between the presence of the FDA and the losing coalition.

Table 4.7: Florida Keys Hero Actors.

Narrative Element	Policy Coalition						Statistics			
	Florida Keys Winning (Oppose) % (n)			Florida Keys Losing (Support) % (n)			χ^2	df	P value	C.'s V
Hero Actor	Yes	No	Total	Yes	No	Total				
NGO Activist Organization	100(28)	0(0)	100(28)	13(3)	87(21)	100(24)	41.097	1	< 0.001	0.889
Company	64(18)	36(10)	100(28)	96(23)	4(1)	100(24)	7.711	1	0.005	0.385
Government-Regulatory Agency	43(12)	57(16)	100(28)	87(21)	13(3)	100(24)	11.107	1	0.001	0.462
Public	57(16)	43(12)	100(28)	54(13)	46(11)	100(24)	0.046	1	Not Sig	
University	7(2)	93(26)	100(28)	4(1)	96(23)	100(24)	0.211	1	Not Sig	

Hero Dyad and Actions

The narratives gathered for the coalitions within the Florida Keys policy subsystem were coded for the presence or absence of 45 hero-alter dyads. As identified in Table 4.8, twelve nonprofit hero-alter dyads differed significantly in the policy narratives examined. Eight NGO Activist dyads were identified in varying percentages (36% - 96%) within the narratives of the winning coalition (anti-GM) and were found in a very low percentages (0% - 8%) of the losing coalition’s (pro-GM) narratives. Seven of these dyads exhibited a strong relationships with the winning coalition, while one exhibited a moderate relationship.

Three Oxitec dyads were identified in varying percentages (29% - 75%) within the losing coalition’s (pro-GM) narratives and were found in a low percentages (0% - 21%) of the winning coalition’s (anti-GM) narratives. One of these dyads exhibited a strong relationship with the losing coalition, while the other two exhibited moderate relationships. One FDA dyad was found in 71% of the narratives of the losing coalition (pro-GM) and was only found in 25% of the narratives of the winning coalition. This dyad exhibited a moderate relationship with the losing coalition.

Table 4.8: Florida Keys Hero-Alter Dyads.

Narrative Element	Policy Coalition						Statistics			
	Florida Keys Winning (Oppose) % (n)			Florida Keys Losing (Support) % (n)			χ^2	df	P value	C.'s V
	Yes	No	Total	Yes	No	Total				
NGO Activist Organization Resists Regulations	68(19)	32(9)	100(28)	0(0)	100(24)	100(24)	25.662	1	< 0.001	0.703
NGO Activist Organization Resists Technology	96(27)	4(1)	100(28)	0(0)	100(24)	100(24)	48.137	1	< 0.001	0.962
NGO Activist Organization Warns the Public	57(16)	43(12)	100(28)	0(0)	100(24)	100(24)	19.81	1	< 0.001	0.617
NGO Activist Organization Warns Government Leaders	36(10)	64(18)	100(28)	0(0)	100(24)	100(24)	10.612	1	0.001	0.452
NGO Activist Organization Admonishes Company	54(15)	46(13)	100(28)	0(0)	100(24)	100(24)	18.069	1	< 0.001	0.589
NGO Activist Organization Admonishes Governmental Regulatory Agencies	64(18)	36(10)	100(28)	0(0)	100(24)	100(24)	23.597	1	< 0.001	0.674
NGO Activist Organization Protects the Environment	68(19)	32(9)	100(28)	4(1)	96(23)	100(24)	22.148	1	< 0.001	0.653
NGO Activist Organization Protects Human Health	71(20)	29(8)	100(28)	8(2)	92(22)	100(24)	21.078	1	< 0.001	0.637
Company Endorses Regulation	21(6)	79(22)	100(28)	71(17)	29(7)	100(24)	12.787	1	< 0.001	0.496
Company Protects the Environment	0(0)	100(28)	100(28)	50(12)	50(12)	100(24)	18.2	1	< 0.001	0.592
Company Protects Human Health	0(0)	100(28)	100(28)	25(6)	75(18)	100(24)	7.913	1	0.005	0.390
Government-Regulatory Agency Inspects Technology	25(7)	75(21)	100(28)	71(17)	29(7)	100(24)	10.924	1	0.001	0.458

Table 4.8 identifies what actions each of the hero actors performed. The NGO Activist Organization hero actor was portrayed as engaging in four different types of hero actions including: Resist (regulations and technology), Warns (public and government leaders), Admonish (Oxitec and FDA), and Protect (environment and human health). The NGO Activist Organization dyads were found almost exclusively in the narratives of the winning coalition (anti-GM) which was completely composed of activist organizations. These actions are how these activist organizations chose to portray themselves in their narratives. (Oxitec) was associated with two different instances of the Protect (environment and human health) and one instance of the Endorse (regulations) hero action. The FDA was associated with the Inspect Technology hero action.

In the Florida Keys narratives, it is interesting that the FDA was not portrayed as protecting human health and environment and that Oxitec was shown to endorse regulations. These results support the findings of Meghani and Kuzma (2018) and Kumza (2019) that a close relationship exists between Oxitec and the FDA which limits the oversight ability of the FDA and comprises its regulatory authority.

Comparison of Combined Winning and Losing Coalitions

Hero Actor

This arrangement provides the opportunity to look across the two regions to determine if hero character actors or their actions were more likely to be found in winning coalitions or losing coalitions, thus indicating whether certain character actors or their actions are important regardless of location. Table 4.9 displays the results of how hero actors were used in the combined winning and losing coalitions which include Brazil and the U.S. As Moscamed or an

organization similar to Moscamed was not found in the Florida Keys policy narratives it will not be used in this comparative analysis. One hero actor, Government- Regulatory Agency (CTNBio and FDA) showed significant difference in usage between the combined winning and losing coalitions. Government- Regulatory Agency was found in 71% of the losing coalition’s narratives and in only 24% of the winning coalition’s narratives. The Cramer’s V value indicates a moderate relationship between the presence of the Government- Regulatory Agency hero actor and the combined losing coalition.

Table 4.9: Combined Coalitions Hero Actors.

Narrative Element	Policy Coalition						Statistics			
	Combined Winning % (n)			Combined Losing % (n)			χ^2	df	p value	C.’s V
	Yes	No	Total	Yes	No	Total				
Public	41(39)	59(56)	100(95)	32(13)	68(28)	100(41)	1.059	1	Not Sig	
Government- Regulatory Agency	24(23)	76(72)	100(95)	71(29)	29(12)	100(41)	26.246	1	< 0.001	0.439
NGO Activist	29(28)	71(67)	100(95)	41(17)	59(24)	100(41)	1.86	1	Not Sig	
Company	62(59)	38(36)	100(95)	78(32)	22(9)	100(41)	3.288	1	Not Sig	
University	28(27)	72(68)	100(95)	10(4)	90(37)	100(41)	5.67	1	Not Sig	

Hero Dyad and Actions

As identified in Table 4.10, three hero-alter dyads associated with Government- Regulatory Agency differed significantly within the policy narratives of the combined winning and losing coalitions and were found in varying percentages (24% - 61%) in the narratives of the combined losing coalition and were found in lower percentages (4% - 19%) in the narratives of the combined winning coalition. Two of the dyads exhibited a moderate relationship with the combined losing coalition, while one dyad showed a weak relationship with the combined losing coalition.

Table 4.10: Combined Coalitions Hero-Alter Dyads.

Narrative Element	Policy Coalition						Statistics			
	Combined Winning % (n)			Combined Losing % (n)			χ^2	df	P value	C.'s V
Hero Dyad	Yes	No	Total	Yes	No	Total				
Government-Regulatory Agency Approves Technology	17(16)	83(79)	100(95)	41(17)	59(24)	100(41)	9.448	1	0.002	0.264
Government-Regulatory Agency Assembles Public	4(4)	96(91)	100(95)	24(10)	76(31)	100(41)	12.63	1	< 0.001	0.305
Government-Regulatory Agency Inspects Technology	19(18)	81(77)	100(95)	61(25)	39(16)	100(41)	23.398	1	< 0.001	0.415

Table 4.10 identifies what actions the Government- Regulatory Agency actor performed. In the narratives of the combined losing coalition the Government- Regulatory Agency actor was portrayed as a hero for inspecting the GM mosquito technology (Inspect Technology), assembling the public (Assembles Public) and approving the GM mosquitos releases (Approves Technology). It is interesting that the government regulatory agency is seen as a hero by fulfilling its purpose of inspecting the GM mosquito technology, gathering feedback from the public regarding the use of GM mosquitos and then ultimately approving the release of mosquitos, yet is associated with a generalized losing coalition. These results would indicate that the GMO regulatory process is not completely trusted and other types of approval such as that of the public are required to allow the release of GM mosquitos. This may be pointing to the importance of a social license to operate. (Baltzegar et al., 2018)

Comparison of pro-GM and anti-GM Coalitions

An alternative method to describe and analyze the GM mosquito policy narratives is to compare coalitions across policy subsystems, as well as from the perspective of coalitions that

supported the release of GM mosquitos (pro-GM) versus coalitions that opposed their release (anti-GM). Since the supporting and opposing coalitions are also the winning and losing coalitions, depending on location, the previously identified hero actor variables and hero-alter dyad variables were used in this analysis. This section examines the five significant hero actor variables and 18 significant hero-alter dyad variables from the perspective of coalitions that support the release of GM mosquitos (pro-GM) and coalitions that oppose the release of GM mosquitos (anti-GM) in Brazil and the Florida Keys. Additionally, this comparison permits an examination of how the use of the significant hero actors and hero-alter dyads varied across the Brazilian and Florida Keys policy subsystems.

Hero Actor

Table 4.11 displays how the five hero actor characters, NGO Activist Organization, Nonprofit Service Provider, Public, Government-Regulatory Agency and Company differed in their usage across policy subsystems, as well as between coalitions that opposed (anti-GM) the release of GM mosquitos compared to coalitions that supported (pro-GM) their release.

The use of the NGO Activist Organization hero actor differed significantly in both the Brazilian and Florida Keys policy subsystems where it was strongly associated with the opposing coalition in both instances. The Nonprofit Service Provider hero actor was identified only in the Brazilian policy subsystem and was strongly associated with the coalition that supported releases. The pro-GM coalition in Brazil portrayed the Public as a hero more often (moderate association). The pro-GM coalition in the Florida Keys evoked Oxitec (Company) as a hero more often (moderate association). The choice of the public and Oxitec being identified as a hero seems to be location dependent.

The Government-Regulatory Agency demonstrated different usage in both the Florida Keys policy subsystem and the Brazilian policy subsystem. In the Florida Keys, pro-GM supporters identified Government Regulatory Agency actor (FDA and FKMCB) as heroes (moderate association), whereas in the Brazilian policy subsystem anti-GM opposers were more likely to identify the Government Regulatory Agency actor (CTNBio) as a hero (weak association). This is the only hero actor that was identified by both pro-GM and anti-GM coalitions. As identified in the analysis for the combined losing coalitions, government regulatory agencies are a hero always associated with a losing coalition and may be an element to consider when attempting to craft a winning narrative.

Table 4.11: Hero Actor Comparison across Opposing Coalitions and Policy Subsystems.

Hero Actor	Hero Significant in Brazil Policy Subsystem?	Hero Significant in Florida Keys Policy Subsystem?	Coalition Brazil	Coalition Florida Keys
NGO Activist Organization	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Government-Regulatory Agency	Yes	Yes	Anti-GM (Losing)	Pro-GM (Losing)
Nonprofit Service Provider	Yes	Not Present in Narrative	Pro-GM (Winning)	Not Present in Narrative
Public	Yes	No	Pro-GM (Winning)	No Difference Found
Company	No	Yes	No Difference Found	Pro-GM (Losing)

Hero Dyad and Actions

Table 4.12 displays how the 18 significant hero-alter dyads differed in their usage between coalitions that opposed the release of GM mosquitos compared to coalitions that supported their release. The NGO Activist Organization hero actor had ten different dyads that demonstrated significant differences in how they were used in policy narratives. These dyads were always associated with the coalition that opposed mosquito releases. Both the Brazilian and Florida Keys policy subsystems contained eight identical NGO Activist Organization dyads that exhibited similar relationship strengths. Two dyads, NGO Activist Organization Educates

the Public and NGO Activist Organization Admonishes Governmental Non-Regulatory Orgs, were only found to be significantly different in the Brazilian policy subsystem.

The Nonprofit Service Provider hero actor (Moscamed) had three significant dyads found only in the Brazilian policy subsystem associated with the coalition that supported the release of GM mosquitos. The Public hero actor had one dyad that was significant in the Brazilian policy subsystem and was weakly associated with the coalition that supported mosquito releases. The Government- Regulatory Agency hero actor had one significant dyad that was present in both the Brazilian and Florida Keys policy subsystem. In Brazil it was weakly associated with the opposing coalition while in the Florida Keys it was moderately associated with the coalition that supported releases. The Company hero actor had three significant dyads only present in the Florida Keys policy subsystem All three were associated with the coalition that supported the release of GM mosquitos.

Table 4.12: Hero-alter Dyad Comparison across Opposing Coalitions and Policy Subsystems.

Hero-Alter Dyad	Dyad Significant in Brazil Policy Subsystem?	Dyad Significant in Florida Key policy Subsystems	Coalition Brazil	Coalition Florida Keys
NGO Activist Organization Educates the Public	Yes	No	Anti-GM (Losing)	Anti-GM (Winning)
NGO Activist Organization Resists Regulations	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
NGO Activist Organization Resists Technology	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
NGO Activist Organization Warns the Public	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
NGO Activist Organization Warns Government Leaders	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
NGO Activist Organization Admonishes Governmental Non-Regulatory Orgs	Yes	No	Anti-GM (Losing)	Anti-GM (Winning)
NGO Activist Organization Admonishes Company	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)

Table 4.12: (Continued).

NGO Activist Organization Admonishes Governmental Regulatory Agencies	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
NGO Activist Organization Protects the Environment	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
NGO Activist Organization Protects Human Health	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Nonprofit Service Provider Combats Mosquitos	Yes	Not Present in Narrative	Pro-GM (Winning)	Not Present in Narrative
Nonprofit Service Provider Combats Disease	Yes	Not Present in Narrative	Pro-GM (Winning)	Not Present in Narrative
Nonprofit Service Provider Endorses Technology	Yes	Not Present in Narrative	Pro-GM (Winning)	Not Present in Narrative
Public Inspects Technology	Yes	No	Pro-GM (Winning)	No Difference Found
Government-Regulatory Agency Inspects Technology	Yes	Yes	Anti-GM (Losing)	Pro-GM (Losing)
Company Endorses Regulation	No	Yes	No Difference Found	Pro-GM (Losing)
Company Protects the Environment	No	Yes	No Difference Found	Pro-GM (Losing)
Company Protects Human Health	No	Yes	No Difference Found	Pro-GM (Losing)

Table 4.12 displays how the significant hero **actions** identified in the hero-alter dyads differed in their usage between coalitions that opposed the release of GM mosquitos compared to coalitions that supported their release. The NGO Activist Organization hero actor (NGOs) performed five different types of heroic actions, Educate (public), Resist (regulations and technology), Warn (public and government leaders), Admonish (government non-regulatory orgs, Oxitec, regulatory agencies), and Protect (environment and human health) across the two policy subsystems. These actions were always associated with the coalition that opposed the release of GM mosquitos. Four of the actions, Resist (regulations and technology), Warn (public and government leaders), Admonish (Oxitec, regulatory agencies) and Protect (environment and human health) were shared across both policy subsystems, although for the Admonish action the

Brazilian subsystem had an additional alter in the Governmental Non-Regulatory Orgs. One NGO Activist Organization hero action, Educate, was only found in the Brazilian subsystem.

The Nonprofit Service Provider hero actor (Moscamed) performed two different hero actions, Combat (mosquitos and disease) and Endorse (technology), that were only found in the Brazilian policy subsystem and associated with the pro-GM coalition. The Public hero actor performed the Inspect (technology) hero action in the Brazilian subsystem where it was associated with the pro-GM coalition. The Government-Regulatory Agency hero actor use of the Inspect heroic action differed in both the Brazilian and Florida Keys policy subsystems. In Brazil it was associated with the anti-GM coalition while in the Florida Keys it was associated with the pro-GM coalition.

Only the pro-GM coalition in the Florida Keys portrayed the Company hero actor (Oxitec) as using the Endorse (regulation) and Protect (environment and human health) hero actions.

4.4 Villain Narrative Elements

This section describes and compares the use of villain characters actors, villain actor dyads and villain actions (villain narrative elements) in the Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos. First, the use of villain narrative elements will be compared across the winning and losing policy coalitions in Brazil and the Florida Keys. Next, the use of villain narrative elements in the combined winning and losing coalitions will be discussed. Finally, the use of villain narrative elements are compared across pro-GM coalitions (supported the release of GM mosquitos) and anti-GM coalitions (opposed GM mosquito releases). This allows a comparison across the two geographic regions or policy subsystems.

In this dissertation the villain character was modeled and identified based on the ego-alter dyad. From an NPF perspective, the ego represents the villain that is played by an actor and is paired to an alter through some type of action. A character actor has defined actions associated with it and the dyad represents the combination of the character actor and its action. (Weible et al., 2016).

As noted in the Methodology section nine different type of character actors were originally identified for the villain analysis. Unlike the hero analysis all villain character actors meet the interrater reliability agreement threshold. However, six character actors including: NGO Activist Organization, Nonprofit Service Provider, Public, Scientific Expert, and University appeared fewer than five times among all the narratives examined and aren't included in this study due to requirement of the Chi square analysis. The villain character actors included in the analysis are Company, Government- Non-Regulatory Org, and Government- Regulatory Agency.

Comparison of Winning and Losing Coalitions

Brazil

Villain Actor

For the villain actor category, each document was coded for the presence or absence of three villain actor types. Table 4.14 displays the results of how villain actors were used in the Brazilian coalitions. The number in the Yes column indicates how many times the villain actor was present in the narrative. The value in χ^2 column is the result of the Pearson chi-square test of independence identifying whether there are any significant differences in the use of the villain actor found between the coalitions. The df column represents the degrees of freedom for the χ^2 test and p-value column presents the corresponding p-value. The term "Not Sig" means not

significant. The C.'s V column represents the Cramer's V value that is used to describe the strength of the relationship between the villain actor and a specific coalition where 0.01 identifies a weak effect size, 0.3 identifies a moderate effect size, and 0.5 identifies a strong effect size.

Three villain actors, Company, Government- Non-Regulatory Org, and Government-Regulatory Agency showed significant difference in usage between the winning and losing coalitions in Brazil. Company was found in 76% of the losing coalitions (anti-GM) narratives and was not identified in any winning coalition narratives. The Cramer's V value indicates a strong relationship between the presence of the Company villain actor and the losing coalition (anti-GM). Government- Non-Regulatory Org was mentioned in 29% of the losing coalition's narratives and was not found in any winning coalition's narratives. The Cramer's V value indicates a strong relationship between the presence of the Government- Non-Regulatory Org villain actor and the losing coalition (anti-GM). Government- Regulatory Agency was found in 24% of the losing coalition's narratives and was not identified in any of the winning coalition's narratives. The Cramer's V value indicates a moderate relationship between the presence of the Government- Regulatory Agency villain actor and the losing coalition (anti-GM).

Table 4.14: Brazil Villain Actors.

Narrative Element	Policy Coalition						Statistics			
	Brazil Winning (Support) % (n)			Brazil Losing (Oppose) % (n)			χ^2	df	P value	C.'s V
Villain Actor	Yes	No	Total	Yes	No	Total				
Company	0(0)	100(67)	100(67)	76(13)	24(4)	100(17)	60.616	1	< 0.001	0.849
Government- Non-Regulatory Org	0(0)	100(67)	100(67)	29(5)	71(12)	100(17)	20.953	1	< 0.001	0.499
Government-Regulatory Agency	0(0)	100(67)	100(67)	24(4)	76(13)	100(17)	16.553	1	< 0.001	0.444

Villain Dyad and Actions

For the villain-alter dyad variables, documents were coded for the presence or absence of 18 villain-alter dyads. Table 4.15 identifies that 13 villain-alter dyads differed significantly in the policy narratives examined in the Brazilian policy subsystem. Nine Company dyads were found in varying frequency, from 12% to 71%, solely within the narratives of the losing coalition (anti-GM) and were not present at all in the narratives for the winning coalition. Seven of the Company dyads exhibited a strong relationship with the losing coalition (anti-GM), one dyad exhibited a moderate relationship and one dyad demonstrated a weak relationship with the losing coalition.

One Government- Non-Regulatory Org dyad was found in 18% of the losing coalition’s narratives and was not present at all in the winning coalition’s narratives. Based on Cramer’s V this dyad has a moderate relationship with the losing coalition (anti-GM).

Three Government- Regulatory Agency dyads were found in 12% of the losing coalition’s narrative and were not present in the winning coalition’s narratives. All three dyads exhibited a moderate relationship with the losing coalition (anti-GM).

Table 4.15: Brazil Villain Dyads.

Narrative Element Villain Dyad	Policy Coalition						Statistics			
	Brazil Winning (Support) % (n)			Brazil Losing (Oppose) % (n)			χ^2	df	p value	C.'s V
	Yes	No	Total	Yes	No	Total				
Company Endangers Environment	0(0)	100(67)	100(67)	47(8)	53(9)	100(17)	34.848	1	< 0.001	0.644
Company Endangers Human Health	0(0)	100(67)	100(67)	47(8)	53(9)	100(17)	34.848	1	< 0.001	0.644
Company Ignores Regulation	0(0)	100(67)	100(67)	24(4)	76(13)	100(17)	16.553	1	< 0.001	0.444
Company Ignores Scientific Experts	0(0)	100(67)	100(67)	12(2)	88(15)	100(17)	8.075	1	0.004	0.31
Company Ignores Public	0(0)	100(67)	100(67)	65(11)	35(6)	100(17)	49.886	1	< 0.001	0.771
Company Deceives Government-Regulatory Agency	0(0)	100(67)	100(67)	71(12)	29(5)	100(17)	55.176	1	< 0.001	0.81

Table 4.15: (Continued).

Company Deceives Government- Non-Regulatory Org	0(0)	100(67)	100(67)	65(11)	35(6)	100(17)	49.886	1	< 0.001	0.771
Company Deceives Public	0(0)	100(67)	100(67)	71(12)	29(5)	100(17)	55.176	1	< 0.001	0.81
Company Deceives Scientific Experts	0(0)	100(67)	100(67)	35(6)	65(11)	100(17)	25.466	1	< 0.001	0.551
Government- Non-Regulatory Org Ignores Regulations	0(0)	100(67)	100(67)	18(3)	82(14)	100(17)	12.261	1	< 0.001	0.382
Government-Regulatory Agency Colludes with Company	0(0)	100(67)	100(67)	12(2)	88(15)	100(17)	8.075	1	0.004	0.31
Government-Regulatory Agency Ignores Regulations	0(0)	100(67)	100(67)	12(2)	88(15)	100(17)	8.075	1	0.004	0.31
Government-Regulatory Agency Approves Technology	0(0)	100(67)	100(67)	12(2)	88(15)	100(17)	8.075	1	0.004	0.31

Table 4.15 identifies what **actions** each of the villain actors performed. The Company actor (Oxitec) was portrayed as engaging in three different types of villain actions: Endanger (environment and human health), Ignores (regulation, experts, and public), and Deceives (CTNBio, government non-regulatory orgs, public, experts). The Government- Non-Regulatory Org dyad was associated with Ignore (regulations) villain action. The Government- Regulatory Agency dyad (CTNBio) was associated with one instance each of the Collude (with Oxitec), Ignore (regulations) and Approve (technology) villain actions.

All villain dyads were found only in the narratives of the losing coalition (anti-GM) which was completely composed of activist organizations. In Brazil, the winning coalition (pro-GM) did not villainize the losing coalition (anti-GM). This may be due to the fact that the winning (pro-GM) wanted to ignore the anti-GM coalition in order to avoid expanding the scope of conflict. Or perhaps, since all of the losing (anti-GM) coalition membership is nonprofit and NGOs the winning coalition (pro-GM) did not want to attack them.

These villain actions are how these activist organizations chose to describe Oxitec, the various health agencies, and CTNBio in their policy narratives. The potential relationship between Oxitec and CTNBio portrayed in the NGO's narratives is quite striking. Oxitec was described as endangering human health and the environment, ignoring regulations, scientific experts and the public and deceiving CTNBio. CTNBio in return is portrayed as colluding with Oxitec, also ignoring regulations and ultimately approving Oxitec's mosquitos for release. This clearly demonstrates that NGO organizations in Brazil don't trust the GM regulatory process.

The Ignores Regulation dyad is shared with all three villain actors and indicates this action is an important part of the losing coalition's narrative. It is interesting to note that the Government- Regulatory Agency is accused of colluding with Oxitec, but that same accusation is not found in dyads describing the company.

Florida Keys

Villain Actor

Table 4.16 displays the results of how villain actors were used in the Florida Keys coalitions. Two villain actors, Company (Oxitec) and Government- Regulatory Agency (FDA and FKMCD) showed significant difference in usage between the winning and losing coalitions in the Florida Keys. Company was found in 96% of the winning coalition's (anti-GM) narratives and was not identified in any of the losing coalition's narratives. The Cramer's V value indicates a strong relationship between the presence of the Company villain actor and the winning coalition. Government- Regulatory Agency was found in 57% of the winning coalition's narratives and in only 8% of the losing coalition's narratives. The Cramer's V value indicates a strong relationship between the presence of the Government- Regulatory Agency villain actor and the winning coalition (anti-GM).

Table 4.16: Florida Keys Villain Actors.

Narrative Element	Policy Coalition						Statistics			
	Florida Keys Winning (Oppose) % (n)			Florida Keys Losing (Support) % (n)			χ^2	df	p value	C.'s V
Villain Actor	Yes	No	Total	Yes	No	Total				
Company	96(27)	4(1)	100(28)	0(0)	100(24)	100(24)	48.137	1	< 0.001	0.962
Government- Non-Regulatory Org	18(5)	82(23)	100(28)	0(0)	100(24)	100(24)	4.742	1	Not Sig	
Government-Regulatory Agency	57(16)	43(12)	100(28)	8(2)	92(22)	100(24)	13.603	1	< 0.001	0.511

Villain Dyad and Actions

Table 4.17 identifies that nine villain-alter dyads differed significantly in the policy narratives examined in the Florida Keys policy subsystem. Seven Company villain dyads were found in varying frequency, from 61% to 86%, within the narratives of the winning coalition and were not present in the narratives of the losing coalition. All seven Company villain dyads exhibited a strong relationship with the winning coalition.

Two Government- Regulatory Agency villain dyads were found in 29% of the winning coalition's narrative and weren't present in the losing narratives. Both dyads exhibited a moderate relationship with the winning coalition.

Table 4.17: Florida Keys Villain Dyads.

Narrative Element	Policy Coalition						Statistics			
	Florida Keys Winning (Oppose) % (n)			Florida Keys Losing (Support) % (n)			χ^2	df	p value	C.'s V
Villain Dyad	Yes	No	Total	Yes	No	Total				
Company Endangers Environment	64(18)	36(10)	100(28)	0(0)	100(24)	100(24)	23.597	1	< 0.001	0.674
Company Endangers Human Health	71(20)	29(8)	100(28)	0(0)	100(24)	100(24)	27.857	1	< 0.001	0.732
Company Ignores Public	64(18)	36(10)	100(28)	0(0)	100(24)	100(24)	23.597	1	< 0.001	0.674
Company Deceives Government-Regulatory Agency	64(18)	36(10)	100(28)	0(0)	100(24)	100(24)	23.597	1	< 0.001	0.674
Company Deceives Government- Non-Regulatory Org	64(18)	36(10)	100(28)	0(0)	100(24)	100(24)	23.597	1	< 0.001	0.674
Company Deceives Public	86(24)	14(4)	100(28)	0(0)	100(24)	100(24)	38.204	1	< 0.001	0.857
Company Deceives Scientific Experts	61(17)	39(11)	100(28)	0(0)	100(24)	100(24)	21.649	1	< 0.001	0.645

Table 4.17: (Continued).

Government-Regulatory Agency Endangers Environment	29(8)	71(20)	100(28)	0(0)	100(24)	100(24)	8.104	1	0.004	0.395
Government-Regulatory Agency Ignores Public	29(8)	71(20)	100(28)	0(0)	100(24)	100(24)	8.104	1	0.004	0.395

Table 4.17 identifies what **actions** each of the villain actors performed. The Company actor (Oxitec) was portrayed as engaging in three different types of villain actions: Endanger (environment and human health), Ignores (public), and Deceives (FDA, government non-regulatory orgs, public and experts). The Government- Regulatory Agency actor (FDA) was associated with one instance each of Endanger (environment) and Ignore (public) villain actions. Like Brazil all villain dyads were found only in the narratives of the winning coalition which was completely composed of activist organizations and this was how activist organizations (NGOs) chose to portray Oxitec and the FDA’s involvement in the GM mosquito policy debate. As identified by Meghani and Kuzma (2018) and Kuzma (2019) both the Oxitec and the FDA exhibit a pro-GM bias when interpreting risk and NGO organizations don’t trust the FDA’s risk assessment. Both the Endangers Environment and Ignores Public hero actions are associated with both villain actors and indicates these actions are an important part of the winning coalition’s narrative.

Comparison of Combined Winning and Losing Coalitions

This arrangement provides the opportunity to look across the two regions to determine if certain type(s) of evidence were more likely to be found in winning coalitions or losing coalitions, thus indicating whether strategies work regardless of location. For the villain actor category, the narratives of the combined winning and losing coalitions were analyzed for the presence or absence of three villain actor types. No significant difference was found for any of

the three villain actor types. For the villain-alter dyad variables each document was analyzed for the presence or absence of 18 villain-alter dyads. No significant differences were found for any of the 18 villain dyads. These results suggest that the identification of villains and villain actions are not required to compose a winning policy narrative and that the use of villain character elements in a winning policy narrative may be region specific as in the Florida Keys.

Comparison of pro-GM and anti-GM Coalitions

This section examines the three significant villain actor variables and 15 significant villain-alter dyad variables from the perspective of supporting (pro-GM) and opposing (anti-GM) coalitions in Brazil and the Florida Keys. This comparison permits an examination of how the use of the significant villain actors and villain-alter dyads varied across the Brazilian and Florida Keys policy subsystems.

Villain Actor

Table 4.18 displays how the three villain actor types, Company (Oxitec), Government-Non-Regulatory Org and Government-Regulatory Agency (FDA and CTNBio) differed in their usage between anti-GM coalitions as compared to pro-GM coalitions. Both the Company and Government-Regulatory Agency villain actor type were significant in both Brazil and Florida Keys policy subsystems and were associated with the coalition that opposed the release of GM mosquitos (anti-GM) in both instances. The Government-Non-Regulatory Org hero actor demonstrated a significant difference of usage in the Brazilian policy subsystem and was associated with the anti-GM coalition.

Table 4.18: Villain Actor Comparison across Opposing Coalitions and Policy Subsystems.

Villain Actor	Villain Significant in Brazil Policy Subsystem	Villain Significant in Florida Keys Policy Subsystem	Coalition Brazil	Coalition Florida Keys
Company	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Government-Regulatory Agency	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)

Table 4.18: (Continued).

Government- Non-Regulatory Org	Yes	No	Anti-GM (Losing)	No Difference Found
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These results indicate that some types of villain actors, like Company and Government-Regulatory Agency, can be shared across coalitions while other villain actors like Government-Non-Regulatory Org can be specific to a certain locale. As both Company and Government Regulatory Organization were shared across both policy subsystems with moderate to strong associations, these villain actor types may not play a strong role in influencing the release of genetically modified mosquitos, as vilifying these groups does not seem to influence release decisions in either country. In other words the same strategy leads to different outcomes. In contrast, as previously noted in section 4.3 portraying Government Regulatory Agencies as heroes led to losing outcomes across both countries.

There are two additional noteworthy points about the use of villain actors in the various GM mosquito policy subsystems. First, only coalitions that opposed the release of GM mosquitos identified villains within their narratives. It appears that the coalitions that supported the release of GM mosquitos chose not to vilify any of the opposition policy actors.

Second, none of the policy actors identified as villains were nonprofit, NGO or civil society organizations. The coalitions that opposed the releases in Brazil could have targeted Moscamed (Nonprofit Service Provider) as a villain, but instead chose to vilify Oxitec (Company). In both policy subsystems the NGO Activist Organizations were very critical of Oxitec, but none of the Oxitec or Moscamed's narratives contained references to the NGO Activist Organizations as behaving like a villain. It appears that in both regions that lack of criticism of nonprofit organizations may be a strategy that organizations use in their narratives.

Villain Dyad and Actions

Table 4.19 displays how the 15 significant villain-alter dyads differed in their usage between coalitions that opposed the release of GM mosquitos as compared to coalitions that supported their release. The Florida Keys policy subsystem contained nine dyads while the Brazil policy subsystem contained 13 dyads. The Government- Non-Regulatory Org villain actor had one dyad that was significant in the Brazilian policy subsystem and was moderately associated with the coalition that opposed mosquito releases.

The Company villain actor had nine different dyads that demonstrated significant differences in how they were used in policy narratives. These dyads were always associated with the coalition that opposed mosquito releases. Both the Brazilian and Florida Keys policy subsystems contained seven identical dyads that exhibited similar relationship strengths. Two dyads, Company Ignores Regulation and Company Ignores Scientific Experts, were only found to be significantly different in the Brazilian policy subsystem. These additional dyads indicate that the Company villain actor was portrayed somewhat differently in the Brazilian policy subsystem in these regards. It could indicate that scientific experts are more aligned with Oxitec in the US (Meghani & Kuzma, 2018).

The Government- Regulatory Agency villain actor had five significant dyads. These dyads were always associated with the coalition that opposed the release of GM mosquitos. Three of the dyads, Government- Regulatory Agency Colludes with Company, Government- Regulatory Agency Ignores Regulations and Government- Regulatory Agency Approves Technology were only found to be significant in the Brazilian policy subsystem. Two dyads, Government- Regulatory Agency Endangers Environment and Government- Regulatory Agency Ignores Public were only found to be significant in the Florida Keys policy subsystem. These

results highlight that although the Government- Regulatory Agency actor was identified as a villain in both policy subsystems the way Government- Regulatory Agency actor was portrayed as a villain was different between the subsystems.

Table 4.19: Villain-alter Dyad Comparison across Opposing Coalitions and Policy Subsystems.

Hero-Alter Dyad	Dyad Significant in Brazil Policy Subsystem	Dyad Significant in Florida Keys Policy Subsystem	Coalition Brazil	Coalition Florida Keys
Company Endangers Environment	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Company Endangers Human Health	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Company Ignores Regulation	Yes	No	Anti-GM (Losing)	No Difference Found
Company Ignores Scientific Experts	Yes	No	Anti-GM (Losing)	No Difference Found
Company Ignores Public	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Company Deceives Government-Regulatory Agency	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Company Deceives Government- Non-Regulatory Org	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Company Deceives Public	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Company Deceives Scientific Experts	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Government- Non-Regulatory Org Ignores Regulations	Yes	No	Anti-GM (Losing)	No Difference Found
Government-Regulatory Agency Colludes with Company	Yes	No	Anti-GM (Losing)	No Difference Found
Government-Regulatory Agency Ignores Regulations	Yes	No	Anti-GM (Losing)	No Difference Found
Government-Regulatory Agency Approves Technology	Yes	No	Anti-GM (Losing)	No Difference Found
Government-Regulatory Agency Endangers Environment	No	Yes	No Difference Found	Anti-GM (Winning)
Government-Regulatory Agency Ignores Public	No	Yes	No Difference Found	Anti-GM (Winning)

Table 4.19 displays how the significant villain **actions** identified in the villain-alter dyad differed in their usage between the two countries, from the perspective of coalitions that opposed the release of GM mosquitos as compared to coalitions that supported their release. The

Government- Non-Regulatory Org villain actor performed one type of villain action, Ignores (regulations), that was only significant in the Brazilian policy subsystem and associated with the coalition that opposed mosquito releases.

Oxitec performed three different types of villain actions: Endanger (environment and human health), Ignore (public) and Deceive (government regulatory agency, government non-regulatory orgs, public and scientific experts) across the two policy subsystems. In the Brazilian subsystem Oxitec performed two additional Ignores villain action: Ignores Regulations and Ignores Scientific Experts. These villain actions were always associated with the anti-GM coalition.

The Government- Regulatory Agency villain actor performed four different villain actions: Colludes, Ignores, Approves and Endangers were only associated with the anti-GM coalitions. In the Brazilian policy subsystem, CTNBio performed the following villain actions: Colludes (with company), Ignores (regulation)and Approves (technology). In the Florida Keys policy subsystem, the FDA performed the following villain actions: Endangers (environment) and Ignores (public).

4.5 Summary of Findings and Discussion

Chapter Four investigated the role of coalition membership and the use of hero and villain narrative elements in the policy narratives discussing the release of GM mosquitos. The composition of the coalitions and their use of hero and villain narrative elements were examined in three different ways: (i) from the perspective of winning and losing coalitions within each country (ii) from the perspective of combined winning coalition and losing coalitions (iii) from the perspective of coalitions that supported (pro-GM) or opposed (anti-GM) GM mosquito releases that allows a comparison across the two geographic regions or policy subsystems. A

summary of the results and discussion of the implications are provided in the remainder of this section.

Importance of Coalition Membership

A primary step in understanding the role of policy narratives in the policy debate regarding the release of GM mosquitos is to examine and analyze the membership composition of the winning and losing coalitions in both Brazil and the Florida Key . This is the pool of potential policy actors that will construct the policy narratives and be portrayed as heroes and villains This section discusses highlights of some of the important findings related to membership of coalitions.

Foundations were not identified as a hero or villain in any policy narratives. It was surprising to discover that the Foundation character actor was only included once in all policy narratives. The Gates Foundation, in particular, has invested millions of dollars in genetic engineering technology to combat malaria (Swetlitz, 2017). It was expected that foundations, especially Gates Foundation, would play a large role in the GM mosquito policy debates This absence from policy narratives may be related to the fact that Gates Foundation is focused on reducing mosquito populations in Africa to combat malaria with a genetically modified mosquito based on a different type of genetic engineering technology.

The pro-GM coalitions in Brazil and the Florida Keys had some key membership differences. In a comparison between Brazil and the Florida Keys four major differences were identified. The Brazilian coalition contained three types of policy actors: federal and state level health agencies (Brazilian Ministry of Health and the State Health Department of Bahia), a nonprofit service provider (Moscamed), and a university (The University of Sao Paulo) where organizational equivalents were not found in the Florida Keys. The Florida Keys coalition

contained the Florida Keys Mosquito Control Board, a local decision-making agency that wasn't found in Brazil.

The anti-GM coalitions in Brazil and the Florida Keys had key membership differences. The Florida Keys coalition had two types of nonprofits not found in Brazil. First was the Center for Food Safety, a US based NGO strongly focused on the use of GM technology with legal expertise in suing the US government for previous policy decisions regarding GM crops. Second were the local organizations like GMO Free Florida that provided grassroots resistance. These types of organizations were not found in the Brazilian coalition. The role that these nonprofits played in GM mosquito policy debate is discussed below.

Nonprofits played a vital role in the policy coalitions debating the release of GM mosquitos in Brazil and the Florida Keys. In both policy subsystems, nonprofits were members of both pro-GM and anti- GM coalitions. Two nonprofit actors, Moscamed (Nonprofit Service Provider) and NGOs (NGO Activist Organizations) played key roles as heroes. The NGOs Activist Organizations were identified in both the Florida Keys and Brazil. Moscamed was found only in Brazil and no similar type of organization was found in the Florida Keys. How Moscamed and the NGOs were described as heroes will be discussed later in this section.

There were three distinct types of NGO Activist Organizations. The first type were international NGOs that have taken strong stances against the use of most any type of genetic engineering. These are organizations like Third World Network, Food & Water Watch and GeneWatch UK. In the policy narratives studied, these organizations wrote most of the reports, newsletters and press releases discussing concerns about GM mosquitos. These organizations were present in both Brazil and the Florida Keys.

The second type of NGO Activist Organizations were regional or national NGOs. In the Brazilian subsystem, regional NGOs, AS-PTA and RALLT, did take stances against GM mosquito release, but were more focused on concerns in Latin America with genetically modified crops and industrial farming practices. The Center for Food Safety was a US focused NGO Activist Organization actor found only in the Florida Keys policy subsystem. They played a legal role and partnered with the other NGO Activist Organization to threaten to file a lawsuit against the FDA.

The third type of NGO Activist Organizations were only found in the Florida Keys policy subsystem. These grassroots organizations, Florida Keys Environmental Coalition and GMO Free Florida focused mostly on issues in Florida and the Florida Keys. They were involved in local and statewide campaigns against the release of GM mosquitos.

Throughout the analysis no nonprofit organizations were identified as villains in either of the policy subsystems. This is interesting in that in both countries anti-GM coalitions were often critical of Oxitec, the company that co-developed the GM mosquitos. However, they never critiqued Moscamed in any of their narratives. Additionally, most of the documents analyzed for the pro-GM coalition were authored by Oxitec in the Brazil and the US or Moscamed in Brazil. None of these documents villainized NGO Activist Organizations. It appears that in both regions that lack of criticism of nonprofit organizations may be a strategy that organizations use in their narratives.

Winning and losing coalitions in the same policy subsystem identified different hero actors and hero actions. Table 4.21 displays a comparison of the winning and losing coalitions in Brazil. Except for the Inspect hero action all the hero actors and hero actions were different

between the two coalitions. Table 4.22 displays a similar comparison for the Florida Keys and no hero actors or hero actions are shared between the two coalitions.

Table 4.21: Comparison of Hero Elements between Winning and Losing Coalitions in Brazil.

Brazil			
Winning Coalition		Losing Coalition	
<u>Hero Actor</u>	<u>Hero Action</u>	Hero Actor	Hero Action
Nonprofit Service Provider	Combat (mosquitos and disease)	NGO Activist Organization	Educate (public)
	Endorse (technology)		Resist (regulation and technology)
Public	Inspect (technology)		Warn (public and government leaders)
			Admonish (government-non-regulatory org, company, government-regulatory agencies)
			Protect (environment and human health)
		Government- Regulatory Agency	Inspect (technology)

Table 4.22: Comparison of Hero Elements between Winning and Losing Coalitions in the Florida Keys

Florida Keys			
Winning Coalition		Losing Coalition	
<u>Hero Actor</u>	<u>Hero Action</u>	<u>Hero Actor</u>	<u>Hero Action</u>
NGO Activist Organization	Resist (regulations, technology)	Company	Protect (environment, human health)
	Warn (public and government leaders)		Endorse (regulations)
	Admonish (company, government-regulatory agencies)	Government- Regulatory Agency	Inspect (technology)
	Protect (environment, human health)		

Winning and losing coalitions in the same policy subsystem identified different villain actors and villain actions. As tables 4.23 and 4.24 demonstrate there is no similarity in the villain actors or villain actions identified between the winning and losing coalitions in Brazil or the Florida Keys.

Table 4.23: Comparison of Villain Elements between Winning and Losing Coalitions in Brazil.

Brazil			
Winning Coalition		Losing Coalition	
<u>Villain Actor</u>	<u>Villain Action</u>	<u>Villain Actor</u>	<u>Villain Action</u>
None	None	Company	Endanger (environment, health)
			Ignores (regulation, scientific experts, public)
			Deceives (government-regulatory agency, government- non-regulatory org, public, scientific experts)
		Government- Non-Regulatory	Ignore (regulations)
		Government- Regulatory Agency	Collude (company)
			Ignore (regulations)
Approve (technology)			

Table 4.24: Comparison of Villain Elements between Winning and Losing Coalitions in the Florida Keys.

Florida Keys			
Winning Coalition		Losing Coalition)	
<u>Villain Actor</u>	<u>Villain Action</u>	<u>Villain Actor</u>	<u>Villain Action</u>
Company	Endanger (environment, health)	None	
	Ignores (public)		
	Deceives (government-regulatory agency, government- non-regulatory org, public, scientific experts)		
Government- Regulatory Agency	Endanger (environment)		
	Ignore (public)		

Coalitions that supported the release of GM mosquitos identified different hero actors but had similar hero actions depending on the region. As identified in Table 4.25 the Brazilian and Florida Keys subsystems identified different hero actors in their policy narratives. However, 50% of the hero actions are shared between the policy subsystems. Different hero actors in each subsystem performed the Inspect and Endorse hero actions.

Table 4.25: Comparison of Hero Elements for Coalitions that Support Mosquito Releases.

Supported GM Mosquito Releases			
Brazil Policy Subsystem		Florida Keys Policy Subsystem	
<u>Hero Actor</u>	<u>Hero Action</u>	<u>Hero Actor</u>	<u>Hero Action</u>
Public	Inspects (technology)	Government- Regulatory Agency	Inspects
Nonprofit Service Provider	Combats	Company	Endorses
	Endorses		Protects

Coalitions that supported the release of GM mosquitos did not identify any villains in their policy narratives. As demonstrated in Table 4.26 neither of the coalitions that supported the release of GM mosquitos identified a villain in their policy narratives.

Table 4.26: Comparison of Villain Elements for Coalitions that Supported Mosquito Releases.

Supported GM Mosquito Releases			
Brazil Policy Subsystem		Florida Keys Policy Subsystem	
<u>Villain Actor</u>	<u>Villain Action</u>	<u>Villain Actor</u>	<u>Villain Action</u>
None	None	None	None

Coalitions that opposed the release of GM mosquitos identified the same heroes and hero actions. As displayed in Table 4.27 both coalitions that opposed GM mosquito releases identified the NGO Activist Organization as a hero in their policy narratives. They also shared 80% of the same hero actions.

Table 4.27: Comparison of Hero Elements for Coalitions that Opposed Mosquito Releases.

Opposed GM Mosquito Releases			
Brazil Policy Subsystem		Florida Keys Policy Subsystem	
<u>Hero Actor</u>	<u>Hero Action</u>	<u>Hero Actor</u>	<u>Hero Action</u>
NGO Activist Organization	Resist (regulation and technology)	NGO Activist Organization	Resist (regulations, technology)
	Warn (public and government leaders)		Warn (public and government leaders)
	Admonish (government-non-regulatory org, company, government-regulatory agencies)		Admonish (company, government-regulatory agencies)

Table 4.27: (Continued).

	Protect (environment and human health)		Protect (environment and human health)
	Educate (public)		

Coalitions that opposed the release of GM mosquitos shared many of the same villain and villain actions across policy domains. Table 4.28 demonstrates that coalitions that opposed the release of GM mosquitos identified the same villain actors, except for the Government- Non-Regulatory Org actor in the Brazil policy subsystem.

Table 4.28: Comparison of Villain Elements for Coalitions that Opposed Mosquito Releases.

Opposed GM Mosquito Releases			
Brazil Policy Subsystem		Florida Keys Policy Subsystem	
<u>Villain Actor</u>	<u>Villain Action</u>	<u>Villain Actor</u>	<u>Villain Action</u>
Company	Endanger (environment, health)	Company	Endanger (environment, health)
	Ignores (regulation, scientific experts, public)		Ignores (public)
	Deceives (government-regulatory agency, government- non-regulatory org, public, scientific experts)		Deceives (government-regulatory agency, government- non-regulatory org, public, scientific experts)
Government- Regulatory Agency	Collude (company)	Government- Regulatory Agency	Endanger (environment)
	Ignore (regulations)		Ignore (public)
	Approve (technology)		
Government- Non-Regulatory Org	Ignore (regulations)	None	None

CHAPTER FIVE: ROLE OF EVIDENCE ANALYSIS AND RESULTS

5.1 Introduction

This dissertation seeks to describe, compare and better understand the role of policy narrative in the policy debate regarding the release of genetically modified mosquitos in Brazil and the Florida Keys. As identified in the introduction and literature review evidence plays an important role in the policy process and is an important element of policy narratives. To understand how evidence can influence the policy process and its role in policy narratives it is necessary to distinguish between the different types of evidence found in policy debates and how that evidence is used. This chapter investigates the role of evidence in policy narratives by examining the types of evidence found in policy narratives and how that evidence was used. The analysis was guided by and addresses the following research questions.

3. What is the role of evidence in the policy narratives related to GM mosquito releases in Brazil and the Florida Keys?
 - a. What differences exist in how the types and uses of evidence were utilized in the policy narratives of the following groups:
 - i. winning and losing coalition in Brazil and the Florida Keys?
 - ii. combined winning coalitions versus combined losing coalitions?
 - iii. pro-GM coalitions as compared to anti-GM coalitions across the Brazilian and Florida Keys policy subsystems?

The chapter is organized in the following manner. Section 5.2 presents the results of the analysis examining the different types of evidence found in policy narratives. Section 5.3 reports the results of the analysis examining how evidence was used in policy narratives. Section 5.4 presents a summary of research findings and discusses the various implications.

5.2 Type of Evidence

This section describes and compares the types of evidence present in the policy narratives of Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos. First, the types of evidence present in policy narratives will be compared across the winning and losing policy coalitions in Brazil and the Florida Keys. Next, the types of evidence present in the policy narratives of the combined winning and losing coalitions will be discussed. Finally, the types of evidence present in policy narratives are compared across pro-GM (supported the release of GM mosquitos) and anti-GM (opposed GM mosquito releases) coalitions. This allows a comparison across the two geographic regions or policy subsystems.

This analysis used a modified version of Smith-Walter's (2016) typology of evidence types found in policy narratives. The six types of evidence include Scientific Studies, Statistics, *ipso dictum*, Public Opinion Polls and Laws and Legal Rulings. These evidence types have been defined in the Methodology chapter in Table 3.14. As the typology lacked any reference to localized or community-based knowledge as a potential type of evidence, a sixth type of evidence, Tacit or Localized Knowledge, was added. Documents were coded for the presence or absence of each of the six types of evidence.

When attempting to discuss the use of a complex and highly technical technology like GM mosquitos it is expected that coalitions that support the use of the technology will refer more often to scientific studies to justify their policy position (Sarewitz, 1996). Drawing from the policy debate regarding the use of GM crops it was noted that localized and tacit farming knowledge is a key component of agricultural success in less developed countries. Opponents to the GM technology often referred to this knowledge source and were concerned that the application of GM technology can disrupt this cycle (G. D. Stone, 2004). A similar argument can be made for the importance of localized knowledge to help control mosquitos. It is expected

that coalitions that oppose GM mosquitos will contain more references to tacit or localized knowledge. Hypothesis One and Two predict which types of evidence will be found in the policy narratives of coalitions that support or oppose the use of GM mosquitos.

Hypothesis 1: Coalitions supporting the use of GM mosquitos will have more references to scientific studies.

Hypothesis 2: Coalitions opposing the use of GM mosquitos will have more references to tacit or localized knowledge.

Comparison of Winning and Losing Coalitions

Brazil

Table 5.1 displays the results for the coalitions in Brazil. The number in the Yes column indicates how many times the type of evidence was present in the narrative. The value in χ^2 column is the result of the Pearson chi-square test of independence identifying whether there are any significant differences in the presence of an evidence type between the coalitions. The df column represents the degrees of freedom for the χ^2 test and p-value column presents the corresponding p-value. The term “Not Sig” means not significant. The C.’s V column represents the Cramer’s V value that is used to describe the strength of the relationship between the type of evidence and a specific coalition, where 0.1 identifies a weak effect size, 0.3 identifies a moderate effect size, and 0.5 identifies a strong effect size.

One type of evidence, *ipso dictum* was found at significantly different levels between the winning and losing coalitions in Brazil. The *ipso dictum* evidence type was found in 85% of the winning coalition’s narratives and in only 53% of the losing coalition’s narratives. The Cramer’s V value indicates a moderate relationship between the presence of *ipso dictum* and the winning coalition. As described by Smith-Walter (2016), *ipso dictum* is “Latin used to denote the

fallacious form of argumentation known as the appeal to authority ...any appeal to an individual as an authority owing to their fame, position, or title as a piece of evidence.” (p. 1062) A common form of *ipso dictum* is a celebrity acting as a spokesperson for a specific cause or policy solution, such as Charlton Heston’s longtime involvement with the National Rifle Association (NRA). In the GM mosquito narratives, the mostly widely used form of *ipso dictum* was an appeal to an individual that carried some type of title associated with their role in an organization (business or NGO), academic titles or government leaders. These titles included CEO, president, Program Director, Mayor, Secretary of Health, etc. In Brazil, the most often cited authorities included the leaders of Oxitec, Moscamed or various NGO organizations, academic scientists, and government leaders.

This finding highlights a key difference between the Brazilian and Florida Keys policy debates. Brazil had a larger number of proponents that supported of the release of GM mosquitos as compared to the Florida Keys. This included Moscamed which produced a large number of public consumption documents supporting the release of GM mosquitos. As previously identified an organization similar to Moscamed was not present in the Florida Keys. Additionally, Brazilian government leaders at the local, state and federal level were identified in policy narratives as providing verbal support for GM mosquito releases and attending Moscamed sponsored events. This type of government support was not seen in the Florida Keys

It should be noted that no public opinion polls (Public Opinion Polls evidence type) were found in any of the policy narratives describing GM mosquito releases in Brazil.

Table 5.1: Brazil Types of Evidence.

Narrative Element	Policy Coalition						Statistics			
	Brazil Winning (Support) % (n)			Brazil Losing (Oppose) % (n)			χ^2	df	p value	C.'s V
Types of Evidence	Yes	No	Total	Yes	No	Total				
Scientific Studies	59(40)	41(28)	100(68)	53(9)	47(8)	100(17)	0.193	1	Not Sig	
Statistics	31(21)	69(47)	100(68)	35(6)	65(11)	100(17)	0.122	1	Not Sig	
<i>Ipsa Dictum</i>	85(58)	15(10)	100(68)	53(9)	47(8)	100(17)	8.528	1	0.003	0.317
Laws and Legal Authority	9(6)	91(62)	100(68)	18(3)	82(14)	100(17)	1.118	1	Not Sig	

Florida Keys

Table 5.2 displays the results for the different types of evidence found in the Florida Keys coalitions. One type of evidence, Public Opinion Polls, was found at significantly different levels between the winning and losing coalitions in the Florida Keys. The Public Opinion Polls evidence type was found in 33% of the losing coalition's (pro-GM) narratives and in none of winning coalition's narratives. The Cramer's V value indicates a moderate relationship between the presence of Public Opinion Polls and the losing coalition in the Florida Keys.

The polls cited in the narratives showed that a majority of Americans supported the release of GM mosquitos to fight diseases, especially Zika. The percent supporting the releases ranged from 53% to 76%. The reason for the use of the polls will be discussed in the next section that addresses how different types of evidence were used in policy narratives.

Table 5.2: Florida Keys Evidence Types.

Narrative Element	Policy Coalition						Statistics			
	Florida Keys Winning (Oppose) % (n)			Florida Keys Losing (Support) % (n)			χ^2	df	p value	C.'s V
Types of Evidence	Yes	No	Total	Yes	No	Total				
Scientific Studies	43(12)	57(16)	100(28)	58(14)	42(10)	100(24)	1.238	1	Not Sig	
Statistics	21(6)	79(22)	100(28)	33(8)	67(16)	100(24)	0.931	1	Not Sig	
Public Opinion Polls	0	100(28)	100(28)	33(8)	67(16)	100(24)	11.03	1	0.001	0.461

Table 5.2: (Continued).

<i>Ipsa Dictum</i>	54(15)	46(13)	100(28)	42(10)	58(14)	100(24)	0.734	1	Not Sig	
Laws and Legal Authority	54(15)	46(13)	100(28)	46(11)	54(13)	100(24)	0.310	1	Not Sig	

Comparison of Combined Winning and Losing Coalitions

This arrangement provides the opportunity to look across the two regions to determine if certain type(s) of evidence were more likely to be found in winning coalitions or losing coalitions, thus indicating whether strategies work regardless of location. Table 5.3 displays the results for the different types of evidence found in the combined winning and losing coalitions. As public opinion polls were not found in the Brazilian narratives the Public Opinion Polls evidence type was removed from this comparison. One evidence type, *ipso dictum*, was found significantly different between the combined winning and losing coalitions. The *ipso dictum* evidence type was found in 76% of the combined winning coalition's narratives and in only 46% of the combined losing coalition's narratives. The Cramer's V value indicates a weak relationship between the presence of *ipso dictum* and the winning coalition.

These results indicate that a key component of winning policy narratives related to the release of GM mosquitos is the inclusion of evidence that is based on the appeal to some type of figure that has authority based on title or position (*ipso dictum*). In the case of GM mosquitos narrative there was no celebrity advocating for the release of GM mosquitos, but rather a group of government, academic, nonprofit and industry leaders.

Table 5.3: Combined Coalitions Evidence Type.

Narrative Element	Policy Coalition						Statistics			
	Combined Winning % (n)			Combined Losing % (n)			χ^2	df	p value	C.'s V
Types of Evidence	Yes	No	Total	Yes	No	Total				
Scientific Studies	54(52)	46(44)	100(96)	56(23)	44(18)	100(41)	0.043	1	Not Sig	
Statistics	28(27)	72(69)	100(96)	34(14)	66(27)	100(41)	0.497	1	Not Sig	

Table 5.3: (Continued).

<i>Ipsa Dictum</i>	76(73)	24(23)	100(96)	46(19)	54(22)	100(41)	11.489	1	0.001	0.290
Laws and Legal Authority	22(21)	78(75)	100(96)	34(14)	66(27)	100(41)	.275	1	Not Sig	

Comparison of pro-GM and anti-GM Coalitions

This section examines the types of evidence found in policy narratives from the perspective of coalitions that supported the release of GM mosquitos (pro-GM) or opposed the release of GM mosquitos (anti-GM) in Brazil and the Florida Keys. This analysis facilitates a comparison of how the different types of evidence varied across the Brazilian and Florida Keys policy subsystems.

Table 5.4 displays how the six types of evidence: Scientific Studies, Statistics, *ipso dictum*, Public Opinion Polls and Laws and Legal Rulings and Tacit or Localized Knowledge differed in their presence in the pro-GM and anti-GM coalitions across Brazilian and Florida Keys policy subsystems. The presence of the *ipso dictum* evidence type differed significantly in Brazilian subsystem where it was associated with the coalition that supported GM mosquito releases (pro-GM). The Public Opinion Polls evidence type differed significantly in the Florida Keys subsystem where it was associated with the coalition that supported mosquito releases (pro-GM). This evidence type was not found in any of the Brazilian policy narratives. The Scientific Studies, Statistics, and Laws and Legal Rulings evidence types were found in policy narratives for both policy subsystems but showed no significant difference in the frequency of their presence. The Tacit or Localized Knowledge evidence type was not found in any Brazilian or Florida Keys policy narratives.

Table 5.4: Types of Evidence Compared across Pro and Anti GM Coalitions and Policy Subsystems.

Type of Evidence	Significant in Brazil Policy Subsystem?	Significant in Florida Keys Policy Subsystem?	Coalition Brazil	Coalition Florida Keys
<i>Ipsa Dictum</i>	Yes	No	Pro-GM (Winning)	No Difference Found
Public Opinion Polls	Not Present in Narrative	Yes	Not Present in Narrative	Pro-GM (Losing)
Scientific Studies	No	No	No Difference Found	No Difference Found
Statistics	No	No	No Difference Found	No Difference Found
Laws and Legal Authority	No	No	No Difference Found	No Difference Found
Tacit or Localized Knowledge	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative

Hypotheses 1 and 2 address the types of evidence that may be present in coalitions that supported the release of GM mosquitos (pro-GM) or opposed the release of GM mosquitos (anti-GM). Hypothesis 1 proposed that coalitions supporting the release of GM mosquitos (pro-GM) would have significantly more references to the Scientific Studies. This hypothesis was not supported as the Scientific Studies evidence type demonstrated no significant difference between pro-GM and anti-GM coalitions in either the Brazilian or Florida Keys policy subsystems. Hypothesis 2 proposed that coalitions opposed to the release of GM mosquitos (anti-GM) would have significantly more references to the Tacit or Localized Knowledge evidence type. This hypothesis was not supported as this evidence type was not found in any policy narratives.

This analysis of the types of evidence used in pro-GM and anti-GM policy narratives paints a much more nuanced picture of the types of evidence that these coalitions rely on. In general, the usual trope about evidence in GMO release discussions is that pro-GM coalitions point to scientific evidence when discussing their policy solution and that anti-GM coalitions ignore scientific research and rely on other types of evidence including celebrity endorsements or an appeal to the importance of localized knowledge. These results demonstrate that in the case of GM mosquitos narratives neither coalition relied on a specific type of evidence. Both referenced scientific studies and it wasn't a distinguishing feature for either coalition. The anti-

GM coalitions never appealed to the importance of localized knowledge. It may be a little surprising that the pro-GM coalitions pointed to other evidence sources such as *ipso dictum* and public opinion polls when discussing their policy solution to release GM mosquitos.

5.3 Use of Evidence

This section describes and compares how different types of evidence were used in the policy narratives of Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos. First, the different types of evidence used in the policy narratives will be compared across the winning and losing policy coalitions in Brazil and the Florida Keys. Next, the different types of evidence used in the policy narratives of the combined winning and losing coalitions will be discussed. Finally, the different types of evidence used in policy narratives are compared across pro-GM (supported the release of GM mosquitos) and anti-GM (opposed GM mosquito releases) coalitions. This allows a comparison across the two geographic regions or policy subsystems.

To understand how evidence is used in the GM mosquito policy narratives this analysis employed a typology developed by Schlaufer (2018) that categorizes the different uses of evidence in policy narratives. According to this typology there are seven narrative uses of evidence including: (a) demonstrating the policy problem, (b) downplaying the policy problem, (c) supporting the policy solution, (d) refuting the solution of opponents, (e) embellishing the hero, (f) demonizing the villain, and (g) evidence as the focus of the narrative. For this analysis each of the six type of evidence identified in Section 5.2, except Tacit or Localized Knowledge, were analyzed against Schlaufer's typology to determine how it was used in the GM mosquito policy narratives. For each evidence type, documents were coded for the presence or absence of each of the seven uses of evidence.

Scientific Studies

Comparison of Winning and Losing Coalitions- Brazil

Table 5.5 displays the results of how the Scientific Studies evidence type was used by the winning and losing coalitions in Brazil. The value in the Yes column indicates how many times a particular usage of an evidence type was present in the narrative. The value in χ^2 column is the result of the Pearson chi-square test of independence identifying whether there are any significant differences in the way the evidence type was used between the coalitions. The df column represents the degrees of freedom for the χ^2 test and p-value column presents the corresponding p-value. The term “Not Sig” means not significant. The C.’s V column represents the Cramer’s V value that is used to describe the strength of the relationship between the usage of Scientific Studies evidence type and a specific coalition, where 0.1 identifies a weak effect size, 0.3 identifies a moderate effect size, and 0.5 identifies a strong effect size.

When examining Scientific Studies four different usages of evidence, Support Policy Solution, Refute Opposing Policy Solution, Demonize the Villain, and Evidence as the Focus of the Narrative were found significantly different between the winning and losing coalitions in Brazil. The Support Policy Solution usage type (scientific evidence used to support GM mosquito releases) was found in 59% of the winning coalition’s narratives and in only 12% of losing coalition’s narratives. Since the winning coalition in Brazil was also the pro-GM coalition, scientific studies were being used by this coalition to support the release of GM mosquitos. The Cramer’s V value indicates a moderate relationship between the presence of Support Policy Solution usage type and the winning coalition in Brazil.

The Refute Opposing Policy Solution usage type (scientific evidence used to argue against GM mosquito releases) was found in 47% of the losing coalition’s narratives and was not

found in the narratives of the winning coalition. The losing coalition in Brazil was also the anti-GM coalition which used scientific studies to refute the release of GM mosquitoes. The Cramer's V value indicates a strong relationship between the presence of Refute Opposing Policy Solution usage type and the losing coalition in Brazil.

The Demonize the Villain usage type was found in 24% of the losing coalition's narratives (anti-GM) and was not found in the narratives of the winning coalition (pro-GM). This supports the results from Chapter Four where the pro-GM coalition in Brazil did not portray any villains in their policy narratives. This may indicate that in Brazil the identification of heroes rather than villains leads to a winning policy narrative. The Cramer's V value indicates a moderate relationship between the presence of Demonize the Villain usage type and the losing coalition in Brazil. The Evidence as the Focus of the Narrative usage type was found in 18% of the losing coalition's narratives (anti-GM) and in only 1% of the winning coalition's narratives. The Cramer's V value indicates a moderate relationship between the presence of Evidence as the Focus of the Narrative usage type and the losing coalition in Brazil. In this use of evidence, the losing coalition (anti-GM) focused on specific results reported by Oxitec or Oxitec publications to identify issues with the data and draw different conclusions. The Demonstrate Policy Problem and Downplaying the Policy Problem evidence usage types were not present in any of the Brazilian policy narratives for Scientific Studies.

These results demonstrate that both winning and losing coalitions in Brazil used scientific evidence in their policy narratives, but for different purposes. The winning coalition used scientific evidence to support their policy solution to release GM mosquitos. The losing coalition used scientific evidence to refute the rationale to release mosquitos, to portray the winning coalition in a bad perspective and to attack specific key results and publications of the

winning coalition. It appears that in Brazil the use of scientific evidence to support GM mosquito releases helped create a winning policy narrative while other uses of evidence were less effective.

Table 5.5: Usage of Scientific Studies as Evidence in Brazil.

Narrative Element	Policy Coalition						Statistics			
	Brazil Winning (Support) % (n)			Brazil Losing (Oppose) % (n)			χ^2	d f	p value	C.'s V
Scientific Studies	Yes	No	Total	Yes	No	Total				
Support Policy Solution	59(40)	41(28)	100(68)	12(2)	88(15)	100(17)	12.049	1	0.001	0.376
Refute Opposing Policy Solution	0	100(68)	100(68)	47(8)	53(9)	100(17)	35.325	1	<0.001	0.645
Embellish the Hero	26(18)	74(50)	100(68)	6(1)	94(16)	100(17)	3.321	1	Not Sig	
Demonize the Villain	0	100(68)	100(68)	24(4)	76(13)	100(17)	16.79	1	<0.001	0.444
Evidence as the Focus of the Narrative	1(1)	99(67)	100(68)	18(3)	82(14)	100(17)	7.936	1	0.005	0.306

Comparison of Winning and Losing Coalitions- Florida Keys

Table 5.6 displays the results of the different ways Scientific Studies was used as evidence in the Florida Keys coalitions. Two different types of usage, Support Policy Solution and Refute Opposing Policy Solution demonstrated significant differences. The Support Policy Solution usage type (scientific evidence used to support GM mosquito releases) was found in 58% of the losing coalition’s narratives (pro-GM) and was not found in the narratives of the winning coalition (anti-GM). In the Florida Keys the losing coalition was also the pro-GM coalition which used scientific studies to support the release of GM mosquitos It demonstrated a strong relationship with the losing coalition. The Refute Opposing Policy Solution usage type (scientific evidence used to argue against GM mosquito releases) was found in 43% of the winning coalition’s narratives and was not found in the narratives of the losing coalition. In the Florida Keys the winning coalition was also the anti-GM coalition which used scientific studies

to argue against the release of GM mosquitos It demonstrated a strong relationship with the winning coalition. The Demonstrate Policy Problem and Downplaying the Policy Problem usage types were not present in any of the Florida Keys policy narratives for the Scientific Studies evidence type. These results are similar to what occurred in Brazil where both policy coalitions used scientific evidence, just in different ways.

Table 5.6: Usage of Scientific Studies as Evidence in the Florida Keys.

Narrative Element	Policy Coalition						Statistics			
	Florida Keys Winning (Oppose) % (n)			Florida Keys Losing (Support) % (n)			χ^2	df	p value	C.'s V
Scientific Studies	Yes	No	Total	Yes	No	Total				
Support Policy Solution	0	100(28)	100(28)	58(14)	42(10)	100(24)	22.351	1	<0.001	0.656
Refute Opposing Policy Solution	43(12)	57(16)	100(28)	0	100(24)	100(24)	13.371	1	<0.001	0.507
Embellish the Hero	11(3)	89(25)	100(28)	17(4)	83(20)	100(24)	0.393	1	Not Sig	
Demonize the Villain	18(5)	82(23)	100(28)	0	100(24)	100(24)	4.742	1	Not Sig	
Evidence as the Focus of the Narrative	4(1)	96(27)	100(28)	0	100(24)	100(24)	0.874	1	Not Sig	

Comparison of Combined Winning and Losing Coalitions

This comparison provides the opportunity to look across the two regions to determine if how Scientific Studies was used in policy narratives is more likely to be associated with winning coalitions or losing coalitions in both countries. The analysis of the combined winning and losing coalitions did not identify any significant differences in how Scientific Studies was used as evidence. These results indicate that the use of scientific evidence may be a successful tactic when building winning policy narratives in certain policy subsystems, but that it isn't applicable to all situations or locations.

Comparison of pro-GM and anti-GM Coalitions

This section examines how the Scientific Studies were used as evidence in policy narratives from the perspective of supporting (pro-GM) and opposing (anti-GM) coalitions in Brazil and the Florida Keys. This comparison also permits an examination of how the Scientific Studies evidence type is used as evidence in winning and losing policy narratives across the Brazilian and Florida Keys policy subsystems, thus shedding light on successful narratives.

Table 5.7 displays how the seven usages of evidence: (a) Demonstrating the Policy Problem, (b) Downplaying the Policy Problem, (c) Support Policy Solution, (d) Refute Opposing Policy Solution, (e) Embellishing the Hero, (f) Demonize the Villain, and (g) Evidence as the Focus of the Narrative differed in usage for the Scientific Studies evidence type across policy subsystems. It also displays the difference between coalitions that opposed the release of GM mosquitos compared to coalitions that supported their release, as well as winners and losers.

The presence of the Support Policy Solution usage type was significant in Brazilian and US policy subsystems where it was associated with the pro-GM coalition and scientific evidence was used to justify or rationalize the release of GM mosquitos. The pro-GM coalition won in Brazil but lost in the Florida Keys. The presence of the Refute Opposing Policy Solution usage type was significant in Brazilian and US policy subsystems where it was associated with the anti-GM coalition and scientific evidence was used to argue against GM mosquito releases. The anti-GM coalition won in the Florida Keys, but lost in Brazil. These results indicate that certain uses of scientific evidence do not automatically support a winning policy narrative or lead to a losing policy narrative. Its tactical advantage or disadvantage in a policy narrative seems to be conditioned on location.

The Demonize the Villain and Evidence as the Focus of the Narrative usage types were significant in the Brazilian policy subsystem and were associated with the anti-GM coalition. The Demonstrating the Policy Problem and Downplaying the Policy Problem usage types were not found in any Brazilian or Florida Keys policy narratives.

These results indicate that the use of Scientific Studies is more closely associated with coalitions that support or oppose the release of GM mosquitos as compared to winning and losing coalitions. From this anti-GM versus pro-GM perspective scientific evidence was used in the following ways: :

- Pro-GM coalitions used scientific evidence to support their coalition’s policy solution of releasing GM mosquitos.
- Anti-GM coalitions used scientific evidence to refute the policy solution of the pro-GM coalitions.
- The anti-GM coalition in Brazil that lost used scientific evidence:
 - to portray the villain of the narrative, mostly Oxitec, in a negative manner
 - as the focus of a policy narrative to attack specific scientific results from Oxitec in an effort to discredit them or provide alternative conclusions.

This use of scientific evidence does not appear to be a successful, winning strategy.

Table 5.7: Usage of Scientific Studies as Evidence across Opposing Coalitions and Policy Subsystems.

Scientific Studies- Use of Evidence	Significant in Brazil Policy Subsystem?	Significant in Florida Keys Policy Subsystem?	Coalition Brazil	Coalition Florida Keys
Support Policy Solution	Yes	Yes	Pro-GM (Winning)	Pro-GM (Losing)
Refute Opposing Policy Solution	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Demonize the Villain	Yes	No	Anti-GM (Losing)	No Difference Found

Table 5.7: (Continued)

Evidence as the Focus of the Narrative	Yes	No	Anti-GM (Losing)	No Difference Found
Demonstrating the Policy Problem	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative
Downplaying the Policy Problem	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative
Embellishing the Hero	No	No	No Difference Found	No Difference Found

Statistics

Comparison of Winning and Losing Coalitions- Brazil

Table 5.8 displays the different ways Statistics was used as evidence in the Brazilian coalitions. When analyzing Statistics two different usages of evidence, Refute Opposing Policy Solution and Demonize the Villain were found significantly different between the winning and losing coalitions in Brazil. The Refute Opposing Policy Solution usage type (statistics used to argue against GM mosquito releases) was found in 29% of the losing coalition's (anti-GM) narratives and in only 1% of winning coalition's (pro-GM) narratives and exhibited a moderate relationship with the losing coalition. The Demonize the Villain usage type (statistics used to vilify a policy actor) was found in 12% of the losing coalition's narratives (anti-GM) and was not found in the winning coalition's narratives. It exhibited a moderate relationship with the losing coalition. Statistics was used in a similar manner as scientific evidence to vilify Oxitec and supports the results in Chapter Four that demonstrates the losing coalition portraying Oxitec as a villain. Both uses of statistics in Brazil are associated with losing policy narratives. If the goal is to construct winning policy narratives it may be best to not to use statistics in this manner.

Table 5.8: Usage of Statistics as Evidence in Brazil.

Narrative Element	Policy Coalition						Statistics			
	Brazil Winning (Support) % (n)			Brazil Losing (Oppose) % (n)			χ^2	df	p value	C.'s V
Statistics	Yes	No	Total	Yes	No	Total				
Demonstrate Policy Problem	24(16)	76(52)	100(68)	6(1)	94(16)	100(17)	2.647	1	Not Sig	
Support Policy Solution	6(4)	94(64)	100(68)	6(1)	94(16)	100(17)	0	1	Not Sig	
Refute Opposing Policy Solution	1(1)	99(67)	100(68)	29(5)	71(12)	100(17)	16.184	1	<0.001	0.436
Embellish the Hero	1(1)	99(67)	100(68)	6(1)	94(16)	100(17)	1.152	1	Not Sig	
Demonize the Villain	0	100(68)	100(68)	12(2)	88(15)	100(17)	8.193	1	0.004	0.31

Comparison of Winning and Losing Coalitions- Florida Keys

The analysis of the winning and losing coalitions in the Florida Keys did not identify any significant differences in how Statistics was used as evidence.

Comparison of Combined Winning and Losing Coalitions

The analysis of the combined winning and losing coalitions did not identify any significant differences in how Statistics was used as evidence. These results indicate that the use of statistics may be a successful tactic when building winning policy narratives in certain policy subsystems, but that it isn't applicable to all situations or locations.

Comparison of pro-GM and anti-GM Coalitions

This section examines how Statistics was used as evidence in policy narratives from the perspective of coalitions that supported (pro-GM) and opposed (anti-GM) the release of GM mosquitos in Brazil and the Florida Keys. This comparison also permits an examination of how the Statistics evidence type is used as evidence in winning and losing policy narratives policy narratives across the Brazilian and Florida Keys policy subsystems, thus shedding light on potential components of successful narratives.

Table 5.9 displays how the seven usages of evidence differed in usage for Statistics across policy subsystems. It also displays differences between coalitions that opposed the release of GM mosquitos compared to coalitions that supported their release. The Refute Opposing Policy Solution and Demonize the Villain usage type were only significant in the Brazilian policy subsystem and were associated with the anti-GM coalition.

The Evidence as the Focus of the Narrative and Downplaying the Policy Problem usage types were not found in any Brazilian or Florida Keys policy narratives. These results indicate that statistics was used in Brazil by the anti-GM coalition (losing) to refute the policy solution of the opposing coalition and portray the villain of the narrative in a negative manner.

Table 5.9: Usage of Statistics as Evidence across Opposing Coalitions and Policy Subsystems.

Statistics- Use of Evidence	Significant in Brazil Policy Subsystem?	Significant in Florida Keys Policy Subsystem?	Coalition Brazil	Coalition Florida Keys
Refute Opposing Policy Solution	Yes	No	Anti-GM (Losing)	No Difference Found
Demonize the Villain	Yes	No	Anti-GM (Losing)	No Difference Found
Support Policy Solution	No	No	No Difference Found	No Difference Found
Demonstrating the Policy Problem	No	No	No Difference Found	No Difference Found
Embellishing the Hero	No	No	No Difference Found	No Difference Found
Evidence as the Focus of the Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative
Downplaying the Policy Problem	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative

Public Opinion Polls

Comparison of Winning and Losing Coalitions- Brazil

The Public Opinion Polls evidence type was not found in the policy narratives of the Brazilian coalitions. No analysis of its uses of evidence is possible.

Comparison of Winning and Losing Coalitions- Florida Keys

Table 5.10 displays the results of the different ways Public Opinion Polls were used as evidence in the Florida Keys coalitions. The Support Policy Solution usage type (public opinion polls used to support GM mosquito releases) showed a significant difference in usage. It was found in 33% of the losing coalition’s narratives (pro-GM) and was not found in the narratives of the winning coalition (anti-GM). As previously described the polls indicated that a majority of Americans supported the release of GM mosquitos to combat diseases, most specifically Zika. The losing coalition in the Florida Keys was also the pro-GM coalition. They used public opinion polls to support their policy preference to release GM mosquitos as the polls seemed to indicate that a majority of Americans seemed to agree with the solution. The losing coalition may have misjudged the power of the polls as the actual voting decision on the referendum to release mosquitos relied on a small number of citizen in the city of Key Haven. The Demonstrate Policy Problem, Demonize the Villain, Refute Opposing Policy Solution and Downplaying the Policy Problem uses of Public Opinion Polls were not found in the Florida Keys narratives.

Table 5.10: Usage of Public Opinion Polls as Evidence in the Florida Keys.

Narrative Element	Policy Coalition						Statistics			
	Florida Keys Winning (Oppose) % (n)			Florida Keys Losing (Support) % (n)			χ^2	df	p value	C.'s V
Public Opinion Polls	Yes	No	Total	Yes	No	Total				
Support Policy Solution	0	100(28)	100(28)	33(8)	67(16)	100(24)	11.03	1	0.001	0.461
Embellish the Hero	0	100(28)	100(28)	8(2)	92(22)	100(24)	2.427	1	Not Sig	
Evidence as the Focus of the Narrative	0	100(28)	100(28)	13(3)	87(21)	100(24)	3.714	1	Not Sig	

Comparison of Combined Winning and Losing Coalitions

No analysis of the combined winning and losing coalitions was conducted as none of the policy narratives gathered for the Brazilian coalitions contained any reference to Public Opinion Polls. These results indicate that the use of public opinion polls may be a successful tactic when building winning policy narratives in certain policy subsystems, but that it isn't applicable to all situations or locations.

Comparison of pro-GM and anti-GM Coalitions

This section examines how the Public Opinion Polls evidence type was used as evidence in policy narratives from the perspective of supporting (pro-GM) and opposing (anti-GM) coalitions in Brazil and the Florida Keys. This comparison also permits an examination of how Public Opinion Polls are used as evidence in winning and losing policy narratives across the Brazilian and Florida Keys policy subsystems, thus shedding light on potential components of successful narratives.

Table 5.11 displays how the seven usages of evidence differed for Public Opinion Polls between pro-GM and anti-GM coalitions across Brazilian and Florida Keys policy subsystems. The Brazilian policy subsystem narratives did not contain any references to Public Opinion Polls, so a cross case comparison was not possible. The Support Policy Solution usage type (public opinion polls used to support GM mosquito releases) was significant in the Florida Keys policy subsystem and was associated with the pro-GM coalition which was also the losing coalition. As the public opinion polls highlighted in the policy narratives demonstrated varying degrees of public support for the release of GM mosquitos, the pro-GM coalition used these polls as evidence to support the release of GM mosquitos. However, due to its presence in the losing coalition's in the Florida Keys and its absence in the narratives of the winning coalition in Brazil

this use of public opinion polls does not seem to be necessary to compose a winning policy narrative.

Table 5.11: Usage of Public Opinion Polls as Evidence across Opposing Coalitions and Policy Subsystems

Public Opinion Polls- Use of Evidence	Significant in Brazil Policy Subsystem?	Significant in Florida Keys Policy Subsystem?	Coalition Brazil	Coalition Florida Keys
Support Policy Solution	Not Present in Narrative	Yes	Not Present in Narrative	Pro-GM (Losing)
Embellish the Hero	Not Present in Narrative	No	Not Present in Narrative	No Difference Found
Evidence as the Focus of the Narrative	Not Present in Narrative	No	Not Present in Narrative	No Difference Found
Demonstrating the Policy Problem	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative
Demonize the Villain	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative
Refute Opposing Policy Solution	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative
Downplaying the Policy Problem	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative

ipso dictum

Comparison of Winning and Losing Coalitions- Brazil

Table 5.12 displays the results of the different ways *ipso dictum* was used as evidence for the Brazilian coalitions. When analyzing the *ipso dictum* evidence type three different usages of evidence, Support Policy Solution, Refute Opposing Policy Solution and Demonize the Villain were found significantly different between the winning and losing coalitions in Brazil. The Support Policy Solution usage type (*ipso dictum* used to support GM mosquito releases) was found in 78% of the winning coalition’s (pro-GM) narratives and in only 6% of losing coalition’s (anti-GM) narratives and exhibited a strong relationship with the winning coalition. The Refute Opposing Policy Solution usage type (*ipso dictum* used to argue against GM mosquito releases) was found in 65% of the losing coalition’s (anti-GM) narratives and was not found in the winning coalition’s (pro-GM) narratives. It exhibited a strong relationship with the losing coalition. The Demonize the Villain usage type (*ipso dictum* used to vilify a policy actor) was

found in 29% of the losing coalition’s (anti-GM) narratives and was not found in the winning coalition’s (pro-GM) narratives. It exhibited a strong relationship with the losing coalition. *ipso dictum* was not used to Demonstrate Policy Problem or Downplaying the Policy Problem in the Brazilian narratives.

The use of *ipso dictum* in Brazil was very similar to the use of scientific evidence. The winning coalition used *ipso dictum* to provide support for the release of GM mosquitos. This similarity may be due to the fact that most of the coding instances of *ipso dictum* are from leaders from Oxitec and Moscamed that often included scientific results in their quotes.

The losing coalition used *ipso dictum* to argue against GM mosquito releases and vilify Oxitec’s motives and behavior. In many instances the losing coalition would issue a joint press release in which a collection of NGO leaders would argue against GM mosquito releases and vilify Oxitec’s actions and motivations. In Brazil *ipso dictum* used to support GM mosquito releases helped build winning policy narratives while *ipso dictum* used to refute mosquito releases or vilify key policy actors many be an incorrect tactic in building winning policy narratives.

Table 5.12: Usage of ipso dictum as Evidence in Brazil.

Narrative Element	Policy Coalition						Statistics			
	Brazil Winning (Support) % (n)			Brazil Losing (Oppose) % (n)			χ^2	df	p value	C.’s V
<i>Ipsa Dictum</i>	Yes	No	Total	Yes	No	Total				
Support Policy Solution	78(53)	22(15)	100(68)	6(1)	94(16)	100(17)	30.479	1	<0.001	0.599
Refute Opposing Policy Solution	0	100(68)	100(68)	35(6)	65(11)	100(17)	25.823	1	<0.001	0.551
Embellish the Hero	40(27)	60(41)	100(68)	12(2)	88(15)	100(17)	4.724	1	Not Sig	
Demonize the Villain	0	100(68)	100(68)	29(5)	71(12)	100(17)	21.25	1	<0.001	0.5
Evidence as the Focus of the Narrative	9(6)	91(62)	100(68)	6(1)	94(16)	100(17)	0.156	1	Not Sig	

Comparison of Winning and Losing Coalitions- Florida Keys

Table 5.13 displays the results of the different ways *ipso dictum* was used as evidence in the Florida Keys coalitions. The Support Policy Solution and Refute Opposing Policy Solution usage type showed significant difference in usage. The Support Policy Solution (*ipso dictum* used to support GM mosquito releases) was found in 33% of the losing coalition’s (pro-GM) narratives and was not found in the narratives of the winning coalition (anti-GM). It demonstrated a moderate relationship with the losing coalition. The Refute Opposing Policy Solution (*ipso dictum* used to argue against GM mosquito releases) was found in 54% of the winning coalition’s (anti-GM) narratives and was not found in the narratives of the losing coalition (pro-GM). It demonstrated a strong relationship with the winning coalition. *ipso dictum* was not used to Demonstrate Policy Problem or Downplaying the Policy Problem in the Florida Keys narratives. These results are opposite to what was found in Brazil which may be due to the fact that the winning coalition in the Florida Keys opposed GM mosquito releases and the losing coalition supported releases.

Table 5.13: Usage of *ipso dictum* as Evidence in the Florida Keys.

Narrative Element	Policy Coalition						Statistics			
	Florida Keys Winning (Oppose) % (n)			Florida Keys Losing (Support) % (n)			χ^2	df	p value	C.’s V
<i>Ipsa Dictum</i>	Yes	No	Total	Yes	No	Total				
Support Policy Solution	0	100(28)	100(28)	33(8)	67(16)	100(24)	11.03	1	0.001	0.461
Refute Opposing Policy Solution	54(15)	46(13)	100(28)	0	100(24)	100(24)	18.069	1	<0.001	0.589
Embellish the Hero	14(4)	86(24)	100(28)	12(3)	88(21)	100(24)	0.035	1	Not Sig	
Demonize the Villain	25(7)	75(21)	100(28)	0	100(24)	100(24)	6.933	1	Not Sig	
Evidence as the Focus of the Narrative	4(1)	96(27)	100(28)	8(2)	92(22)	100(24)	0.539	1	Not Sig	

Comparison of Combined Winning and Losing Coalitions

This comparison provides the opportunity to look across the two regions to determine if how *ipso dictum* was used in policy narratives is more likely to be associated with winning coalitions or losing coalitions in both countries. Table 5.14 displays the results for the different ways *ipso dictum* was used as evidence for the combined winning and losing coalitions. The Support Policy Solution usage type was found in 55% of the combined winning coalition’s narratives and in 22% of the narratives of the combined losing coalition’s narratives. It demonstrated a moderate relationship with the combined winning coalition. These results indicate the use of *ipso dictum* to support a particular policy solution may be a valuable component of a winning policy narrative.

Table 5.14: Usage of ipso dictum as Evidence in Combined Coalitions.

Narrative Element	Policy Coalition						Statistics			
	Combined Winning % (n)			Combined Losing % (n)			χ^2	df	p value	C.'s V
<i>Ipso Dictum</i>	Yes	No	Total	Yes	No	Total				
Support Policy Solution	55(53)	45(43)	100(96)	22(9)	78(32)	100(41)	12.826	1	<0.001	0.306
Refute Opposing Policy Solution	16(15)	84(81)	100(96)	15(6)	85(35)	100(41)	0.022	1	Not Sig	
Embellish the Hero	32(31)	68(65)	100(96)	12(5)	88(36)	100(41)	5.99	1	Not Sig	
Demonize the Villain	7(7)	93(89)	100(96)	12(5)	88(36)	100(41)	0.864	1	Not Sig	
Evidence as the Focus of the Narrative	7(7)	93(89)	100(96)	7(3)	93(38)	100(41)	0	1	Not Sig	

Comparison of pro-GM and anti-GM Coalitions

This section examines how the *ipso dictum* is used as evidence in policy narratives from the perspective of supporting (pro-GM) and opposing (anti-GM) coalitions in Brazil and the Florida Keys. This comparison also permits an examination of how *ipso dictum* is used as

evidence in winning and losing policy narratives across the Brazilian and Florida Keys policy subsystems, thus shedding light on potential components of successful narratives.

Table 5.15 displays how the seven usages of evidence differed for *ipso dictum* between pro-GM and anti-GM coalitions across Brazilian and Florida Keys policy subsystems. The Support Policy Solution usage type was significant in Brazilian and Florida Keys policy subsystems where it was associated with the pro-GM coalitions. The Refute Opposing Policy Solution usage type was also significant across both subsystem and was associated with the anti-GM coalitions. The Demonize the Villain usage type was significant in Brazilian subsystem and was associated with the anti-GM coalition.

These results indicate that the use of *ipso dictum* is more closely associated with coalitions that support or oppose the release of GM mosquitos as compared to winning and losing coalitions. From this anti-GM versus pro-GM perspective *ipso dictum* was used in the following ways:

- Pro-GM coalitions used *ipso dictum* to support their coalition’s policy solution of releasing GM mosquitos
- Anti-GM coalitions used *ipso dictum* to refute the policy solution of the pro-GM coalitions
- The anti-GM coalition in Brazil that lost used *ipso dictum*:
 - to portray the villain of the narrative, mostly Oxitec, in a negative manner

Table 5.15: Usage of *ipso dictum* as Evidence across Opposing Coalitions and Policy Subsystems.

<i>Ipsa Dictum</i> - Use of Evidence	Significant in Brazil Policy Subsystem?	Significant in Florida Keys Policy Subsystem?	Coalition Brazil	Coalition Florida Keys
Support Policy Solution	Yes	Yes	Pro-GM (Winning)	Pro-GM (Losing)
Refute Opposing Policy Solution	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Demonize the Villain	Yes	No	Anti-GM (Losing)	No Difference Found

Table 5.15: (Continued)

Embellish the Hero	No	No	No Difference Found	No Difference Found
Evidence as the Focus of the Narrative	No	No	No Difference Found	No Difference Found
Demonstrating the Policy Problem	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative
Downplaying the Policy Problem	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative

Laws and Legal Authority

Comparison of Winning and Losing Coalitions- Brazil

Table 5.16 displays the results of the different ways Laws and Legal Authority was used as evidence for the Brazilian coalitions. When analyzing Laws and Legal Authority, the Refute Opposing Policy Solution usage type was found significantly different between the winning and losing coalitions in Brazil. The Refute Opposing Policy Solution usage type was found in 12% of the losing coalition's (anti-GM) narratives and was not found in the winning coalition's (pro-GM) narratives. It exhibited a moderate relationship with the losing coalition and was used by the losing coalition to argue against the release of GM mosquitos. The losing coalition in Brazil highlighted that Oxitec and the Brazilian government were not abiding by the Convention for Biodiversity (CBD) legal requirements that required Oxitec to submit specific a risk assessment in export documentation when shipping genetically modified material (mosquito larvae) from the United Kingdom to Brazil and other locations. The Demonstrate Policy Problem and Downplaying the Policy Problem usage types were not found in the Brazilian narratives for the Laws and Legal Authority evidence type. The use of legal arguments did not seem to have any influence as a good tactic for a winning policy narrative.

Table 5.16: Usage of Laws and Legal Authority as Evidence in Brazil.

Narrative Element	Policy Coalition						Statistics			
	Brazil Winning (Support) % (n)			Brazil Losing (Oppose) % (n)			χ^2	df	p value	C.'s V
Laws and Legal Authority	Yes	No	Total	Yes	No	Total				
Support Policy Solution	7(5)	93(63)	100(68)	0	100(17)	100(17)	1.328	1	Not Sig	
Refute Opposing Policy Solution	0	100(68)	100(68)	12(2)	88(15)	100(17)	8.193	1	0.004	0.310
Embellish the Hero	1(1)	99(67)	100(68)	0	100(17)	100(17)	0.253	1	Not Sig	
Demonize the Villain	0	100(68)	100(68)	6(1)	94(16)	100(17)	4.048	1	Not Sig	
Evidence as the Focus of the Narrative	3(2)	97(66)	100(68)	0	100(17)	100(17)	0.512	1	Not Sig	

Comparison of Winning and Losing Coalitions- Florida Keys

Table 5.17 displays the results of the different ways Laws and Legal Authority was used as evidence for the Florida Keys coalitions. The Support Policy Solution, Refute Opposing Policy Solution and Demonize the Villain usage type showed significant difference in usage. The Support Policy Solution was found in 46% of the losing coalition's (pro-GM) narratives and was not found in the narratives of the winning coalition (anti-GM). It demonstrated a strong relationship with the losing coalition that used laws and legal authority to support the release of GM mosquitos. In most instances the losing policy coalition highlighted the FDA's release of a Finding of No Significant Impact (FONSI) for the trial releases of GM mosquitos in Key Haven or the FDA's final approval to allow trial releases of GM mosquitos in Key Haven. The Refute Opposing Policy Solution was found in 39% of the winning coalition's (anti-GM) narratives and was not found in the narratives of the losing coalition. It demonstrated a moderate relationship with the winning coalition that used laws and legal authority to argue against the release of GM mosquitos. In most instances the winning coalition referred to the results of the referendum in

Key Haven were citizens decided against GM mosquito releases. The Demonize the Villain usage type was found in 29% of the winning coalition's (anti-GM) narratives and was not found in the narratives of the winning coalition (pro-GM). It demonstrated a moderate relationship with the winning coalition that used laws and legal authority to oppose the release of GM mosquitos. In their narratives the winning coalition again raised the point that Oxitec failed to comply with the Convention for Biodiversity's requirement to provide a risk assessment when exporting genetically modified material to Brazil and other countries. This document was not required for the United States, but the winning coalition implied that Oxitec cannot be trusted to comply with other regulatory and legal requirements. The Demonstrate Policy Problem and Downplaying the Policy Problem uses of evidence were not found in the Florida Keys narratives.

It is interesting that the winning coalition did not use laws and legal authority to support its policy solution of no GM mosquitos. Instead they used laws and legal authority to argue against and attack the losing coalition. The use of legal arguments as evidence in this manner could be a component needed in winning policy narratives in the Florida Keys.

Table 5.17: Usage of Laws and Legal Authority as Evidence in the Florida Keys.

Narrative Element	Policy Coalition						Statistics			
	Florida Keys Winning (Oppose) % (n)			Florida Keys Losing (Support) % (n)			χ^2	df	p value	C.'s V
Laws and Legal Authority	Yes	No	Total	Yes	No	Total				
Support Policy Solution	0	100(28)	100(28)	46(11)	54(13)	100(24)	16.276	1	<0.001	0.559
Refute Opposing Policy Solution	39(11)	61(17)	100(28)	0	100(24)	100(24)	11.958	1	0.001	0.48
Embellish the Hero	14(4)	86(24)	100(28)	17(4)	83(20)	100(24)	0.056	1	Not Sig	
Demonize the Villain	29(8)	71(20)	100(28)	0	100(24)	100(24)	8.104	1	0.004	0.395
Evidence as the Focus of the Narrative	4(1)	96(27)	100(28)	4(1)	96(23)	100(24)	0.012	1	Not Sig	

Comparison of Combined Winning and Losing Coalitions

This comparison provides the opportunity to look across the two regions to determine if how Laws and Legal Authority was used in policy narratives is more likely to be associated with winning coalitions or losing coalitions in both countries. Table 5.18 displays the results for of the different ways Laws and Legal Authority was used as evidence for the combined winning and losing coalitions. The Support Policy Solution usage type showed significant difference in usage. It was found in 27% of the combined losing coalition’s narratives and in 5% of the narratives of the combined winning coalition’s narratives. It demonstrated a moderate relationship with the combined losing coalition. These results indicate that losing coalitions tried to use laws and legal rulings to support their policy positions, but this does not appear to be a successful tactic when attempting to create a winning policy narrative.

Table 5.18: Usage of Laws and Legal Authority as Evidence in Combined Coalitions.

Narrative Element	Policy Coalition						Statistics			
	Combined Winning % (n)			Combined Losing % (n)			χ^2	df	p value	C.’s V
Laws and Legal Authority	Yes	No	Total	Yes	No	Total				
Support Policy Solution	5(5)	95(91)	100(96)	27(11)	73(30)	100(41)	13.02	1	<0.001	0.308
Refute Opposing Policy Solution	11(11)	89(85)	100(96)	5(2)	95(39)	100(41)	1.448	1	Not Sig	
Embellish the Hero	5(5)	95(91)	100(96)	10(4)	90(37)	100(41)	0.968	1	Not Sig	
Demonize the Villain	8(8)	92(88)	100(96)	2(1)	98(40)	100(41)	1.626	1	Not Sig	
Evidence as the Focus of the Narrative	3(3)	97(93)	100(96)	2(1)	98(40)	100(41)	0.048	1	Not Sig	

Comparison of pro-GM and anti-GM Coalitions

This section examines how the Laws and Legal Authority are used as evidence in policy narratives from the perspective of supporting (pro-GM) and opposing (anti-GM) coalitions in Brazil and the Florida Keys. This comparison also permits an examination of how Laws and

Legal Authority is used as evidence in winning and losing policy narratives across the Brazilian and Florida Keys policy subsystems, thus shedding light on potential components of successful narratives.

Table 5.19 displays how the seven usages of evidence differed in usage for Laws and Legal Authority across policy subsystems, as well as between coalitions that opposed the release of GM mosquitos compared to coalitions that supported their release. The Refute Opposing Policy Solution was significant across both subsystem and in both instances was associated with the anti-GM coalitions. This indicates that these coalitions use Laws and Legal Authority to argue against the release of GM mosquitos. The Support Policy Solution usage type was significantly in the Florida Keys policy subsystem where it was associated with the pro-GM coalition.

These results indicate that the use of Laws and Legal Authority as evidence is more closely associated with coalition that support or oppose the release of GM mosquitos as compared to winning and losing coalitions. From this anti-GM versus pro-GM perspective Laws and Legal Authority was used in the following ways:

- Anti-GM coalitions in both regions used Laws and Legal Authority as evidence in their policy narratives to refute the policy solution of the pro-GM coalition. This produced mixed results from the perspective of constructing a winning coalitions based on the different results in Brazil and the Florida Keys. This use of evidence appears as a tactic in successful policy narratives seems to be region specific or requirements additional elements in the policy narrative.
- The pro-GM coalition in the Florida Keys used laws and legal authority as evidence to support its policy solution to release GM mosquitos by highlighting

the FDA’s approval at a number of key steps to allow the initial releases. A similar emphasis may not have been as important in Brazil as initial trial releases had already been approved by CTNBio and the releases discussed in the Brazilian policy narratives were to provide evidence for unrestricted releases.

Table 5.19: Usage of Laws and Legal Authority as Evidence across Opposing Coalitions and Policy Subsystems.

Laws and Legal Authority- Use of Evidence	Significant in Brazil Policy Subsystem?	Significant in Florida Keys Policy Subsystem?	Coalition Brazil	Coalition Florida Keys
Support Policy Solution	No	Yes	No Difference Found	Pro-GM (Losing)
Refute Opposing Policy Solution	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Embellish the Hero	No	No	No Difference Found	No Difference Found
Demonize the Villain	No	Yes	No Difference Found	Anti-GM (Winning)
Evidence as the Focus of the Narrative	No	No	No Difference Found	No Difference Found
Demonstrating the Policy Problem	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative
Downplaying the Policy Problem	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative	Not Present in Narrative

5.4 Summary of Findings and Discussion

Chapter Five investigated the role of evidence in policy narratives by examining the types of evidence found in policy narratives and how that evidence was used. In this analysis the types of evidence found, and the use of that evidence were examined in three different ways: (i) from the perspective of winning and losing coalitions within each country (ii) from the perspective of combined winning coalition and the losing coalitions (iii) from the perspective of coalitions that supported or opposed GM mosquito releases across the policy subsystems. A summary of the results is provided in the remainder of this section.

Some types of evidence were not found in policy narratives. The Tacit or Localized evidence type was not found in any policy narratives. The Public Opinion Polls evidence type was not found in any of the narratives that discussed the release of GM mosquitos in Brazil.

The types of evidence found in policy narratives differed between the winning and losing coalitions in the same policy subsystem. *ipso dictum* was found at significantly different levels between the winning and losing coalitions in Brazil. Public Opinion Polls was found at significantly different levels between the winning and losing coalitions in the Florida Keys.

Some types of evidence found significant in policy narratives were only associated with coalitions that supported the release of GM mosquitos. *ipso dictum* was moderately associated with the coalition that supported release in Brazil and Public Opinion Polls was moderately associate with the coalition that supported releases in the Florida Keys.

Both hypotheses that predicted the association of a type of evidence to a coalition that supported or opposed the release of GM mosquitos were not supported. Hypothesis 1 proposed that coalitions supporting the release of GM mosquitos would have significantly more references to the Scientific Studies evidence type. The number of appeals to Scientific Studies was not significantly different between pro-GM and anti-GM coalitions in either the Brazilian or US policy subsystems. Although as will be discussed shortly the way the used the evidence was different. Hypothesis 2 proposed that coalitions opposed to the release of GM mosquitos would have significantly more references to the Tacit or Localized Knowledge evidence type. This type of evidence was not found in any policy narratives.

The Downplay a Problem evidence usage type was not used. This use of evidence was not identified in policy narratives analyzed. This would indicate that the opposing coalitions did not disagree on the importance of controlling mosquito populations.

Winning and losing policy coalitions used similar evidence types in different ways. Scientific Studies, *ipso dictum*, and Laws and Legal Rulings evidence types exhibited multiple

uses some associated with a winning coalition while other uses were associated with a losing coalition.

Although the presence of a type of evidence is not significantly different between coalitions the way it is used may demonstrate significant difference. Table 5.20 displays how the different uses of evidence were associated with different types of evidence. This table creates a grid that allows the comparison of each type of evidence with each potential use of evidence. Blank cells highlight that a specific combination of an evidence type and the corresponding usage type showed no significant difference in usage in any policy narratives. The pro-GM or anti-GM cell entries identify that an evidence type by usage type combination showed a significant association with the coalition that either opposed (anti-GM) or supported (pro-GM) the release of GM mosquito.

As identified in Table 5.20 the Scientific Studies, Statistics, and Law and Legal Rulings evidence types show significant difference in usage when used for specific purposes identified by the usage type.

Table 5.20: How Different Types of Evidence are Used.

	Demonstrating the Policy Problem	Supporting the Policy Solution	Refuting the Solution of Opponents	Embellishing the Hero	Demonizing the Villain	The Center of the Narrative
Scientific Studies		Pro-GM Brazil- Win Florida K- Lose	Anti-GM Brazil- Lose Florida K-Win		Anti-GM Brazil- Lose	Anti-GM Brazil- Lose
Statistics			Anti-GM Brazil- Lose		Anti-GM Brazil- Lose	
<i>ipso dictum</i>		Pro-GM Brazil- Win Florida K- Lose	Anti-GM Brazil- Lose Florida K-Win		Anti-GM Brazil- Lose	
Public Opinion Polls		Pro-GM Florida K- Lose				
Laws and Legal Rulings		Pro-GM Florida K- Lose	Anti-GM Brazil- Lose Florida K-Win			

Some uses of evidence are associated with certain types of coalitions. As displayed in Table 5.20 Support Policy Solution was used more frequently in the policy narratives of

coalitions that supported GM mosquito releases. Refute Opposing Policy Solution, Demonize the Villain and Evidence as the Focus of the Narrative usage types were used more frequently in the policy narratives of the coalitions that opposed mosquito releases.

Some uses of an evidence are associated with a specific region. As displayed in Table 5.20 Demonizing the Villain and The Center of the Narrative are only associated with the Brazilian coalitions.

CHAPTER SIX: NPF NARRATIVE STRATEGY ANALYSIS AND RESULTS

6.1 Introduction

This dissertation seeks to describe, compare and better understand the role of policy narrative in the policy debate regarding the release of genetically modified mosquitos in Brazil and the Florida Keys. This chapter investigates the role of narrative strategies, one of the three main components of a policy narrative. Narrative strategies represent the tactical use of narrative elements to expand or contain the scope of a policy issue in order to influence flow of resources and policy actors in the policy arena. Coalitions employ narrative strategies in their policy narratives in an attempt to influence the public's and decision-makers' policy preferences. When policy coalitions find themselves losing a policy battle, they employ narrative strategies in an effort to expand the scope of conflict of the policy issue in order to mobilize indifferent groups to alter the policy status quo. When a coalition is winning a policy battle, they use narrative strategies to contain the scope of conflict in an effort to maintain the policy conditions favorable to them and minimize chance of other policy actors becoming involved in the policy debate.

This chapter examines how three narrative strategies: (i) the distribution of cost and benefits, (ii) the use of policy surrogate(s), and (iii) the use of condensation symbol(s) were used in the policy narratives of Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos. This analysis was guided by the following research question:

4. What is the role of narrative strategies in the policy narratives related to GM mosquito releases in Brazil and the Florida Keys?
 - a. What difference exists in how narrative strategies were utilized in the policy narratives of the following groups:
 - i. winning and losing coalition in Brazil and the Florida Keys?

- ii. combined winning coalitions versus combined losing coalitions?
- iii. pro-GM coalitions as compared to anti-GM coalitions across the Brazilian and Florida Keys policy subsystems?

The chapter is organized in the following manner. Section 6.2 presents the results and analysis on the use of the distribution of cost and benefits narrative strategy. Section 6.3 reports on the results and analysis describing the use of the policy surrogate narrative strategy. Section 6.4 presents the results and analysis on the use of the condensation symbol narrative strategy. Section 6.4 provides a summary of research findings and discusses the various implications.

6.2 Distribution of Cost and Benefits

In the distribution of cost and benefits narrative strategy the NPF postulates that coalitions use policy narratives to portray who benefits from a policy solution and who pays the costs as a strategic way to expand or maintain the scope of conflict of a policy debate (McBeth et al., 2007; E. A. Shanahan et al., 2013). This section describes and compares how the distribution of cost and benefits narrative strategy was used in the policy narratives of Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos. First, the use of this narrative strategy in policy narratives will be compared across the winning and losing policy coalitions in Brazil and the Florida Keys. Next, the use of the distribution of costs and benefits narrative strategy in the policy narratives of the combined winning and losing coalitions will be discussed. Finally, the use of this narrative strategy in policy narratives is compared across pro-GM (supported the release of GM mosquitos) and anti-GM (opposed GM mosquito releases) coalitions. This allows a comparison across the two geographic regions or policy subsystems. Documents were coded for two elements:

1. whether the narrative described the distribution of the benefits as concentrated or diffused.

2. whether the narrative described the distribution of the costs as concentrated or diffused.

The Narrative Policy Framework theorizes that coalitions depict the distribution of costs and benefits differently depending on whether they are describing their own policy preference or an opposing policy solution as well as whether they are winning or losing the policy debate (E. A. Shanahan et al., 2013). The following hypotheses postulate how coalitions will portray the distribution of cost and benefits in their policy narratives:

Hypothesis 3a: When describing their own policy solution winning and losing coalitions will stress the diffusion of benefits in their narrative.

Hypothesis 3b: When describing their own policy solution winning and losing coalitions will stress the concentration of costs in their narrative.

Hypothesis 4a: When describing the winning policy solution, the losing coalition will stress the concentration of benefits in their narrative.

Hypothesis 4b: When describing the winning policy solution, the losing coalition will stress the diffusion of costs in their narrative.

Hypothesis 5a: When describing the losing policy solution, the winning coalition will ignore the losing policy solution.

Hypothesis 5b: When describing the losing policy solution, the winning coalition will stress the concentration of benefits in their narrative.

Hypothesis 5c: When describing the losing policy solution, the winning coalition will stress the diffusion of costs in their narrative.

Comparison of Winning and Losing Coalitions- Brazil

When examining policy narratives in Brazil, the preferred policy solution for the winning coalition is to release GM mosquitos (release mosquitos). The preferred policy solution for the losing coalition is to not release GM mosquitos and maintain the current or status quo mosquito control practices (no release, maintain status quo).

Distribution of Benefits

Preferred Policy Solution

Table 6.1 presents the results of how the winning and losing coalitions in Brazil portrayed the distribution of benefits for their preferred policy solution. The Distribution of Benefits column notes how the benefits were described. The values in the winning and losing columns represent the percentage and number of narratives that contained a description of how benefits were distributed. The χ^2 value is the result of the Pearson chi-square test of independence identifying whether there are any significant differences in the description of distribution of benefits between the coalitions. The df identifies the degrees of freedom for the χ^2 test and p-value represents the corresponding p-value. The term “Not Sig” means not significant. The Cramer’s V value is used to describe the strength of the relationship between how benefits are described and a specific coalition, where 0.1 identifies a weak effect size, 0.3 identifies a moderate effect size, and 0.5 identifies a strong effect size.

The winning and losing coalitions in Brazil differed significantly in how they described the **distribution of benefits for their preferred policy solution**. The narratives of the winning coalition (pro-GM) diffused benefits 91% of the time compared with the narratives of the losing coalition (anti-GM) that diffused benefits only 12% of the time. The narratives of the losing coalition (anti-GM) did not describe how the benefits were distributed 88% of the time while the narratives of the winning coalition (pro-GM) did not describe a distribution of benefits only 7% of the time.

In other words, the winning coalition’s narratives diffused benefits when discussing its preferred policy solution (release mosquitos) while the losing coalition’s narratives did not describe how benefits were distributed when discussing its preferred policy solution (no releases,

maintain status quo). These results partially support Hypothesis 3a that postulates that both winning and losing coalitions will diffuse benefits when describing their own policy solution. This hypothesis is confirmed for the winning coalition but not for the losing coalition as it did not provide a description of the distribution benefits in most of its policy narratives.

Table 6.1: Distribution of Benefits for the Preferred Policy Solution in Brazil.

Distribution of Benefits	Brazil Winning (Support) % (n)	Brazil Losing (Oppose) % (n)
Concentrates Benefits	2% (1)	0
Diffuses Benefits	91% (62)	12% (2)
No Description of Benefits	7% (5)	88% (15)
Total	100% (68)	100% (17)
χ^2 (d.f.=2) = 49.453, p < 0.001; Cramer's V = 0.763		

Opposing Policy Solution

Table 6.2 displays the results of how the winning and losing coalitions in Brazil described the **distribution of benefits for the opposing policy solution**. The coalitions differed significantly. The winning coalition's (pro-GM) narratives did not describe the distribution of benefits for the losing policy solution (no release, maintain status quo) 93% of the time while the losing coalition's (anti-GM) narratives did not describe the distribution of benefits for the winning policy solution (release mosquitos) 59% of the time. These results support Hypotheses 5a that postulates that a winning coalition will ignore the losing coalition's policy solution.

The narratives of the losing coalition (anti-GM) described a diffusion of benefits 35% of the time when discussing the winning policy solution (release mosquitos) while only 7% of the winning coalition's narratives described a diffusion of benefits when discussing the losing policy solution (no releases, maintain status quo). These results do not support Hypothesis 4a which states that losing coalitions would tend to depict a concentration of benefits for the winning policy solution. These results are interesting in that the losing coalition (anti-GM) at times admitted that the GM mosquito technology could reduce mosquito populations but were doubtful

about the magnitude of reduction or whether the reductions would be sufficient to reduce the incidence of disease. From their perspective the potential risks inherent in the technology was not worth the potential marginal benefit.

Table 6.2: Distribution of Benefits for the Opposed Policy Solution in Brazil.

Distribution of Benefits	Brazil Winning (Support) % (n)	Brazil Losing (Oppose) % (n)
Concentrates Benefits	0	6% (1)
Diffuses Benefits	7% (5)	35% (6)
No Description of Benefits	93% (63)	59% (10)
Total	100% (68)	100% (17)
χ^2 (d.f.=2) = 14.016 , p = 0.001; Cramer's V = 0.406		

Distribution of Costs

Preferred Policy Solution

Table 6.3 presents the results on how the winning and losing coalitions in Brazil described the **distribution of costs for their preferred policy solution**. The winning and losing coalitions in Brazil differed significantly in how they described the distribution of costs for their preferred policy solution. The winning coalition's (pro-GM) narratives depicted a concentration of costs 19% of the time when discussing their preferred policy solution (release mosquitos) while the losing coalition's (anti-GM) narratives did not describe any concentration of costs when discussing their preferred policy (no releases, maintain status quo). All of the losing coalition's (anti-GM) narratives (100%) did not describe how costs were distributed when discussing their preferred policy solution (no releases, maintain status quo) while 81% of the winning coalition's narratives did not describe a distribution costs for their preferred policy solution (release mosquitos).

The results partially support Hypothesis 3b that postulates that both winning and losing coalitions will concentrate costs when describing their own policy solution. This is confirmed for the winning coalition but is not supported for the losing coalition. These results highlight an

overall theme of the losing coalition’s (anti-GM) fight against the GM mosquito. Most of their focus was on fighting against GM mosquito releases. This coalition spent very little time identifying alternative control methods or explaining why the current practices were sufficient.

Table 6.3: Distribution of Costs for the Preferred Policy Solution in Brazil.

Distribution of Costs	Brazil Winning (Support) % (n)	Brazil Losing (Oppose) % (n)
Concentrates Costs	19% (13)	0
No Description of Costs	81% (55)	100% (17)
Total	100% (68)	100% (17)
χ^2 (d.f.=1) = 3.837, p = 0.05; Cramer’s V = 0.406		

Opposing Policy Solution

Table 6.4 displays the results on how the winning and losing coalitions in Brazil described the **distribution of costs for the opposing policy solution**. The coalitions differed significantly. The winning coalition’s (pro-GM) narratives did not describe a distribution of costs for the losing policy solution (no releases, maintain status quo) 97% of time while the losing coalition’s (anti-GM) policy narratives did not describe the distribution of costs of the winning solution (release mosquitos) 71% of the time. These results support Hypotheses 5 that postulates that a winning coalition will ignore the losing coalition’s policy solution.

The losing coalition’s (anti-GM) narratives described a diffusion of costs 29% of the time when discussing the winning policy solution (release mosquitos) while the winning coalition’s (pro-GM) narratives depict a diffusion of costs only 3% of the time when discussing the losing policy solution (no releases, maintain status quo). These results support Hypothesis 4b which postulates that losing coalitions would depict a diffusion of costs when describing in the winning policy solution. This is the only instance in the losing coalition’s narratives in Brazil where the losing coalition attempted to expand the scope of conflict by describing a distribution of costs or benefits that would favor the winning coalition rather than everyone where the mosquitos would be released.

Table 6.4: Distribution of Costs for the Opposed Policy Solution in Brazil.

Distribution of Costs	Brazil Winning (Support) % (n)	Brazil Losing (Oppose) % (n)
Diffuses Costs	3% (2)	29% (5)
No Description of Costs	97% (66)	71% (12)
Total	100% (68)	100% (17)
χ^2 (d.f.=1) = 12.610, p < 0.001; Cramer's V = 0.385		

Comparison of Winning and Losing Coalitions- Florida Keys

When examining policy narratives in the Florida Keys, the preferred policy solution of the winning coalition is to not release GM mosquitos and maintain the status quo mosquito control practices (no releases, maintain status quo). The preferred policy solution of the losing coalition is to release GM mosquitos (release mosquitos).

Distribution of Benefits

Preferred Policy Solution

Table 6.5 presents the results of how the winning and losing coalitions in the Florida Keys portrayed the **distribution of benefits for their preferred policy solution**. The winning and losing coalitions in the Florida Key differed significantly. The winning coalition's (anti-GM) narratives did not describe a distribution of benefits 86% of the time while the losing coalition's (pro-GM) narratives did not describe a distribution of benefits only 21% of the time. The losing coalition's (pro-GM) narratives described a diffusion of benefits 79% of the time while the winning coalition's (anti-GM) narratives described a diffusion of benefits only 14% of the time.

The results partially support Hypothesis 3a that postulates that both winning and losing coalitions will diffuse benefits when describing their own policy solution. This is confirmed for the losing coalition (pro-GM) but is not supported for the winning coalition (anti-GM). As was seen in Brazil these results demonstrate that the anti-GM coalition (winning coalition) does not focus on the benefits of its own policy solution of maintaining the current mosquito control

practices of using pesticides. This might be expected as a several of the coalition members are environmental groups that often have concerns with the use of pesticides. It seems that the use of pesticides to control mosquitos may be preferable to the use of GM technology.

Table 6.5: Distribution of Benefits for the Preferred Policy Solution in the Florida Keys.

Distribution of Benefits	Florida Key Winning (Oppose) % (n)	Florida Key Losing (Support) % (n)
Diffuses Benefits	14% (4)	79% (19)
No Description of Benefits	86% (24)	21% (5)
Total	100% (28)	100% (24)
χ^2 (d.f.=1) = 22.054, p < 0.001; Cramer's V = 0.651		

Opposed Policy Solution

The winning and losing coalitions in the Florida Keys did not significantly differ in the way they described the **distribution of benefits of the opposed policy solution**. These results support Hypotheses 5a that postulates that a winning coalition will ignore the losing coalition's policy solution. These results do not support Hypothesis 4a which postulates that a losing coalition would depict a concentration of benefits for the winning policy solution.

Distribution of Costs

Preferred Policy Solution

The winning and losing coalitions in the Florida Keys did not significantly differ in the way they described the **distribution of costs in their preferred policy solution**. These results do not support Hypothesis 3b which postulates that both winning and losing coalitions will concentrate costs when describing their own policy solution.

Opposed Policy Solution

Table 6.6 displays the results on how the winning and losing coalitions in the Florida Keys depicted the **distribution of costs for the opposing policy solution**. The coalitions differed significantly in how they portrayed the distribution of costs. The winning coalition's (anti-GM) narratives depicted a diffusion of cost 64% of the time when addressing GM mosquito

releases while the losing coalition’s (pro-GM) narratives did not depict any diffusion of costs in the status quo policy solution. The Cramer’s V value indicates a strong association between the winning coalition and the diffusion of costs. These results support Hypothesis 5 which postulates that winning coalitions would depict a diffusion of costs in the losing policy solution.

For the losing coalition 100% of their narratives did not describe how the costs of the losing solution would be distributed as compared to 36% for the winning coalition. The Cramer’s V value indicates a strong relationship between losing coalition and the no description of cost. These results do not support Hypotheses 4b that postulates that a losing coalition will stress the diffusion of costs when describing the winning policy solution.

Table 6.6: Distribution of Costs for the Opposed Policy Solution in the Florida Keys.

Distribution of Costs	Florida Key Winning (Oppose) % (n)	Florida Key Losing (Support) % (n)
Diffuses Costs	64% (18)	0
No Description of Costs	36% (10)	100% (24)
Total	100% (28)	100% (24)
χ^2 (d.f.=1) = 23.597, p < 0.001; Cramer’s V = 0.674		

Comparison of Combined Winning and Losing Coalitions

The combined winning and losing coalitions demonstrated no significant difference in how they described **the distribution of benefits and costs** for both their preferred and opposing policy solutions. These results suggest that the distribution of benefits is not a necessary strategy when attempting to construct a winning policy narrative concerning the release of GM mosquitos. These results are not surprising due to the fact that the anti-GM coalitions did little to emphasize the benefits of maintaining status control methods.

Comparison of pro-GM and anti-GM Coalitions

This section examines how distribution of costs and benefits are used in policy narratives from the perspective of coalitions that supported the release of GM mosquitos (pro-GM) or opposed the release of GM mosquitos (anti-GM) in Brazil and the Florida Keys. This analysis

facilitates a comparison of how the distribution of costs and benefits varied across the Brazilian and Florida Keys policy subsystems.

Table 6.7 provides a summary of how benefits were described. The Benefit Descriptor column presents the descriptions used to portray benefits. The Policy Solution Described column notes whether the coalition is describing their preferred policy solution or the opposing policy solution. The Significant in Brazil and Florida Keys Policy Subsystem columns highlights the policy subsystem where the benefit descriptor was used. The Brazil and Florida Keys coalition columns display which coalition, pro-GM or anti-GM, used the benefit descriptor.

Both subsystems shared two benefit descriptors, Diffuses Benefits and No Description of Benefits, that were both used to describe the coalitions' preferred policy solution. The Diffuses Benefits descriptor was used by the pro-GM coalitions while the No Description of Benefits was used by the anti-GM coalitions.

The Brazil policy subsystem has two benefit descriptors not found in the Florida Keys subsystem, Diffuses Benefits and No Description of Benefits, both used to describe the opposing policy solution. Diffuses Benefits was used by the anti- GM coalition while the No Description of Benefits was used by the pro-GM coalition.

Two benefit descriptors, Concentrated Benefits (for Preferred Solution) and Concentrated Benefits (for Opposing Solution) were not significant in the Brazilian subsystem and were not found in the Florida Keys subsystem.

Table 6.7: Benefit Descriptions across Opposing Coalitions and Policy Subsystems.

Benefit Descriptors	Policy Solution Described	Significant in Brazil Policy Subsystem?	Significant in Florida Keys Policy Subsystem?	Coalition Brazil	Coalition Florida Keys
Diffuses Benefits	Preferred Solution	Yes	Yes	Pro-GM (Wining)	Pro-GM (Losing)
Concentrates Benefits	Preferred Solution	No	Not Found	No Significant Difference	Not Found
No Description of Benefits	Preferred Solution	Yes	Yes	Anti-GM (Losing)	Anti-GM (Wining)
Diffuses Benefits	Opposing Solution	Yes	No	Anti-GM (Losing)	No Significant Difference
Concentrates Benefits	Opposing Solution	No	Not Found	No Significant Difference	Not Found
No Description of Benefits	Opposing Solution	Yes	No	Pro-GM (Wining)	No Significant Difference

These results highlight a few key points about the use of the distribution of benefits in GM mosquito policy narratives. The narratives of the pro-GM coalitions in both regions stressed the diffusion of benefits when describing their policy solution to release GM mosquitos. With this portrayal pro-GM coalitions were attempting to signal in their narratives that many people will benefit from GM mosquito releases. This strategy was part of a winning narrative in Brazil but did not provide similar results in the Florida Keys.

The narratives of the anti-GM coalitions in both regions did not provide any description of the benefits of their policy solution to prohibit GM mosquito releases and continue using the current mosquito control practices. These results seems appropriate as the anti-GM coalitions seldom described their own policy solution and instead focused on concerns with the pro-GM coalition's solution to release GM mosquitos. This tactic was part of a winning narrative in the Florida Keys but seemed less effective in the Florida Keys.

Neither the pro-GM or anti-GM narratives focused on describing a concentration of benefits for their own policy solution or the opposing policy solution. It makes sense that no coalition would describe a concentration of benefits when describing their own solution. That a

concentration of benefits was not used when describing an opposing policy may be due to the fact that both policy solutions addressed a public health issue of disease prevention and any positive effects of either solution would be shared by everyone.

In general, there are two additional points to consider. First, the description of benefits seems more aligned with pro-GM and anti-GM coalitions rather than winning and losing coalitions. The same distribution of benefits showed mixed results between Brazil and the Florida Keys. Second, the description of benefits was much more pronounced in Brazil as compared to the Florida Keys. This may be due to the fact that GM mosquitos had already been released in certain parts of Brazil and were shown to reduce mosquito populations. These benefits were highlighted in the pro-GM narratives. Trial releases had not yet occurred in the Florida Keys so the benefits of reduced mosquito populations could not be emphasized.

Table 6.8 provides a summary of how costs were described in the two policy subsystems. Both subsystems shared two cost descriptors, Diffuses Costs and No Description of Costs, that were both used to describe how costs were distributed in opposing policy solutions. The Diffuse Costs descriptor was used by the anti-GM coalitions to expand the scope of conflict by highlighting that potential issues with human health and environmental damage would be the cost that all the public would have to pay if GM mosquito were released. The No Description of Costs descriptor was used by the pro-GM coalitions to either ignore the opposing policy solution or since the anti-GM coalitions supported a solution that maintained the status quo, that wasn't explicitly described in their policy narratives, it may have made it difficult to assign cost descriptions.

The Brazilian subsystem had two cost descriptors, Concentrated Costs and No Description of Costs, that were both used to describe how costs were distributed in their

preferred policy solution. The Concentrated Costs descriptor used by the pro-GM coalition attempted to contain the scope of conflict by highlighting that the costs for GM mosquito releases were covered by the Brazilian government. The No Description of Costs descriptor was used by the anti-GM coalition and highlights an issue noted previously that the anti-GM coalitions did not describe on their preferred policy solution, but instead focused on concerns with GM mosquito releases.

Two cost descriptors, Diffused Costs (Preferred Solution) and Concentrated Costs (Opposing Solution) were not found in any narratives in either policy subsystem.

Table 6.8: Cost Descriptions across Opposing Coalitions and Policy Subsystems.

Cost Descriptor	Policy Solution Described	Significant in Brazil Policy Subsystem?	Significant in Florida Keys Policy Subsystem?	Coalition Brazil	Coalition Florida Keys
Diffuses Costs	Preferred Solution	Not Found	Not Found	Not Found	Not Found
Concentrates Costs	Preferred Solution	Yes	No	Pro-GM (Wining)	No Significant Difference
No Description of Costs	Preferred Solution	Yes	No	Anti-GM (Losing)	No Significant Difference
Diffuses Costs	Opposing Solution	Yes	Yes	Anti-GM (Losing)	Anti-GM (Wining)
Concentrates Costs	Opposing Solution	Not Found	Not Found	Not Found	Not Found
No Description of Costs	Opposing Solution	Yes	Yes	Pro-GM (Wining)	Pro-GM (Losing)

These results emphasize some important aspects about the use of the distribution of costs in GM mosquito policy narratives. The narratives of the anti-GM coalitions in both regions focused on the diffusion of costs when discussing the release of GM mosquitos. Typically, the costs are framed in the potential impacts to human health and damage to the environment. Everyone will pay these costs if GM mosquito releases go awry. This strategy was part of a winning policy narrative in the Florida Keys, but didn't seem to be as successful in Brazil.

The narratives of the pro-GM coalitions in both regions don't contain a description of costs when addressing the anti-GM coalitions' policy solution to maintain the current mosquito control practices. This lack of attention to costs could be a strategic move to ignore the opposing solution or that it was difficult to define costs as the anti-GM coalitions spent little time discussing their solution.

Two more general points to consider. The distribution of costs was much more pronounced in Brazil than in the Florida Keys. This could be due to the fact that mosquito releases were already occurring in Brazil and that many of the pro-GM policy narratives highlighted that the government was paying for the releases. The cost picture was much more unclear in the Florida Keys. The description of costs seems more aligned with pro-GM and anti-GM coalitions rather than winning and losing coalitions.

6.3 Policy Surrogate

Nie (2003) suggested that some policy debates become more complex when policy actors employ a "policy surrogate," where the coalition's less complex policy problem is used as a surrogate or proxy to "debate larger and more controversial problem." (pg. 314) The NPF postulates that policy surrogates can be used as a narrative strategy to expand the scope of conflict for a policy arena and that losing coalitions will use policy surrogates in an effort to expand their coalition membership, increase resources and strengthen their coalition. This is captured in Hypothesis 7:

Hypothesis 7: The losing coalition will use policy surrogates more frequently in their policy narratives as compared to the winning coalition.

This section describes and compares how the policy surrogate narrative strategy was used in the policy narratives of Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos. First, the use of the policy surrogate narrative strategy

in policy narratives will be compared across the winning and losing policy coalitions in Brazil and the Florida Keys. Next, the use of the policy surrogate narrative strategy in the policy narratives of the combined winning and losing coalitions will be discussed. Finally, the use of the policy surrogate narrative strategy in policy narratives is compared across pro-GM (supported the release of GM mosquitos) and anti-GM (opposed GM mosquito releases) coalitions. This allows a comparison across the two geographic regions or policy subsystems.

Four policy surrogates that could be used in GM mosquito narratives were previously identified and include: (a) the importance of innovation, (b) the GMO regulatory process is not transparent, (c) the GMO regulatory process is not participatory and (d) the GMO regulatory process provides security and safety. For this policy surrogate analysis, documents were coded for the presence of the four potential policy surrogates.

Comparison of Winning and Losing Coalitions- Brazil

When examining the winning and losing coalitions in Brazil, Table 6.9 highlights that two policy surrogates, Regulatory Process not Transparent and Regulatory Process not Participatory, were found at significantly different levels between the coalitions. The Regulatory Process not Transparent policy surrogate was found in 47% of the losing coalition's (anti-GM) narratives and was not found in any of the winning coalition's (pro-GM) narratives. The Cramer's V value indicates a strong relationship between the Regulatory Process not Transparent policy surrogate and the losing coalition. The Regulatory Process not Participatory policy surrogate was found in 53% of the losing coalition's (anti-GM) narratives and was not found in any of the winning coalition's (pro-GM) narratives. The Cramer's V value indicates a strong relationship between the Regulatory Process not Participatory policy surrogate and the losing

coalition. Both results support Hypothesis 7 that states that losing coalitions will use policy surrogates more frequently than winning coalitions.

These results in Brazil indicate that the use of a policy surrogate was not beneficial in creating a winning policy narrative. This may be due to the fact that the GM mosquito releases occurred in rural and remote locations where much of the population was more concerned about reducing the incidence of a painful endemic disease, dengue fever, rather than the fairness of the regulatory system. Similarly, there was very little grassroots activism in these remote Brazilian cities to raise awareness of these regulatory concerns.

Table 6.9: The Use of Policy Surrogates in Brazil.

Narrative Element	Policy Coalition						Statistics			
	Brazil Winning (Support) % (n)			Brazil Losing (Oppose) % (n)			χ^2	df	p value	C.'s V
Policy Surrogate	Yes	No	Total	Yes	No	Total				
Ability to Innovate is Important	7(5)	93(63)	100(68)	0(0)	100(17)	100(17)	1.328	1	Not Sig	
Regulatory Process not Transparent	0(0)	100(68)	100(68)	47(8)	53(9)	100(17)	35.325	1	<0.001	0.645
Regulatory Process not Participatory	0(0)	100(68)	100(68)	53(9)	47(8)	100(17)	40.263	1	<0.001	0.688
Regulatory Process Provides Safety	7(5)	93(63)	100(68)	0(0)	100(17)	100(17)	1.328	1	Not Sig	

Comparison of Winning and Losing Coalitions- Florida Keys

Table 6.10 displays the results for use of policy surrogates in the winning and losing coalitions in the Florida Keys. Three policy surrogates, Regulatory Process not Transparent, Regulatory Process not Participatory and Regulatory Process Provides Safety, were found at significantly different levels between the winning and losing coalitions in the Florida Keys. The Regulatory Process not Transparent policy surrogate was found in 36% of the winning coalition's (anti-GM) narratives and was not found in any of the losing coalition's (pro-GM) narratives. The Cramer's V value indicates a moderate relationship between the Regulatory Process not Transparent policy surrogate and the winning coalition. The Regulatory Process not

Participatory policy surrogate was found in 39% of the winning coalition’s (anti-GM) narratives and was not found in any of the losing coalition’s (pro-GM) narratives. The Cramer’s V value indicates a moderate relationship between the Regulatory Process not Participatory policy surrogate and the winning coalition. Both these results do not support hypothesis 7 as both policy surrogates were used by the winning coalition.

The Regulatory Process Provides Safety policy surrogate was found in 33% of the losing coalition’s (pro-GM) narratives and was not found in any of the winning coalition’s (anti-GM) narratives. The Cramer’s V value indicates a moderate relationship between the Regulatory Process Provides Safety policy surrogate and the losing coalition. This result supports Hypothesis 7.

In the Florida Keys, two policy surrogates are associated with the narratives of the winning coalition. These results indicate that in a more localized setting that policy surrogates can be a valuable component of winning policy narrative. The potential success of these policy surrogates may have been driven by the presence of a strong local grassroots movement opposing releases that in part focused on concerns with the US regulatory process.

Table 6.10: Use of Policy Surrogates in the Florida Keys.

Narrative Element	Policy Coalition						Statistics			
	Florida Keys Winning (Oppose) % (n)			Florida Keys Losing (Support) % (n)			χ^2	df	p value	C.’s V
Policy Surrogate	Yes	No	Total	Yes	No	Total				
Ability to Innovate is Important	0(0)	100(28)	100(28)	13(3)	87(21)	100(24)	3.714	1	Not Sig	
Regulatory Process not Transparent	36(10)	64(18)	100(28)	0(0)	100(24)	100(24)	10.612	1	0.001	0.452
Regulatory Process not Participatory	39(11)	61(17)	100(28)	0(0)	100(24)	100(24)	11.958	1	0.001	0.480
Regulatory Process Provides Safety	0(0)	100(28)	100(28)	33(8)	67(16)	100(24)	11.03	1	0.001	0.461

Comparison of Combined Winning and Losing Coalitions

This comparison provides the opportunity to look across the two regions to determine if the use of policy surrogates were more likely to be associated with winning coalitions or losing coalitions. Table 6.11 displays the results for use of policy surrogates in the combined winning and losing coalitions. No policy surrogates showed significant difference of usage between the combined winning and losing coalitions that contained the coalitions from both Brazil and the Florida Keys. These results would indicate that the policy surrogate narrative strategy may not be an effective generalized strategy when attempting to create a winning policy narrative to influence the release of GM mosquitos but may be effective in a more localized setting as seen in the Florida Keys.

Table 6.11: Use of Policy Surrogates in the Combined Coalitions.

Narrative Element	Policy Coalition						Statistics			
	Combined Winning % (n)			Combined Losing % (n)			χ^2	df	p value	C.'s V
Policy Surrogate	Yes	No	Total	Yes	No	Total				
Ability to Innovate is Important	5(5)	95(91)	100(96)	93(38)	7(3)	100(41)	0.232	1	Not Sig	
Regulatory Process not Transparent	10(10)	90(86)	100(96)	80(33)	20(8)	100(41)	2.083	1	Not Sig	
Regulatory Process not Participatory	11(11)	89(85)	100(96)	78(32)	22(9)	100(41)	2.537	1	Not Sig	
Regulatory Process Provides Safety	5(5)	95(91)	100(96)	80(33)	20(8)	100(41)	6.844	1	Not Sig	

Comparison of pro-GM and anti-GM Coalitions

This section examines how policy surrogates are used in policy narratives from the perspective of coalitions that supported the release of GM mosquitos (pro-GM) or opposed the release of GM mosquitos (anti-GM) in Brazil and the Florida Keys. This analysis facilitates a comparison of how the use of policy surrogates varied across the Brazilian and Florida Keys policy subsystems.

Table 6.12 displays how the use of policy surrogates varied across policy subsystems, as well as between coalitions that opposed the release of GM mosquitos (anti-GM) compared to coalitions that supported their release (pro-GM). The Ability to Innovate is Important was not significant in either policy subsystem. The Regulatory Process not Transparent and Regulatory Process not Participatory policy surrogates were significant in both policy subsystems and were found in the anti-GM policy narratives. The Regulatory Process Provides Safety policy narrative was significant in the Florida Keys policy subsystem and was associated with the pro-GM policy narratives.

The use of policy surrogates is more closely aligned with pro- GM (opposing) and anti-GM (supporting) coalitions rather than winning and losing coalitions. Policy surrogates were mostly used by coalitions that oppose the release of mosquitos (anti-GM) in both policy subsystems. The only instances of policy surrogates being used by pro-GM coalitions occurred in the Florida Keys.

In the debates surrounding the release of GM mosquitos the larger controversial issue present in policy narratives could be described as concerns with the suitability of the GMO regulatory process. The anti-GM coalitions highlight the flaws with the process in both policy subsystems while in the Florida Keys the pro-GM coalitions focused on the safety and security the regulatory process ensures.

Table 6.12: The Use of Policy Surrogates across Opposing Coalitions and Policy Subsystems.

Policy Surrogate	Significant in Brazil Policy Subsystem?	Significant in Florida Keys Policy Subsystem?	Coalition Brazil	Coalition Florida Keys
Ability to Innovate is Important	No	No	No Difference Found	No Difference Found
Regulatory Process not Transparent	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Regulatory Process not Participatory	Yes	Yes	Anti-GM (Losing)	Anti-GM (Winning)
Regulatory Process Provides Safety	No	Yes	No Difference Found	Pro-GM (Losing)

6.4 Condensation Symbol

This section addresses the importance of symbols in policy narratives. The use of images and symbols helps reduce or condense complicated policy issues into simple and memorable forms that are understandable to non-policy experts and the general public (Achter, 2004). The Narrative Policy Framework theorizes that condensation symbols can be used in policy narratives to expand the scope of conflict in a policy arena by defining the policy issue and characterizing their opponents (McBeth et al., 2007). Losing coalitions use condensation symbols in their policy narratives in an effort to attract to their coalition groups or organizations with whom the symbol resonates. These potential new coalition members might not have previously understood or recognized the importance a more complex version of the policy issue, but the condensation symbol helps provide clarity and alignment with their potential policy concerns. Hypotheses 6 codifies this assertion and postulates that the losing coalition will use policy surrogates more frequently than the winning coalition.

Hypothesis 6: The losing coalition will use policy surrogates more frequently in their policy narratives as compared to the winning coalition.

This section describes and compares how the condensation symbol narrative strategy was used in the policy narratives of Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos. First, the use of the condensation symbol narrative strategy in policy narratives will be compared across the winning and losing policy coalitions in Brazil and the Florida Keys. Next, the use of the condensation symbol narrative strategy in the policy narratives of the combined winning and losing coalitions will be discussed. Finally, the use of the condensation symbol narrative strategy in policy narratives is compared across pro-GM (supported the release of GM mosquitos) and anti-GM (opposed GM mosquito

releases) coalitions. This allows a comparison across the two geographic regions or policy subsystems. Documents were coded for the presence or absence of a condensation symbol(s).

Comparison of Winning and Losing Coalitions- Brazil

Table 6.13 displays the results for the winning and losing coalitions in Brazil. The presence of a condensation symbol was found at significantly different levels between the winning and losing coalitions in Brazil. A condensation symbol was found in 76% of the winning coalition’s (pro-GM) narratives and in only 6% of the losing coalition’s (anti-GM) narratives. The Cramer’s V value indicates a strong relationship between the presence of a condensation symbol and the winning coalition (pro-GM). These results do not support Hypothesis 6 which postulates that losing coalitions will use policy surrogates more frequently than winning coalitions.

Table 6.13: Use of Condensation Symbol(s) in Brazil.

	Policy Coalition						Statistics			
	Brazil Winning (Support) %(n)			Brazil Losing (Oppose) % (n)			χ^2	df	p value	C.’s V
Narrative Element	Yes	No	Total	Yes	No	Total				
Condensation Symbol	76(52)	24(16)	100(68)	6(1)	94(16)	100(17)	28.868	1	<0.001	0.583

In Brazil, the condensation symbol most frequently used in the narratives of the winning coalition was PAT, the Aedes Transgenic Project. PAT was the program created and implemented by Moscamed with assistance of Oxitec and the University of Sao Paulo to organize, implement and evaluate the trial releases of GM mosquitos in the Brazilian state of Bahia. This program was responsible for public, government and scientific outreach activities. PAT sponsored academic conferences, visited schools, trained health workers, attended local events and visited neighborhoods where the GM mosquitos would be released. The program had a branded logo that was worn by PAT representatives and included on all documents, fliers and

public information material. When GM mosquito release activities were discussed in the Brazilian narratives it was through the auspices of PAT. This program encapsulated the entirety of the GM mosquito releases in Brazil in just three letters. Although at its heart this program was about releasing GM mosquitos it was also a way to discuss mosquito releases without constantly referencing the fact that the mosquito was a genetically modified organism.

Comparison of Winning and Losing Coalitions- Florida Keys

Table 6.14 displays the results for the use of condensation symbols for the winning and losing coalitions in the Florida Keys. There was no significant difference in the use of condensation symbols. The winning coalition recorded no instances of a condensation symbol and only 4% of the losing coalition’s narratives contained a condensation symbol. These results do not support Hypothesis 6.

In one of the losing coalition’s policy narratives the GM mosquito is described by the mechanism used to reduce mosquito populations, RIDL mosquitos. RIDL is an acronym for Release of Insects carrying Dominant Lethals. This acronym is an attempt to condense the complex technology and biology required to make the GM mosquito, but was used very infrequently.

Table 6.14: Use of Condensation Symbol(s) in the Florida Keys.

	Policy Coalition						Statistics			
	Florida Keys Winning (Oppose) n (%)			Florida Keys Losing (Support) n (%)			χ^2	df	p value	C.’s V
Narrative Element	Yes	No	Total	Yes	No	Total				
Condensation Symbol	0	100(28)	100(28)	4(1)	96(23)	100(24)	1.19	1	Not Sig	

Comparison of Combined Winning and Losing Coalitions

This comparison provides the opportunity to look across the two regions to determine if the use of condensation symbols was more likely to be associated with winning coalitions or

losing coalitions in both countries. Table 6.15 displays the results for the combined winning and losing coalitions. The presence of a condensation symbol was found at significantly different levels between the combined winning and losing coalitions. A condensation symbol was found in 54% of the combined winning coalition’s narratives and in only 5% of the combined losing coalition’s narratives. The Cramer’s V value indicates a moderate relationship between the presence of a condensation symbol and the winning coalition. These results do not support Hypothesis 6 which postulates that losing coalitions will use policy surrogates more frequently than winning coalitions. The condensation symbol most often identified is PAT that was previously described in the Brazil subsystem analysis. These results would indicate that the policy surrogate narrative strategy may be an effective strategy when attempting to construct a winning policy narrative. The rationale behind the potential success of the strategy was to limit the scope of the policy issue by limiting the discussion regarding the use of a genetically modified mosquito and instead focus on the overall process of reducing mosquito populations.

Table 6.15: Use of Condensation Symbols in Combined Coalitions.

Narrative Element	Policy Coalition						Statistics			
	Combined Winning n (%)			Combined Losing n (%)			χ^2	df	p value	C.’s V
	Yes	No	Total	Yes	No	Total				
Condensation Symbol	54(52)	46(44)	100(96)	5(2)	95(39)	100(41)	29.228	1	<0.001	0.462

Comparison of pro-GM and anti-GM Coalitions

This section examines how condensation symbols are used in policy narratives from the perspective of coalitions that supported the release of GM mosquitos (pro-GM) or opposed the release of GM mosquitos (anti-GM) in Brazil and the Florida Keys. This analysis facilitates a comparison of how the use of condensation symbols varied across the Brazilian and Florida Keys policy subsystems.

Table 6.16 displays how the use of condensation symbol(s) varied across policy subsystems, as well as between coalitions that opposed the release of GM mosquitos compared to coalitions that supported their release. The use of condensation symbols differed significantly in the Brazilian subsystem where it was associated with the coalition that supported GM mosquito releases. There was no difference in usage in the Florida Keys. The evidence is inconclusive as to whether this narrative strategy is more closely associated with pro-GM or anti-GM coalitions or winning and losing coalitions.

Table 6.16: The Use of Condensation Symbols across Opposing Coalitions and Policy Subsystems.

Narrative Element	Significant in Brazil Policy Subsystem?	Significant in Florida Keys Policy Subsystem?	Coalition Brazil	Coalition Florida Keys
Condensation Symbol	Yes	No	Pro-GM (Winning)	No Difference Found

6.5 Summary of Findings and Discussion

Chapter Six investigated the role of narrative strategies in policy narratives by examining the four narrative strategies commonly used in NPF analysis including: the distribution of costs and benefits, the use of policy surrogate(s), and the use of condensation symbol(s) as a narrative strategy. In this analysis the use of these narrative strategies were examined in three different ways: (i) from the perspective of winning and losing coalitions within each country (ii) from the perspective of combined winning coalition and the losing coalitions (iii) from the perspective of coalitions that supported or opposed GM mosquito releases across the policy subsystems. A summary of the results is provided in the remainder of this section.

Distribution of Costs and Benefits

The Distribution of Costs and Benefits narrative strategy was used in both Brazil and the Florida Keys. In Brazil, the winning (pro-GM) and losing (anti-GM) coalitions demonstrated significant difference in how they described the distribution of costs and benefits for their

preferred policy solution and the opposing policy solution. In the Florida Keys, the winning and losing coalition demonstrated significant difference in only a subset of the descriptions of costs and benefits for their preferred policy solution and the opposing policy solution.

Certain cost and benefit descriptions were associated with either coalitions that opposed the release of GM mosquitos or coalitions that supported releases. Two Diffused Benefits descriptors were used by coalitions that supported mosquito releases both when describing their own solution and also when describing the opposing policy solution. Two No Description of Benefits descriptors were used by coalitions that opposed releases both when describing their own solution and when describing the opposing policy solution.

Some cost and benefit descriptors were only used in Brazil. The Brazilian subsystem used two benefit descriptors, Diffused Benefits for Opposing Solution and No Description of Benefits for Opposing Solution, that weren't significant in the Florida Keys. The Brazilian subsystem also had two cost descriptors, Concentrated Costs for Preferred Solution and No Description of Costs for Preferred Solution, that weren't found in the Florida Keys subsystem.

Some cost and benefit descriptors were not used. Two benefit descriptors, Concentrated Benefits for Preferred Solution and Concentrated Benefits for Opposing Solution were not significant in the Brazilian subsystem and were not found in the Florida Keys subsystem. Two cost descriptors, Diffused Costs for Preferred Solution and Concentrated Costs for Opposing Solution were not found in either policy subsystem.

In summary, two general points should be highlighted. First, the use of the narrative strategy to describe costs and benefits was more pronounced in the Brazilian policy subsystem. This may be due to the fact that in Brazil several different trial releases in different locations were occurring over the time period and the ultimate result was final regulatory approval for

unrestricted releases. This indicates a diffusion of benefits over large geographic areas. The Brazilian narratives identified various government agencies paying for the releases which identifies a concentration of costs. In the Florida Keys the policy debates were over approving the first trial release. The Florida Key narratives contained fewer discussion about costs. Second, the opposing coalitions focused almost exclusively on the negative aspects of the GM mosquito solution and rarely discussed their proposed policy solution of maintaining current control strategies. This blunted their ability to describe their own costs and benefits or provided little opportunity for the coalitions that supported releases to describe them.

Policy Surrogate

The Policy Surrogate narrative strategy was used in Brazil. Analysis revealed that the two policy surrogates: Regulatory Process not Transparent and The Regulatory Process not Participatory were present in the Brazil GM mosquito policy narratives and were used by the losing coalitions.

The Policy Surrogate narrative strategy was used in the Florida Keys. The three policy surrogates were present in the GM mosquito policy narratives in the Florida Keys. Regulatory Process not Transparent and The Regulatory Process not Participatory were used by the winning coalition. Regulatory Process Provides Safety was used by both the losing coalitions.

Condensation Symbol

The use of a condensation symbol varied across regions. The condensation symbol was used as a narrative strategy in Brazil but was not used in the Florida Keys.

No support for Hypothesis 6. Hypothesis 6 was supported in Brazil where the PAT condensation symbol was identified in policy narrative of the winning coalition.

Hypothesis 6: The losing coalition will use condensation symbols more frequently in their policy narratives as compared to the winning coalition.

CHAPTER SEVEN: SUMMARY, LIMITATIONS, AND CONCLUSIONS

7.1 Introduction

This dissertation seeks to describe, compare and better understand the role of policy narratives in the policy debates surrounding the release of genetically modified mosquitos in Brazil and the Florida Keys using the Narrative Policy Framework as a theoretical framework (Jones et al., 2014; E. Shanahan et al., 2017). The focus of this research was twofold. First, this dissertation described the policy narratives of coalitions involved in the debate regarding the release of genetically modified mosquitos. Second, this research identified significant differences in policy narratives in terms of narrative characters, narrative strategies and the role of evidence and why differences might exist.

The NPF postulates that policy narratives have defined and discernable characteristics that can be operationalized and quantitatively analyzed, enabling their description and permitting comparisons and identification of differences. The Narrative Policy Framework identifies three components of policy narratives: narrative elements, narrative strategies, and policy beliefs (E. Shanahan et al., 2017). At the meso-level the NPF examines the construction of policy narratives by opposing coalitions within a larger policy subsystem. NPF research has shown that opposing coalitions structure their narratives differently and that these differences can influence policy decision makers and the public (D. A. Crow et al., 2017; Heikkila, Weible, & Pierce, 2014; Merry, 2015; Price, 2018; Smith-Walter, 2018; Smith-Walter et al., 2016).

This dissertation examined the use of narrative characters, narrative strategies and the role of evidence to describe and compare the GM mosquito policy narratives from Brazil and the Florida Keys. For the narrative character, this dissertation investigated the use of hero and villain characters as policy actors. The hero and villain characters were analyzed as an ego-alter dyad construct (Weible et al., 2016). This construction permits an examination of policy actors,

as well as their actions. To examine the role of evidence in the Brazilian and Florida Keys' policy narratives this dissertation investigated both (a) the different types of evidence found in the narrative (Smith-Walter et al., 2016) and (b) how the evidence is used within the policy narrative (Schlaufer, 2018). To investigate narrative strategies this dissertation applied the following NPF narrative strategies previously used in other NPF research: the Distribution of Costs and Benefits (E. A. Shanahan et al., 2013), the use of Condensation Symbols (McBeth et al., 2007), the use of a Policy Surrogate (McBeth et al., 2007) and the use of Scientific Evidence (McBeth et al., 2007).

In this dissertation the role of narrative characters, narrative strategies and evidence were examined in three different ways. First, policy narratives were examined from the perspective of winning and losing coalitions within each country highlighting potential narrative components that may help create winning or losing policy narratives in a localized setting. Second, policy narratives were investigated from the perspective of combined winning coalitions and losing coalitions emphasizing potential narrative components that help produce a winning or losing policy narrative that is not dependent on a specific location. Third, policy narratives were analyzed from the perspective of coalitions that supported (pro-GM) or opposed (anti-GM) GM mosquito releases spotlighting narrative components that are more aligned with stances that pro-GM and anti-GM coalitions have toward GM mosquito technology rather than an association with winning or losing coalitions. Perspective three allows a comparison across the two geographic regions or policy subsystems that highlight narrative components specific to a region.

This chapter provides the overall summary and discussion of the study's key results. The chapter is organized in the following manner. Sections 7.1.1 – 7.1.5 focus on the study's research questions and provide a brief summary and discussion of the study's key findings

Section 7.2 highlights the contributions of the research. Section 7.3 identifies and considers the limitations of the dissertation. Section 7.5 outlines possible avenues for future research.

7.1.1 The Influence of the Composition of Policy Coalitions on Policy Narratives

Chapter Four described and compared the membership composition of the Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos and was guided by the following research question:

1. What influence does the composition of the policy coalitions have on the policy narratives relating to GM mosquito release decisions in Brazil and the Florida Keys?
 - a. What is the membership composition of the policy coalitions in Brazil and the Florida Keys?
 - b. What differences in coalitional composition exist across the Brazilian and Florida Keys policy subsystems?

There are two key highlights regarding the composition of policy coalitions from the perspective of winning and losing coalitions. First, NGOs and nonprofit organizations were solely responsible for the opposition to GM mosquito releases in both Brazil and the Florida Keys. As shown in Chapter 4, having an opposing coalition composed only of nonprofit organizations potentially affected how heroes and villains were used in policy narratives. It was identified in Chapter Four that the pro-GM coalitions in both Brazil and the Florida Keys did not identify any villains in their policy narratives. A potential reason for this unusual result is that the anti-GM coalition was composed of only nonprofit organizations and the pro-GM coalition may have chosen not to attack them as nonprofits are usually held in higher esteem by the public.

Second, Oxitec was an important character actor in both the Brazil and Florida Keys policy subsystem. However, as will be discussed later, Oxitec had different types of involvement and interaction in each region. In Brazil, Oxitec was a key member of PAT along

with Moscamed and the University of Sao Paulo. Oxitec helped supply the genetically modified mosquitos used in Brazil and provided technical expertise. However, Oxitec was not the public “face” of the GM mosquito releases in Brazil. This function was performed by the PAT project, mostly through Moscamed. As identified in Chapter 4 Oxitec was not identified as a hero in the Brazilian policy narratives. In the Florida Keys, the situation was much different. No organization like Moscamed was present in the Florida Keys so Oxitec became the “face” of public engagement for GM mosquito releases. Oxitec was identified as a hero in the Florida Keys. The interplay between Oxitec and Moscamed will be discussed later in this chapter.

From the perspective of combined winning and losing coalitions that included coalition members from both Brazil and the Florida Keys several organizations could have played a major role in policy narratives. As shown in Table 4.3, several organizations including Oxitec, Third World Network, Food & Water Watch, GeneWatch UK and the ETC Group were members of both combined winning and losing coalitions. Federal regulatory agencies, CTNBio and FDA, with similar regulatory responsibilities were also found in the combined countries winning and losing coalitions. As was discussed in Chapter 4, the Government-Regulatory Agency character actor (CTNBio and FDA) was the only organization highlighted to have an association with a combined winning or losing coalition. It was described as a hero and associated with the combined losing coalition. The combined coalition arrangement provides the opportunity to look across the two regions to determine if certain character actors were more likely to be found in winning coalitions or losing coalitions. A significant presence in one of these coalition may indicate the importance of the character actor regardless of location. As the Government Regulatory Agency character actor was associated with a losing policy narrative care needs to be taken with this actor when attempting to build a winning policy narrative.

From the perspective of pro-GM and anti-GM coalitions several policy actors played a significant role as a character actor in country specific policy narratives. The Brazilian pro-GM coalition contained three types of policy actors that weren't found in the Florida Keys. These included Moscamed, a nonprofit service provider, the University of Sao Paulo, and federal and state level health agencies, Brazilian Ministry of Health and the State Health Department of Bahia. Organizational equivalents of these policy actors were not found in the Florida Keys. Of these three Moscamed played the largest role. As discussed in Chapter 4 Moscamed was identified as a hero in the pro-GM coalitions and associated with two different types of hero actions, Combats (mosquito, disease) and Endorse (technology). The influence of Moscamed will be discussed later. See Tables 4.5 and 4.6.

The Florida Keys pro-GM coalition contained the Florida Keys Mosquito Control Board, a local decision-making agency that wasn't found in Brazil. As a pseudo-Government-Regulatory Agency actor, FKMCD was identified as both a hero and a villain in the policy narratives discussing GM mosquito releases in the Florida Keys. See Tables 4.7 and 4.8. As will be discussed later FKMCD plays a large role in enabling the public referendum that eventually led to the decision to not release mosquitos.

The Florida Keys anti-GM coalition contained two different types of nonprofits not found in Brazilian anti-GM coalitions. First was the Center for Food Safety, a US based NGO strongly focused on the use of GM technology with legal expertise in suing the US government for previous policy decisions regarding GM crops. Second were the local organizations like GMO Free Florida that provided grassroots resistance.

The key role of these organizations played in the Florida Keys release decisions will be discussed later in this chapter.

7.1.2 The Role of Narrative Characters in Policy Narratives

Chapter Four described and compared the use of hero and villain character actors, hero and villain actor dyads and hero and villain actions for the Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos and was guided by the following research question: What is the role of narrative characters in the policy narratives related to GM mosquito releases in Brazil and the Florida Keys?

This study specifically focuses on the hero and villain narrative characters as policy actors that are modeled on the ego-alter dyad construct. From an NPF perspective, the ego represents the hero or villain, that is played by an actor, that is paired to an alter through some type of action. A character actor has defined actions associated with it and the dyad represents the combination of the character actor and its action. This section will first discuss hero characters and then move to villain characters.

Hero

An examination of winning and losing coalitions in Brazil highlighted four hero character actors: the Public, Moscamed (Nonprofit Service Provider), CTNBio (Government- Regulatory Agency) and NGO Activist Organizations that were associated with a winning or losing policy narrative. Public was found in the policy narratives of the winning coalition (pro-GM) and performed the Inspect (technology) hero action. Moscamed was also found in the policy narrative of the winning coalition (pro-GM) and performed the Combat (mosquito, disease) and Endorse (technology) hero actions.

CTNBio was found in the policy narratives of the losing coalition (anti-GM) and performed the Inspect (technology) hero action. The NGO Activist Organization character actor was also found in the losing coalition's (anti-GM) policy narratives and performed the Educate (public), Resist (regulations, technology), Warn (public, government leaders), Admonish

(Governmental Non-Regulatory Orgs, Oxitec, CTNBio), and Protect (environment, human health) hero actions.

An interesting note is that the winning coalition (pro-GM) highlighted the role of the public in inspecting the GM technology and did not mention CTNBio (Government- Regulatory Agency) while the losing coalition (anti-GM) emphasized the role of CTNBio (Government-Regulatory Agency) performing the inspection and did not mention the public. Perhaps an important component of the winning policy narrative in Brazil is that the public was portrayed as a hero by inspecting the technology rather than just relying on the regulatory agency.

Also, as previously mentioned Oxitec is not identified as a hero in the pro-GM coalitions. This role seems to be played by Moscamed and this will be explored more fully later in the chapter.

An examination of winning or losing coalitions in the Florida Keys highlighted three character actors: NGO Activist Organization, FDA (Government- Regulatory Agency) and Oxitec (Company) that were associated with a winning or losing policy narratives. NGO Activist Organization was found in the policy narratives of the winning coalition (anti-GM) and performed the Resist (regulations and technology), Warns (public and government leaders), Admonish (Oxitec and FDA), and Protect (environment and human health) hero actions.

The FDA was found in the policy narratives of the losing coalition (pro-GM) and performed the Inspect (technology) hero action. Oxitec was also found in the policy narratives of the losing coalition (pro-GM) and performed the Protect (environment and human health) and Endorse (regulations) hero actions.

As previously mentioned, it was noted that the FDA was not portrayed as protecting human health and environment and that Oxitec was shown to endorse regulations. These results

support the findings of Meghani and Kuzma (2018) and Kumza (2019) that a close relationship exists between Oxitec and the FDA which limits the oversight ability of the FDA and compromises its regulatory authority.

It should also be noted that Oxitec was portrayed as a hero in the Florida Keys and performed similar actions to Moscamed in Brazil including Protect (environment and human health). However, unlike Moscamed, Oxitec endorsed regulations rather than the technology. When constructing winning policy narratives, it may be important which type of endorsement actions a hero takes.

An analysis of the combined winning and losing coalitions identified that Government-Regulatory Agency character actor was a hero associated with combined losing policy narratives and performed the Assembles (public), Inspect (technology) and Approves (technology) hero actions.

As previously identified the government regulatory agency is acting as a hero by fulfilling its supposed purpose of inspecting the GM mosquito technology, gathering feedback from the public regarding the use of GM mosquitos and then ultimately approving the release of mosquitos. However, all these actions are associated with a generalized losing coalition which implies the hero and its actions are not region or policy subsystem specific. These results would indicate that the GMO regulatory process is not completely trusted and other types of approval as perhaps identified by the concept of the social license to operate (Baltzegar et al., 2018) may be important.

An investigation of the pro-GM and anti-GM coalitions highlighted four character actors that were portrayed as heroes and associated with only a pro-GM coalition or anti-GM coalition. The NGO Activist Organization character actor was identified as a hero in both policy

subsystems and was found in the policy narratives of the anti-GM coalitions performing the following hero actions: Resist (regulations, technology), Warn (public, government leaders), Admonish (Oxitec, CTNBio), and Protect (environment, human health).

The Government-Regulatory Agency character actor (CTNBio and FDA) was identified as a hero in both policy subsystems. In the Florida Keys policy subsystem, the FDA was found in the narratives of the pro-GM coalition performing the Inspect (technology) hero action while in the Brazilian policy subsystem, CTNBio was found in the narratives of the anti-GM coalition performing the inspect (technology) hero action.

This is the only instance of a character actor performing the same action and being associated with both the anti-GM coalition and the pro-GM coalition and with the winning and losing coalitions. When attempting to construct winning policy narratives the role and action of the regulatory agency may be a key element.

Specific to the Brazilian policy subsystem both the Public and Moscamed were identified as hero and were found in the narratives of the pro-GM coalition. The public performed the Inspect (technology) hero action. Moscamed performed the Combat (mosquito, disease) and Endorse (technology) hero actions. Specific to the Florida Keys policy subsystem Oxitec was identified as a hero in the narratives of the pro-GM coalition and performed the Combat (mosquito, disease) and Endorse (technology) hero actions.

Villain

An examination of winning and losing coalitions in Brazil highlighted three villain character actors, Government- Non-Regulatory Org, Oxitec (company), and CTNBio (Government- Regulatory Agency) that were associated with the losing coalition's (anti-GM) policy narratives. The Government- Non-Regulatory Org villain character performed the Ignore

(regulations) villain action. Oxitec performed the Endanger (environment and human health), Ignores (regulation, experts, and public), and Deceives (CTNBio, government non-regulatory orgs, public, experts) villain actions. CTNBio performed the Collude (with Oxitec), Ignore (regulations) and Approve (technology) villain actions.

No villain character actors were identified in the policy narratives of the winning coalition (pro-GM).

There are a couple of important points to mention about the use of villain characters in Brazil. First, all villain dyads were found only in the narratives of the losing coalition (anti-GM) which was completely composed of activist organizations. The winning coalition (pro-GM) did not villainize the losing coalition (anti-GM). This lack of villainization could be a strategic move to ignore the anti-GM coalition in order to avoid expanding the scope of conflict. Or perhaps, since all of the losing (anti-GM) coalition membership is nonprofit and NGOs the winning coalition (pro-GM) did not want to attack them.

Second, these villain actions are how these activist organizations chose to describe Oxitec, the various health agencies, and CTNBio in their policy narratives. The portrayal of the interactions between Oxitec and CTNBio should be noted. Oxitec was described as endangering human health and the environment, ignoring regulations, scientific experts and the public and deceiving CTNBio. CTNBio in return is portrayed as colluding with Oxitec, also ignoring regulations and ultimately approving Oxitec's mosquitos for release. This narrative demonstrates that NGO organizations in Brazil don't trust the GM regulatory process.

Finally, the Ignores Regulation dyad is shared with all three villain actors and indicates this action is an important part of the losing coalition's narrative.

An examination of winning and losing coalitions in the Florida Keys highlighted two villain character actors, Oxitec (company), and FDA (Government- Regulatory Agency) that were associated with the winning coalition's (anti-GM) policy narratives. The FDA performed two villain actions including: Endanger (environment) and Ignore (public). Oxitec performed several villain actions including: Endanger (environment and human health), Ignores (public), and Deceives (FDA, government non- regulatory orgs, public and experts).

No villain character actors or dyads were identified in the policy narratives of the losing coalition.

Like Brazil all villain dyads were found only in the narratives of the winning coalition which was completely composed of activist organizations and this was how activist organizations (NGOs) chose to portray Oxitec and the FDA's involvement in the GM mosquito policy debate. As identified by Meghani and Kuzma (2018) and Kuzma (2019) both the Oxitec and the FDA exhibit a pro-GM bias when interpreting risk and NGO organizations don't trust the FDA's risk assessment. Both the Endangers Environment and Ignores Public hero actions are associated with both villain actors and indicates these actions are an important part of the winning coalition's narrative.

An analysis of the combined winning and losing coalitions did not identify a significant villain character actor. These results suggest that the identification of villains and villain actions are not required to compose a winning policy narrative and that the use of villain character elements in a winning policy narrative may be region specific as in the Florida Keys.

An investigation of the pro-GM and anti-GM coalitions highlighted three character actors that were portrayed as villains and associated with only a pro-GM coalition or anti-GM coalition. The Government- Regulatory Agency character actor (CTNBio, FDA) and Oxitec (company)

were identified as villains in both the Brazilian and Florida Keys policy subsystems and were only found in the policy narratives of the anti-GM coalitions. Oxitec performed the Endanger (environment and human health), Ignores (regulation, experts, and public), and Deceives (CTNBio, government non-regulatory orgs, public, experts) villain actions. CTNBio performed the Collude (with Oxitec), Ignore (regulations) and Approve (technology) villain actions. The FDA performed two villain actions including: Endanger (environment) and Ignore (public).

The Government- Non-Regulatory Org character actor was identified as a villain only in the Brazilian policy subsystem and was found in the narratives of the anti-GM coalition. It performed the Ignore (regulations) villain action.

As previously identified these results indicate that some types of villain actors, like Company and Government- Regulatory Agency, can be shared across coalitions while other villain actors like Government- Non-Regulatory Org can be specific to a certain locale. As both Company and Government Regulatory Organization were shared across both policy subsystems with moderate to strong associations, these villain actor types may not play a strong role in influencing the release of genetically modified mosquitos, as vilifying these groups does not seem to influence release decisions in either country. In other words, the same strategy leads to different outcomes. In contrast, as previously noted in section 4.3 portraying Government Regulatory Agencies as heroes led to losing outcomes across both countries.

There are two additional noteworthy points about the use of villain actors in the various GM mosquito policy subsystems. First, only coalitions that opposed the release of GM mosquitos identified villains within their narratives. It appears that the coalitions that supported the release of GM mosquitos chose not to vilify any of the opposition policy actors.

Second, none of the policy actors identified as villains were nonprofit, NGO or civil society organizations. The coalitions that opposed the releases in Brazil could have targeted Moscamed (Nonprofit Service Provider) as a villain, but instead chose to vilify Oxitec (Company). In both policy subsystems the NGO Activist Organizations were very critical of Oxitec, but none of the Oxitec or Moscamed's narratives contained references to the NGO Activist Organizations as behaving like a villain. It appears that in both regions that lack of criticism of nonprofit organizations may be a strategy that organizations use in their narratives.

7.1.3 The Role of Evidence in Policy Narratives

Chapter Five investigated the role of evidence in policy narratives for the Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos by examining the types of evidence found in policy narratives and how that evidence was used. The analysis was guided by and addressed the following research question: What is the role of evidence in the policy narratives related to GM mosquito releases in Brazil and the Florida Keys?

Evidence Types

This analysis was based on a modified version of Smith-Walter's (2016) typology of evidence types found in policy narratives. The six types of evidence included Scientific Studies, Statistics, *ipso dictum*, Public Opinion Polls, Laws and Legal Rulings, and Tacit or Localized Knowledge.

Of the six types of evidence, Tacit or Localized Knowledge was not found in any policy narratives. This was somewhat surprising as the importance of localized knowledge in agriculture in less developed countries and how GM technology could affect it was an argument often used to refute the use of GM technology. It was thought that a similar dynamic may be present with GM mosquitos. This was surmised in Hypothesis 2 that postulated that anti-GM

coalitions would more frequently reference the importance of localized knowledge when dealing with mosquitos. These results of this study did not support Hypothesis 2. Another evidence type Public Opinion Polls was not found in the Brazilian policy narratives and was only present in the Florida Keys narratives.

An examination of winning or losing coalitions in Brazil and the Florida Keys highlighted two types of evidence, *ipso dictum* and Public Opinion Polls, that were associated with winning and losing policy narratives. The *ipso dictum* evidence type was emphasized in policy narratives of the winning coalition (pro-GM) in Brazil. The mostly widely used form of *ipso dictum* was an appeal to an individual that carried some type of title associated with their role in an organization (business or NGO), academic titles or government leaders. In Brazil, the most often cited authorities included the leaders of Oxitec, Moscamed, academic scientists, and government leaders.

These findings highlight a key difference between the Brazilian and Florida Keys policy debates. Brazil had a larger number of proponents that supported of the release of GM mosquitos as compared to the Florida Keys including Moscamed and Brazilian government leaders at the local, state and federal level. This type of support offered by Moscamed and government leaders was not evident in the Florida Keys.

The Public Opinion Polls evidence type was emphasized in the policy narratives of the losing coalition (pro-GM) in the Florida Keys. The polls cited in the narratives highlighted that a majority of Americans supported the release of GM mosquitos to fight diseases. This national support did not seem to represent the local sentiment in Florida Keys, Key Haven in particular, where citizen voted to stop GM mosquito releases.

An analysis of the combined winning and losing coalitions also identified both the *ipso dictum* and Public Opinion Polls as types of evidence associated with winning and losing policy narratives. The *ipso dictum* evidence type was found more often in policy narratives of the combined winning coalition, while the Public Opinion Polls evidence type was found more frequently in the policy narratives of the combined losing coalition. This implies that an important element of a winning policy narrative relating to the release of GM mosquitos is using evidence that is based on the appeal to an individual that has authority based on title or position (*ipso dictum*). Additionally, public opinion polls may provide limited success when attempting to craft a winning narrative.

An investigation of the pro-GM and anti-GM coalitions highlighted that both *ipso dictum* and Public Opinion Polls were only used by the pro-GM coalitions. No evidence types were specifically associated with the anti-GM coalitions. What is surprising about these results is that the Scientific Studies evidence type was not emphasized in the narratives of the pro-GM coalition. As postulated in Hypothesis 2, due to the complex nature of the GM mosquito technology it was probable that the pro-GM coalition would reference scientific studies more frequently when discussing GM mosquito releases. Hypothesis 2 was not supported. These results demonstrate that the types of evidence referenced by pro-GM and anti-GM coalitions are more nuanced than the simplistic scientific evidence versus localized knowledge dichotomy.

Uses of Evidence

This analysis employed a typology developed by Schlauffer (2018) that categorizes seven different uses of evidence in policy narratives including: (a) demonstrating the policy problem, (b) downplaying the policy problem, (c) supporting the policy solution, (d) refuting the solution of opponents, (e) embellishing the hero, (f) demonizing the villain, and (g) evidence as the focus

of the narrative. For this analysis each of the six types of evidence Scientific Studies, Statistics, *ipso dictum*, Public Opinion Polls, Laws and Legal Rulings were analyzed with Schlauffer's typology to determine how it was used in the GM mosquito policy narratives.

Of the seven uses of evidence, Downplaying the Policy Problem was not found in any policy narratives. This would indicate that all coalitions considered the issue of mosquito-borne disease to be of major concern and did not downplay its significance. Two uses of evidence, Demonstrating the Policy Problem and Embellishing the Hero showed no significance usage in any policy narratives.

Examining the winning and losing coalitions in Brazil and the Florida Keys for uses of evidence that are associated with winning or losing policy narratives yields some very messy results. (See Table 5.20) For instance, in Brazil scientific evidence and *ipso dictum* were used in the winning coalition's (pro-GM) narrative to support their policy solution to release GM mosquitos. However, the exact same uses of evidence were also present in the losing coalition's policy (pro-GM) narratives in the Florida Keys that also argued for the release of GM mosquitos. In a similar example, scientific evidence, *ipso dictum* and Laws and Legal Rulings were used in the winning coalition's (anti-GM) narratives in the Florida Keys to successfully argue against the release of GM mosquitos while in Brazil the exact same uses of evidence were employed in the losing coalition's (anti-GM) narratives that argued against GM mosquito releases. As will be discussed below some of the uses of evidence are more aligned with pro-GM and anti-GM coalitions than with winning and losing coalitions. The only potentially firm link between the use of evidence and a potential policy outcome come from situations when a certain use of evidence are associated with losing policy narratives. In the Florida Keys, the use of public opinion polls and laws and legal rulings to support a preferred policy solution are used in the

narratives of the losing coalition (pro-GM). In Brazil the following uses of evidence are associated with a losing policy narrative: statistics used to argue against (refute) an opponent's policy solution, the use of scientific evidence, statistics and *ipso dictum* to demonize a villain character actor.

An analysis of the combined winning and losing coalitions identified two uses of evidence, *ipso dictum* used to support a policy solution and Laws and Legal Rulings used to support a policy solution, that are linked to winning or losing policy narratives. The *ipso dictum* usage was associated with the combined winning policy narrative while the Laws and Legal Ruling usage was associated with the combined losing policy narrative. From a purely scientific standpoint it is extremely interesting that for such a complex and highly contested policy topic as GM mosquitos releases that the use of evidence most associated with a winning policy narrative is the appeal to a figure with authority rather than scientific data. This is an unexpected finding and has ramifications when attempting to construct winning policy narratives.

An investigation of the pro-GM and anti-GM coalitions highlighted that specific usages of evidence are associated with pro-GM or anti-GM coalitions. The Supporting the Policy Solution usage type was always associated with the pro-GM coalition and was used with Scientific Studies, *ipso dictum*, Public Opinion Polls and Laws and Legal Rulings. This indicates the narratives of pro-GM coalitions were focused on proving the value of their policy solution to release GM mosquitos. The Refuting the Solution of Opponents, Demonizing the Villain and The Center of the Narrative usage types were always associated with the anti-GM coalitions. This indicates that the anti-GM coalitions used evidence to combat the pro-GM coalition's policy solution rather than focusing on their own policy solution. Refuting the

Solution of Opponents usage type was found in Brazil and the Florida Keys, while Demonizing the Villain and The Center of the Narrative usage types were only found in Brazil.

7.1.4 The Role of Narrative Strategies in Policy Narratives

Chapter six described and compared how three narrative strategies: (i) the Distribution of Cost and Benefits, (ii) the use of Policy Surrogate(s), and (iii) the use of Condensation Symbol(s) and the Use of Scientific Evidence are employed in the policy narratives of the Brazilian and Florida Keys coalitions involved in the policy debates regarding the release of GM mosquitos. The analysis was guided by the following research question and hypotheses: What is the role of narrative strategies in the policy narratives related to GM mosquito releases in Brazil and the Florida Keys?

Distribution of Costs and Benefits

This section first discusses the distribution of benefits (see Table 6.7) and then focuses on the distribution of costs (see Table 6.8).

Distribution of Benefits

Examining how winning and losing policy coalitions depict the distribution of benefits identifies if this portrayal is associated with a winning or losing policy narrative (see Table 6.7). In Brazil, when discussing their preferred policy solution (release mosquitos) the winning coalition's (pro-GM) narrative diffused benefits. The losing coalition's (anti-GM) narrative did not describe benefits when discussing their preferred policy solution (no releases, maintain status quo). These results partially support Hypothesis 3a that postulates that both winning and losing coalitions will diffuse benefits when describing their own policy solution. This hypothesis is confirmed for the winning coalition but not for the losing coalition.

In Brazil, when discussing the opposing policy solution (no releases, maintain status quo) the winning coalition's (pro-GM) narratives did not describe benefits. These results support

Hypotheses 5a that postulates that a winning coalition will ignore the losing coalition's policy solution. The losing coalition's (anti-GM) narratives diffused benefits when discussing the opposing policy solution (release mosquitos). These results do not support Hypothesis 4a which states that losing coalitions would tend to depict a concentration of benefits for the winning policy solution.

In the Florida Keys, the losing coalition's (pro-GM) narrative diffused benefits when describing its preferred policy solution (release mosquitos). The winning coalition's (anti-GM) narrative did not describe benefits when discussing their preferred policy solution (no releases, maintain status quo). The results partially support Hypothesis 3a that postulates that both winning and losing coalitions will diffuse benefits when describing their own policy solution. This is confirmed for the losing coalition (pro-GM) but is not supported for the winning coalition (anti-GM). An interesting element to these results is that the losing coalition (anti-GM) admitted that the GM mosquito technology could reduce mosquito populations. They were doubtful as to whether the reduced mosquito population would lead to a reduction in the incidence of disease. From their perspective the potential risks inherent in the technology were not worth the potential marginal benefit.

The winning and losing coalitions in the Florida Keys did not significantly differ in the way they described the distribution of benefits of their opposed policy solution. These results support Hypotheses 5a that postulates that a winning coalition will ignore the losing coalition's policy solution. These results do not support Hypothesis 4a which postulates that a losing coalition would depict a concentration of benefits for the winning policy solution.

From the perspective of the combined winning and losing coalitions no significant difference was identified in how they described the distribution of benefits for both their

preferred and opposing policy solutions. These results do not support Hypothesis 3a that postulates that both winning and losing coalitions will diffuse benefits when describing their own policy solution. These results support Hypotheses 5a that postulates that a winning coalition will ignore the losing coalition's policy solution. These results do not support Hypothesis 4a which postulates that a losing coalition would depict a concentration of benefits for the winning policy solution. These results suggest that the distribution of benefits is not a necessary strategy when attempting to construct a winning policy narrative concerning the release of GM mosquitos. This is not surprising due to the fact that the anti-GM coalitions did little to emphasize the benefits of maintaining status control methods.

The analysis of how pro-GM and anti-GM coalitions depict the distribution of benefits highlights if this portrayal is associated with only a pro-GM coalition or anti-GM coalition (Table 6.7). A diffusion of benefits when describing a preferred policy solution is associated with the pro-GM coalition across both regions. No description of benefits is associated with the anti-GM coalition across both regions. Diffusion of benefits when describing an opposing policy solution is associated with the anti-GM coalition in Brazil. No description of benefits when describing an opposing policy solution is associated with the pro-GM coalition in Brazil.

There are a few key points to note regarding how the distribution of benefits is used in GM mosquito policy narratives. The pro-GM coalition's policy narratives in both countries focused on the diffusion of benefits when describing their policy solution to release GM mosquitos. With this portrayal pro-GM coalitions were attempting to signal in their narratives that many people will benefit from GM mosquito releases. This strategy was part of a winning narrative in Brazil but did not provide similar results in the Florida Keys.

The anti-GM coalition's narratives in both regions lacked any description of the benefits of their policy solution to prohibit GM mosquito releases and continue using the current mosquito control practices. This seems appropriate as the anti-GM coalitions focused on concerns with the pro-GM coalition's solution to release GM mosquitos rather than describing their own policy solution. This tactic was part of a winning narrative in Brazil but seemed less effective in the Florida Keys.

None of the anti-GM or pro-GM narratives focused on the concentration of benefits for their own policy solution or the opposing policy solution. No coalition would describe a concentration of benefits when describing their own solution as that could expand the scope of conflict. Potentially the concentration of benefits was not used to describe an opposing policy due to the fact that both policy solutions addressed a public health issue of disease prevention and any positive effects of either solution would be shared by everyone.

There are two additional points to consider. First, the description of benefits seems more aligned with pro-GM and anti-GM coalitions rather than winning and losing coalitions as similar distribution of benefits strategies showed mixed results between Brazil and the Florida Keys. Second, the description of benefits was much more pronounced in Brazil as compared to the Florida Keys.

Distribution of Costs

Examining how winning and losing policy coalitions depict the distribution of costs identifies if this portrayal is associated with a winning or losing policy narrative (see Table 6.8). In Brazil, the winning coalition's (pro-GM) narrative concentrated costs when discussing their preferred policy solution (release mosquitos) while the losing coalition's (anti-GM) narrative did not describe costs when discussing their preferred policy solution (no releases, maintain status

quo). The results partially support Hypothesis 3b that postulates that both winning and losing coalitions will concentrate costs when describing their own policy solution. This is confirmed for the winning coalition but is not supported for the losing coalition.

In Brazil, the winning coalition's (pro-GM) narrative did not describe costs when discussing the opposing policy solution (no releases, maintain status quo). These results support Hypotheses 5a that postulates that a winning coalition will ignore the losing coalition's policy solution. The losing coalition's (anti-GM) narrative diffused costs when discussing the opposing policy solution (release mosquitos). These results support Hypothesis 4b which postulates that losing coalitions would depict a diffusion of costs when describing the winning policy solution.

These results highlight an overall theme of the losing coalition's (anti-GM) fight against the GM mosquito. Most of their focus was on fighting against GM mosquito releases. This coalition spent very little time identifying alternative control methods or explaining why the current practices were sufficient.

In the Florida Keys, the winning and losing coalitions did not significantly differ in the way they described the distribution of costs in their own policy solution. These results do not support Hypothesis 3b which postulates that both winning and losing coalitions will concentrate costs when describing their own policy solution.

In the Florida Keys, the winning coalition's (anti-GM) narrative diffused costs when discussing the opposing policy solution (no releases, maintain status quo). These results support Hypothesis 5c which postulates that winning coalitions would depict a diffusion of costs in the losing policy solution. The losing coalition's (pro-GM) narrative did not describe costs when discussing the opposing policy solution (no releases, maintain status quo). These results do not

support Hypotheses 4b that postulates that a losing coalition will stress the diffusion of costs when describing the winning policy solution.

From the perspective of the combined winning and losing coalitions no significant difference was identified in how they described the distribution of costs for both their preferred and opposing policy solutions. These results do not support Hypothesis 3b that postulates that both winning and losing coalitions will concentrate costs when describing their own policy solution. These results support Hypotheses 5a that postulates that a winning coalition will ignore the losing coalition's policy solution. These results do not support Hypothesis 4b which postulates that a losing coalition would depict a diffusion of costs for the winning policy solution. These results suggest that the distribution of costs is not a necessary strategy when attempting to construct a winning policy narrative concerning the release of GM mosquitos.

An investigation of the pro-GM and anti-GM coalitions highlighted if how a coalition uses the distribution of costs is associated with only a pro-GM coalition or anti-GM coalition (Table 6.8). No description of costs when discussing an opposing policy solution is associated with the pro-GM coalition across both regions. The diffusion of costs when discussing an opposing policy solution is associated with the anti-GM coalition across both regions.

Policy Surrogate

An examination of winning and losing policy coalitions in Brazil helps determine if how a coalition uses a policy surrogate is associated with winning or losing policy narratives. The Regulatory Process not Transparent and Regulatory Process not Participatory policy surrogates were found in losing coalition's (anti-GM) narratives. No policy surrogates were found in the winning coalition's (pro-GM) narratives (Table 6.12). These results support Hypothesis 7 that states that losing coalitions will use policy surrogates more frequently than winning coalitions.

As identified previously these results in Brazil indicate that the use of a policy surrogate was not beneficial in creating a winning policy narrative. This may be due to the fact that the GM mosquito releases occurred in rural and remote locations where much of the population was more concerned about reducing the incidence of a painful endemic disease, dengue fever, rather than the fairness of the regulatory system. Similarly, there was very little grassroots activism in these remote Brazilian cities to raise awareness of these regulatory concerns.

An examination of winning and losing policy coalitions in the Florida Keys helps determine if how a coalition uses a policy surrogate is associated with winning or losing policy narratives. The Regulatory Process not Transparent and Regulatory Process not Participatory policy surrogates were found in the winning coalition's (anti-GM) narratives. These results do not support hypothesis 7 as both policy surrogates were used by the winning coalition. The Regulatory Process Provides Safety policy surrogate was found in the losing coalition's (pro-GM) narratives. This result supports Hypothesis 7.

These results indicate that policy surrogates can be a valuable component of winning policy narrative in a more localized setting. The potential success of these policy surrogates may have been driven by the presence of a strong local grassroots movement opposing releases that in part focused on concerns with the US regulatory process.

An analysis of the combined winning and losing coalitions identified that no policy surrogates were associated with a combined winning or losing policy narrative. These results would indicate that the policy surrogate narrative strategy may not be an effective generalized strategy when attempting to create a winning policy narrative to influence the release of GM mosquitos.

An investigation of the pro-GM and anti-GM coalitions highlighted if how a coalition uses a policy surrogate is associated with only a pro-GM coalition or anti-GM coalition. The Regulatory Process not Transparent and Regulatory Process not Participatory policy surrogates were associated with the anti-GM coalition across both regions. The Regulatory Process Provides Safety policy surrogate was associated with the pro-GM coalition in the Florida Keys.

These results indicate that the use of policy surrogates is more closely aligned with pro-GM (opposing) and anti-GM (supporting) coalitions rather than winning and losing coalitions. Policy surrogates were mostly used by anti-GM coalitions in both policy subsystems. The only instances of policy surrogates being used by pro-GM coalitions occurred in the Florida Keys.

Condensation Symbol

An examination of winning and losing policy coalitions in Brazil helps determine if how a coalition uses a condensation symbol is associated with winning or losing policy narratives. The PAT condensation symbol was associated with the winning coalition's (pro-GM) narrative. No condensation symbol was found in the losing coalition's narrative. These results do not support Hypothesis 6 which postulates that losing coalitions will use condensation symbols more frequently than winning coalitions.

An examination of winning and losing policy coalitions in the Florida Keys helps determine if how a coalition uses a condensation symbol is associated with winning or losing policy narratives. No condensation symbol was found in either the winning or losing coalition's narratives. These results do not support Hypothesis 6 which postulates that losing coalitions will use condensation symbols more frequently than winning coalitions.

An analysis of the combined winning and losing coalitions identified that the PAT condensation symbol is associated with the combined winning coalition. These results do not

support Hypothesis 6 which postulates that losing coalitions will use condensation symbols more frequently than winning coalitions. These results would indicate that using a condensation symbol may be an effective strategy when attempting to construct a winning policy narrative. Typically, condensation symbols are not associated with winning coalitions. In this instance the potential success of the strategy was to actually limit the scope of the policy issue by limiting the discussion about using a genetically modified mosquito and instead focusing on the overall process of reducing mosquito populations.

An investigation of the pro-GM and anti-GM coalitions highlighted if how a coalition uses a condensation symbol is associated with only a pro-GM coalition or anti-GM coalition. The PAT condensation symbol was associated with the pro-GM coalition in Brazil. Due to the limited number of condensation symbols it is unclear as to whether this narrative strategy is more closely associated with pro-GM or anti-GM coalitions or winning and losing coalitions.

7.1.5 Discussion of Overall Findings

The results from this research highlight several important parameters of how policy narratives were used in the policy debates discussing the release of GM mosquitoes in Brazil and the Florida Keys. First, policy coalitions in both Brazil and the Florida Keys included policy narratives in their public consumption documents that contained coalition specific portrayals of heroes and villains, different types and uses of evidence, and variations in the use of NPF narrative strategies in an effort to influence decisions regarding the release of GM mosquitos.

Second, few NPF narrative components were significantly associated with both winning coalitions' narratives in Brazil and the Florida Keys or in both losing coalitions' narratives across the two countries. The analysis of the combined winning coalitions from both Brazil and the Florida Keys only identified two narrative components that were associated with winning narratives in both countries: the use of *ipso dictum* evidence to support a policy solution and the

use of condensation symbols. The analysis of the combined losing coalitions across Brazil and the Florida Keys only identified two narrative components that were associated with losing narratives in both countries: the portrayal of the government regulatory actors as a villain and the use of laws and legal rulings to support a policy solution. In the context of this policy debate there appear to be few global narrative components that will generate winning or losing policy narratives.

Third, the use of hero narrative elements is more pronounced in these policy narratives than the use of villain narrative elements. The pro-GM coalitions in both regions did not use villain narrative elements in their policy narratives. Across both regions, five character actors were identified as heroes and performed 18 hero actions while only three character actors were identified as villains that performed 15 villain actions. All coalitions preferred to use of hero narrative elements as compared to villain narrative elements in their policy narratives.

Fourth, the types of evidence found in policy narratives discussing the release of GM mosquitos is more nuanced than the typical description of a dichotomy between the use of scientific evidence versus localized or traditional knowledge. Across the two regions, five different types of evidence were found in policy narratives. However, a key finding was that descriptions of localized or traditional ways of dealing with mosquitos were not mentioned in any policy narrative. The winning and losing coalitions did not significantly differ in the presence of scientific evidence in their policy narratives. The type of evidence that showed the greatest difference between the winning and losing coalitions was *ipso dictum* that was associated with winning policy coalitions. In the policy debates regarding the use of GM mosquitos the policy narrative used several different types of evidence.

Fifth, policy coalitions use evidence differently. In general, there was no association identified between a winning or losing coalition and how different types of evidence were used. In fact, the use of evidence is more closely associated with whether a coalition had a pro-GM or anti-GM stance to the GM mosquito technology. Pro-GM coalitions used evidence to support their pro-GM mosquito policy solution while the anti-GM coalitions used evidence to refute or argue against the use of GM mosquitos.

Sixth, the use of NPF narrative strategies by winning and losing coalitions in both regions often differed from what was postulated by traditional NPF hypotheses. Of the 26 instances where the use of narrative strategies was tested in the policy narratives of coalitions from Brazil and the Florida Keys only 11 instances conformed to how the strategies should be utilized according to standard NPF hypotheses. The use of narrative strategies was more closely aligned with pro-GM or anti-GM technology stances of the coalitions rather than whether they were a winning or losing coalitions.

Seventh, the potential influence of NPF narrative components to create winning policy narratives is context dependent. There are two important elements of context identified in this research. First is a difference in context based on the specific composition of a policy coalition. The presence of Moscamed in Brazil or the Florida Keys Mosquito Control Board in the Florida Keys allowed specific policy actors to influence policy narratives. The second difference in context is related to the location where the policy narrative was used. There are many instances of a specific narrative component being associated with a winning policy narrative in one region but was also associated with the losing policy narrative in the other region. It may be that certain narrative components can only help create a winning policy narrative if used in the appropriate country.

The results of this study provide some challenges to the Narrative Policy Framework. This is the first NPF study that compares policy narratives and policy decisions across two separate policy subsystems, Brazil and the Florida Keys. What made this research interesting was that the decision to release GM mosquitos differed between the two policy subsystems. At the federal level in both countries approval was given to release GM mosquitos. If this was the final decision point then the results would have been very similar to past NPF analysis. However, the role of the Florida Keys Mosquito Control District as an additional decision control point in the Florida Keys added additional complexity not previously seen in other NPF studies.

These results suggest that use of narrative strategies and the role of evidence in policy narratives may be more closely associated with a coalition's stance regarding the use of genetic engineering technology rather than if it was a winning or losing coalition. The results suggest that context or setting play a large role in the potential effectiveness of policy narratives. This context can be associated with the varying composition of the various coalitions or the presence of additional decision making points within a certain policy subsystem.

These results identify that adjustments to NPF hypotheses may be needed. For instance, it may be more appropriate to hypothesize that the role of evidence and the use of certain narrative strategies are more closely associated with a particular policy stance, such as the use of GM mosquitos, rather than with a winning or losing coalition.

It should be noted that the confirmation of hypotheses in this research was not presented to prove that the presence of a specific narrative component leads to specific release decisions. The two cases studies, Brazil and the Florida Keys are statistically insufficient to determine causation. The validation of hypotheses in this research provides additional evidence of an

association of how a specific narrative component is used by a specific type of coalition. These types of associations have been identified in other NPF studies. The positive results from this research confirm previous associations while contradictory results call into doubt whether NPF hypotheses accurately portray the role of specific policy narratives components in policy decisions.

Although this dissertation cannot determine any causal effects it can highlight and begin to explain how certain contexts and conditions of the GM mosquito policy debate, identified in the policy narratives, could have influenced release decisions. A key element of policy narratives is that they are not only an important source of influence within the policy process, they also “reflect the beliefs and actions of policy stakeholders” (D. A. Crow & Berggren, 2014, p. 134). When attempting to understand policy debates, the policy narrative is a powerful tool that allows an examination of not only how coalitions attempt to influence policy decisions, but also the context of the policy debate and the actions taken by policy actors. In this way policy narratives provide a unique view of policy debates.

To better understand how differences in policy narratives between Brazil and the Florida Keys can be used to decipher differences in GM mosquito release decisions three examples from the GM mosquito policy debates are discussed.

The first example is a comparison between Moscamed and Oxitec. Both organizations were or would be responsible for outreach activities and the release of GM mosquitos depending on the location. In Brazil, Moscamed, not Oxitec, conducted the outreach activities, reared, released and monitored mosquitos and appeared as the public face of the trial releases. In the Florida Keys, no organization like Moscamed was present so Oxitec was directly responsible for public outreach and would have been responsible for the mosquito releases. Moscamed was

identified as a significant hero actor in the Brazilian policy subsystem associated with the winning coalition. Oxitec was not identified as a significant hero actor in Brazil. In the Florida Keys, Oxitec was identified as a significant hero actor, but was associated with the losing coalition.

Both actors performed similar, but not identical actions. In Brazil, Moscamed was associated with the following actions and alters: Combats Mosquitos, Combats Disease, and Endorses Technology. In the Florida Keys, Oxitec was associated with Endorses Regulation, Protects the Environment, and Protects Human Health. Perhaps the absence of Moscamed in the Florida highlighted by the differences in policy narratives can begin to explain differences in release decisions.

A second example of how policy narratives can help explain difference in release decisions focuses on the role of the Florida Keys Mosquito Control District and its interactions with regional and local activists organizations. Like Brazil, federal regulatory approval for trial releases of GM mosquitos in the Florida Keys had been granted, in this instance, by the FDA. However, due to intense lobbying and advocacy efforts by local citizens and activist organizations the FKMCD board decided to base its decision to release mosquitos on a public referendum (Never Again Foundation, 2016; Servick, 2016). This was a first for the mosquito control board and was protested by some members of the board (Shastri, 2017) . Before the vote on the referendum there was a great deal of campaigning and lobbying done by the local activist organizations and concerned citizens to rally support to vote against the referendum (Shastri, 2017).

From the policy narratives describing the release debates in the Florida Keys, this type of lobbying and advocacy work can be seen in the hero actions Resist, Warn, Admonish, and

Protect that were used to describe NGO Activist Organization(s). In Brazil, similar actions were used to describe the actions of NGO Activist Organizations focused on releases there. However, there were two key differences in context between Brazil and the Florida Keys. First, most of the NGO Activist Organizations active in Brazil were not located in Brazil and were focused on regional and international issues. Second, there did not appear to be a local control point like FKMCD in the areas of Brazil where GM mosquitos were released. The policy narratives would indicate that without presence of local activist organizations and an additional local control point like the FKMCD the potential influence of the NGO Activist Organizations in Brazil was much more limited.

A third example of how differences in policy narratives may illuminate differences in release decisions is the use of Condensation Symbols as a narrative strategy. In Brazil, the PAT project was identified as a condensation symbol and helped encapsulate for policy decision makers and the public the rationale to release GM mosquitos. In the Florida Keys, no condensation symbol was identified and most times policy debates quickly devolved into arguments about the potential issues with a genetically modified organism.

An important part of PAT's message about GM mosquitos was that they were male and that would not bite or spread disease. PAT often used phrases like "friendly mosquito" or "helpful mosquito" to describe the GM mosquito. This type of description of the GM mosquito was not found in Florida Keys policy narratives and was not promoted by Oxitec. It is very interesting that Oxitec now markets its GM mosquito solution under the moniker of "Friendly Mosquito" (Oxitec, n.d.). It appears that Oxitec may have learned from its differing experiences in Brazil and the Florida Keys and has decided to use a potential condensation symbol to represent its proposed GM mosquito policy solution.

These three examples provide a tantalizing view into how policy narratives can provide greater insight into GM mosquito policy debates. However, a potentially more powerful use of policy narratives is the holistic view they can provide of policy debates. As identified by Crow and Berggren (2014)

Parties often disagree as to what the relevant facts of an issue are, which can prevent resolution of policy conflicts. Understanding competing stakeholder views related to policy beliefs and their opposing coalitions would help scholars to better examine the role of coalition communication and outreach strategy in such situations. (pg. 132 – 133).

Policy narratives can provide insight into policy beliefs, actions, solutions and strategies of opposing coalitions. Based on this information it may be possible for policy stakeholders interested in collaboration to resolve policy conflicts and develop a solution that solves the policy problem.

7.2 Contributions of the Research

This dissertation advances the study of the Narrative Policy Framework and the GM policy process in the following ways.

First, this dissertation extends the scope of the Narrative Policy Framework. This research validated Smith-Walters et al. (2016) characterization of types of evidence and Schlaufer (2018) typology of uses of evidence. The research demonstrated that the two typologies can be combined to provide greater insight into the role of evidence in policy narratives. This dissertation also validated Weible et al. (2016) construction of narrative characters as ego-alter dyads for a new policy arena (GMOs). The results of this study indicate that the ego-alter dyad construct is useful in identifying differences in narratives of coalitions that support or oppose the release of genetically modified mosquitoes. Unlike traditional NPF

character analysis, the ego-alter dyad provided clarity by identifying the types of actors involved in the narratives and the types of actions that they performed. This research also conducted an NPF analysis across two separate countries and validated that the framework and the ego-alter dyad is suitable for investigating policy narrative and policy debates from the perspective of two different policy subsystems.

Second, this study improves and informs GMO policy practice. This dissertation provided insight into how proponents and those opposed to the release of genetically modified mosquitos used narrative characters, narrative strategies and evidence in their policy narratives to influence policy stakeholders and decision makers. The policy debates and use of policy narratives surrounding the release of GM mosquitos provide a model for stakeholders looking to influence policy decisions regarding other genetically modified organisms.

Third, it began to identify elements of winning narratives in this policy domain. It is hoped that this research helps policy makers, policy advocates and policy experts better understand how to structure effective and successful policy narratives used in these policy debates to help achieve their policy solution.

There may be negative consequences of this research. Policy narratives can be used by policy actors with very different values, interests and ethical commitments for nefarious purposes. A better understanding of policy narratives can lead to the construction of narratives that are meant to confuse, obfuscate and potentially mislead policy decision makers and the public. It is the hope of this researcher that, instead, this research will be used by policy stakeholders to better argue their views and who are looking for ways to understand policy differences with opposing coalitions and try to build pathways of collaboration to solve important policy issues.

7.3 Limitations of this Dissertation

This section reviews the limitations of the dissertation.

First, this research did not include some public consumption documents in the content analysis that may have been used in previous NPF studies. As noted in the methodology section this research applied a definition of a policy narrative as presented by Weible (2016) rather than the definition put forward by Jones, McBeth et al. (2014). Weible (2016) highlighted that the “NPF needs further development in its concepts, reliability of methods, and consistency of applications” (p. 421) and identified that “several impediments that limit its growth in becoming a portable framework capable of supporting comparable policy research” including a “blurred definition of the policy narrative.” (p. 422) From Weible’s perspective, although Jones, McBeth et al. (2014) defined a policy narrative as a story with a setting, characters, plots, and a moral of the story several different definitions of a policy narrative have been applied in the NPF research. According to Weible (2016) the definition of a policy narrative in the current NPF literature lacks a set of minimal conditions to identify a policy narrative which will make it difficult to reliably identify narratives. Clarifying a definition will help create a replicable method to analyze policy narratives.

To avoid potential issues associated with mis-identifying policy narratives this research only included a public consumption document in the content analysis if it contained four specific elements that define a policy narrative as describe by Weible (2016):

- i. a narrative hero or villain constructed as an ego-alter dyad
- ii. the document addresses the topic of using genetically modified mosquitos
- iii. the document was published during the timeframes identified in Table

3.1

- iv. the document specifically identified the use of GM mosquitos in Brazil or the Florida Keys.

Five public consumption documents created by NGO Activist Organizations that opposed GM mosquito releases were not included in this analysis as they did not identify the specific locales of Brazil or the Florida Keys. From a policy narrative perspective, these documents included strong arguments and rationale for opposing GM mosquito technology. However, many of these arguments were found in other documents that were included in the analysis.

Second, many of the documents and websites addressing releases in Brazil needed to be translated. This was performed using Google Translate as no funding was available for translation services. In general, the Google translations seemed adequate for analysis, but there were instances of certain phrases or technical language that did not appear to translate appropriately. At times, this made coding more difficult especially with variables that might have varied nuances.

Third, for Brazil it was difficult to gather information about the GM mosquito releases and the related policy debates outside of the descriptions provided in the public consumption documents. The releases occurred in rural and remote locations within Brazil. The larger Brazilian newspapers and magazines would provide coverage occasionally but did not provide a great level of detail or any local policy actors that might have been involved. The local or regional newspapers often did not have a web presence or articles discussing releases had been archived and were not accessible. This lack of information made it difficult to determine whether the public consumption documents were accurately portraying the mosquito releases.

7.4 Directions for Future Research

Two directions for future research arise from this dissertation:

First, this dissertation created a valuable framework, based on the NPF, to investigate the policy debates surrounding the release of genetically modified organisms. As identified by the GM mosquito the use of GMOs is quickly advancing beyond their original role to provide pesticide and herbicide resistance in a small number of agriculturally important crops. GM organisms are now being proposed as solutions to resolve environmental and conservation issues often caused by climate change. For instance, genetically modified coral could be used to combat coral bleaching or genetically modified trees could be developed to combat higher temperatures, invasive species and lack of water. The GMOs developed for these applications are second-generation GMOs that are designed to spread and sustain themselves in the wild environment. Some environmental coalitions support the used of second-generation GMOs, while others strongly oppose their use.

To understand how these new GMO applications might affect the policy decisions regarding their use and release, the next phase of research plans to investigate the policy debates and policy narratives surrounding the release of the genetically engineered American chestnut tree (GEAC). The American Chestnut is functionally extinct due to chestnut blight; however, a coalition of non-profit and academic organizations are working to restore the chestnut using a genetically modified, blight resistant tree. The GEAC is an example of a second-generation GMO. The context surrounding the use, research, funding and deployment of the GE chestnut tree and other second-generation GMOs are very different from first-generation, agriculturally based GMOs and the GM mosquito. The GEAC and the policy debates surrounding its release provide a case study to understand whether second-generation GMOs will be publicly acceptable solutions for environmental and ecological issues.

Key topics to examine in the narratives will be whether the policy narratives address the application of second-generation GMOs and if the difference in context, funding, and deployment of the GEAC alter the narratives of the opposing coalitions. This research will provide insight regarding the potential policy debates that will occur when other second-generation GMOs are proposed as solutions to mitigate climate change issues. A thorough understanding of these debates will be important to public managers and nonprofit leaders. The NPF research conducted on GM mosquitos in this dissertation showed that even though a GMO has received US federal regulatory approval, the ultimate decision to deploy a GMO may ultimately be made at the regional, state and local level by public managers influenced by policy coalitions and the public. This is especially true of public managers that are responsible for natural resource and public lands.

Second, this dissertation has identified several differences in the policy narratives of coalitions that support or oppose the release of GM mosquitos. However, it is not clear whether these narrative differences could lead to changes in individual perceptions regarding the release of GM mosquitos or a difference in policy decisions. Part of the power of the Narrative Policy Framework is that it looks at the effects of policy narratives at different levels, including the individual. A future avenue of research is to conduct a series of NPF micro level studies to investigate if policy narrative differences in the use of characters, evidence or narrative strategies found in the meso level policy narratives influence perceptions at the individual level. This research would provide more clarity around the influence of policy narratives and assist policy stakeholders in creating more effective policy narratives.

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APPENDICES

Appendix A: Coding Script for Narrative Character Analysis

Step 1- Complete the following information

Document Number:

Narrative Number:

Coding Date:

Coder:

Help Sheet Version #:

Narrative Structure

Step 2- Read the entire document

Step 5- How narratives do you think this document contains?

Narrative Valence

Step 6- What is the general stance of the narrative in regard to the use of genetically modified (GM) mosquitoes?

- Supports usage of GM mosquitoes
- Opposes usage of GM mosquitoes

Heroes

Step 7- Identify characters that may be acting as a hero and the alters they interact with. (*see Helpsheet for character that may be heroes and their alters*)

Step 8- Is a foundation portrayed as a hero?

- Yes (go to step # 9)
- No (go to step # 11)

Step 9- Provide the name(s) of all foundation(s) listed in the narrative that were portrayed as a hero.

Foundation Name(s):

Step 10- Identify all activities that a foundation(s) performed as a hero.

<u>Activity</u>	<u>Y/N</u>	<u>Activity</u>	<u>Y/N</u>
Combat Mosquitoes		Combat Disease	
Educate Public		Educate Scientific Experts	
Educate Government- Non-Regulatory Departments		Educate Industry	
Educate Government- Regulatory Agency		Resist Regulation	
Resist Technology		Advocate Technology	
Advocate Regulation		Approve Technology	
Warn Government Leaders		Warn Public	
Admonish Scientific Experts		Admonish Government- Non-Regulatory Departments	

Admonish Government- Regulatory Agency		Admonish Industry	
Assemble Scientific Experts		Assemble Public	
Assemble Government- Regulatory Agency		Assemble Government- Non-Regulatory Departments	
Inspect Regulation		Inspect Technology	
Save Human Lives		Protect Human Health	
Protect Environment			

Step 11- Is an NGO- Activist Organization portrayed as a hero?

- Yes (go to step # 12)
 No (go to step #14)

Step 12- Provide the name(s) of all NGO- Activist Organization(s) listed in the narrative that were portrayed as a hero. (*See Help Sheet for list of actors that might be an NGO- Activist Organization.*)

NGO- Activist Organization Name(s):

Step 13- Identify all activities that the NGO- Activist Organization(s) performed as a hero.

<u>Activity</u>	<u>Y/N</u>	<u>Activity</u>	<u>Y/N</u>
Combat Mosquitoes		Combat Disease	
Educate Public		Educate Scientific Experts	
Educate Government- Non-Regulatory Departments		Educate Industry	
Educate Government- Regulatory Agency		Resist Regulation	
Resist Technology		Advocate Technology	
Advocate Regulation		Approve Technology	
Warn Government Leaders		Warn Public	
Admonish Scientific Experts		Admonish Government- Non-Regulatory Departments	
Admonish Government- Regulatory Agency		Admonish Industry	
Assemble Scientific Experts		Assemble Public	
Assemble Government- Regulatory Agency		Assemble Government- Non-Regulatory Departments	
Inspect Regulation		Inspect Technology	
Save Human Lives		Protect Human Health	
Protect Environment			

Step 14- Is a company(s) portrayed as a hero?

- Yes (go to step # 15)
 No (go to step #17)

Step 15- Provide the name(s) of all company(s) listed in the narrative that were portrayed as a hero. (*See Help Sheet for list of organizations that might be a company*)

Company Name(s):

Step 16- Identify all activities that the company(s) performed as a hero.

<u>Activity</u>	<u>Y/N</u>	<u>Activity</u>	<u>Y/N</u>
Combat Mosquitoes		Combat Disease	
Educate Public		Educate Scientific Experts	
Educate Government- Non-Regulatory Departments		Educate Industry	
Educate Government- Regulatory Agency		Resist Regulation	
Resist Technology		Advocate Technology	
Advocate Regulation		Approve Technology	
Warn Government Leaders		Warn Public	
Admonish Scientific Experts		Admonish Government- Non-Regulatory Departments	
Admonish Government- Regulatory Agency		Admonish Industry	
Assemble Scientific Experts		Assemble Public	
Assemble Government- Regulatory Agency		Assemble Government- Non-Regulatory Departments	
Inspect Regulation		Inspect Technology	
Save Human Lives		Protect Human Health	
Protect Environment			

Step 17- Is a Nonprofit Service Provider portrayed as a hero?

- Yes (go to step # 18)
 No (go to step #20)

Step 18- Provide the name(s) of all Nonprofit Service Providers(s) listed in the narrative that were portrayed as a hero. (*See Help Sheet for list of actors that might be a Nonprofit Service Provider*)

Name(s) of Nonprofit Service Providers:

Step 19- Identify all activities that the Nonprofit Service Provider(s) performed as a hero.

<u>Activity</u>	<u>Y/N</u>	<u>Activity</u>	<u>Y/N</u>
Combat Mosquitoes		Combat Disease	
Educate Public		Educate Scientific Experts	
Educate Government- Non-Regulatory Departments		Educate Industry	
Educate Government- Regulatory Agency		Resist Regulation	
Resist Technology		Advocate Technology	
Advocate Regulation		Approve Technology	
Warn Government Leaders		Warn Public	
Admonish Scientific Experts		Admonish Government- Non-Regulatory Departments	
Admonish Government- Regulatory Agency		Admonish Industry	
Assemble Scientific Experts		Assemble Public	
Assemble Government- Regulatory Agency		Assemble Government- Non-Regulatory Departments	
Inspect Regulation		Inspect Technology	
Save Human Lives		Protect Human Health	
Protect Environment			

Step 20- Is the public portrayed as a hero?

- Yes (go to step # 21)
- No (go to step #22)

Step 21- Identify all activities that the public performed as a hero in this narrative.

<u>Activity</u>	<u>Y/N</u>	<u>Activity</u>	<u>Y/N</u>
Combat Mosquitoes		Combat Disease	
Educate Public		Educate Scientific Experts	
Educate Government- Non-Regulatory Departments		Educate Industry	
Educate Government- Regulatory Agency		Resist Regulation	
Resist Technology		Advocate Technology	
Advocate Regulation		Approve Technology	
Warn Government Leaders		Warn Public	
Admonish Scientific Experts		Admonish Government- Non-Regulatory Departments	
Admonish Government- Regulatory Agency		Admonish Industry	
Assemble Scientific Experts		Assemble Public	
Assemble Government- Regulatory Agency		Assemble Government- Non-Regulatory Departments	
Inspect Regulation		Inspect Technology	
Save Human Lives		Protect Human Health	
Protect Environment			

Step 22- Is a scientific expert(s) portrayed as a hero?

- Yes (go to step # 23)
- No (go to step #24)

Step 23- Identify all activities that scientific expert(s) performed as a hero in this narrative.

<u>Activity</u>	<u>Y/N</u>	<u>Activity</u>	<u>Y/N</u>
Combat Mosquitoes		Combat Disease	
Educate Public		Educate Scientific Experts	
Educate Government- Non-Regulatory Departments		Educate Industry	
Educate Government- Regulatory Agency		Resist Regulation	
Resist Technology		Advocate Technology	
Advocate Regulation		Approve Technology	
Warn Government Leaders		Warn Public	
Admonish Scientific Experts		Admonish Government- Non-Regulatory Departments	
Admonish Government- Regulatory Agency		Admonish Industry	
Assemble Scientific Experts		Assemble Public	
Assemble Government- Regulatory Agency		Assemble Government- Non-Regulatory Departments	
Inspect Regulation		Inspect Technology	
Save Human Lives		Protect Human Health	
Protect Environment			

Step 24- Is a Government- Non-Regulatory Department(s) or its agent(s) portrayed as a hero?

- Yes (go to step # 25)
- No (go to step # 27)

Step 25- Provide Government- Non-Regulatory Department name(s) and agent titles(s) listed in the narrative that were portrayed as a hero. *(See Help Sheet for list of potential Government- Non-Regulatory Departments)*

Titles(s) of agents:

Names of departments:

Step 26- Identify all activities that Government- Non-Regulatory Department(s) performed as a hero.

<u>Activity</u>	<u>Y/N</u>	<u>Activity</u>	<u>Y/N</u>
Combat Mosquitoes		Combat Disease	
Educate Public		Educate Scientific Experts	
Educate Government- Non-Regulatory Departments		Educate Industry	
Educate Government- Regulatory Agency		Resist Regulation	
Resist Technology		Advocate Technology	
Advocate Regulation		Approve Technology	
Warn Government Leaders		Warn Public	
Admonish Scientific Experts		Admonish Government- Non-Regulatory Departments	
Admonish Government- Regulatory Agency		Admonish Industry	
Assemble Scientific Experts		Assemble Public	
Assemble Government- Regulatory Agency		Assemble Government- Non-Regulatory Departments	
Inspect Regulation		Inspect Technology	
Save Human Lives		Protect Human Health	
Protect Environment			

Step 27- Is a Government- Regulatory Agency or its agent(s) portrayed as a hero?

- Yes (go to step # 28)
- No (go to step # 30)

Step 28- Provide Government- Regulatory Agency name(s) and agent titles(s) listed in the narrative that were portrayed as a hero. *(See Help Sheet for list of potential Government- Regulatory Agencies)*

Titles(s) of government agents:

Names of departments:

Step 29- Identify all activities that Government- Regulatory Agency performed as a hero.

<u>Activity</u>	<u>Y/N</u>	<u>Activity</u>	<u>Y/N</u>
Combat Mosquitoes		Combat Disease	
Educate Public		Educate Scientific Experts	
Educate Government- Non-Regulatory Departments		Educate Industry	
Educate Government- Regulatory Agency		Resist Regulation	
Resist Technology		Advocate Technology	
Advocate Regulation		Approve Technology	
Warn Government Leaders		Warn Public	
Admonish Scientific Experts		Admonish Government- Non-Regulatory Departments	
Admonish Government- Regulatory Agency		Admonish Industry	
Assemble Scientific Experts		Assemble Public	
Assemble Government- Regulatory Agency		Assemble Government- Non-Regulatory Departments	
Inspect Regulation		Inspect Technology	
Save Human Lives		Protect Human Health	
Protect Environment			

Step 30- Is a university(s) portrayed as a hero?

- Yes (go to step # 31)
 No (go to step # 33)

Step 31- Provide the name(s) of all university(s) listed in the narrative that were portrayed as a hero.

University Name(s):

Step 32- Identify all activities that a university(s) performed as a hero.

<u>Activity</u>	<u>Y/N</u>	<u>Activity</u>	<u>Y/N</u>
Combat Mosquitoes		Combat Disease	
Educate Public		Educate Scientific Experts	
Educate Government- Non-Regulatory Departments		Educate Industry	
Educate Government- Regulatory Agency		Resist Regulation	
Resist Technology		Advocate Technology	
Advocate Regulation		Approve Technology	
Warn Government Leaders		Warn Public	
Admonish Scientific Experts		Admonish Government- Non-Regulatory Departments	
Admonish Government- Regulatory Agency		Admonish Industry	
Assemble Scientific Experts		Assemble Public	
Assemble Government- Regulatory Agency		Assemble Government- Non-Regulatory Departments	
Inspect Regulation		Inspect Technology	
Save Human Lives		Protect Human Health	

Protect Environment			
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Villains

Step 33- Identify characters that may be acting as a villain and the alters they interact with (*see Help Sheet for character that may be villains and their alters*)).

Step 34- Is a foundation(s) portrayed as a villain?

- Yes (go to step # 35)
 No (go to step # 37)

Step 35- Provide the name(s) of all foundation(s) listed in the narrative that were portrayed as a villain.

Foundation Name(s):

Step 36- Identify all activities that foundation(s) performed as a villain.

Potential Activities

<u>Action</u>	<u>Y/N</u>	<u>Action</u>	<u>Y/N</u>
Endangers Human Lives		Endangers Environment	
Endangers Human Health		Resist Regulation	
Resist Technology		Collude with Government- Non-Regulatory Department	
Collude with Scientific Experts		Collude with Government- Regulatory Agency	
Collude with Industry		Ignore Regulations	
Ignore Scientific Experts		Ignore Public	
Deceives Government- Regulatory Agency		Deceives Government- Non-Regulatory Department	
Deceives Public		Deceives Scientific Experts	
Approve Technology			

Step 37- Is an NGO- Activist Organization portrayed as a villain?

- Yes (go to step # 38)
 No (go to step # 40)

Step 38- Provide the name(s) of all NGO- Activist Organization(s) listed in the narrative that were portrayed as a villain.

NGO- Activist Organization Name(s):

Step 39- Identify all activities that NGO- Activist Organization(s) performed as a villain.

<u>Action</u>	<u>Y/N</u>	<u>Action</u>	<u>Y/N</u>
Endangers Human Lives		Endangers Environment	
Endangers Human Health		Resist Regulation	
Resist Technology		Collude with Government- Non-Regulatory Department	
Collude with Scientific Experts		Collude with Government- Regulatory Agency	
Collude with Industry		Ignore Regulations	
Ignore Scientific Experts		Ignore Public	
Deceives Government- Regulatory Agency		Deceives Government- Non-Regulatory Department	
Deceives Public		Deceives Scientific Experts	
Approve Technology			

Step 40- Is a company portrayed as a villain?

- Yes (go to step # 41)
 No (go to step # 43)

Step 41- Provide the name(s) of all company(s) listed in the narrative that were portrayed as a villain.

Company Name(s):

Step 42- Identify all activities that company(s) performed as a villain.

<u>Action</u>	<u>Y/N</u>	<u>Action</u>	<u>Y/N</u>
Endangers Human Lives		Endangers Environment	
Endangers Human Health		Resist Regulation	
Resist Technology		Collude with Government- Non-Regulatory Department	
Collude with Scientific Experts		Collude with Government- Regulatory Agency	
Collude with Industry		Ignore Regulations	
Ignore Scientific Experts		Ignore Public	
Deceives Government- Regulatory Agency		Deceives Government- Non-Regulatory Department	
Deceives Public		Deceives Scientific Experts	
Approve Technology			

Step 43- Is a Nonprofit Research Organization portrayed as a villain?

- Yes (go to step # 44)
 No (go to step # 46)

Step 44- Provide the name(s) of all Nonprofit Research Organizations(s) listed in the narrative that were portrayed as a villain.

Name(s) of Nonprofit Research Organizations:

Step 45- Identify all activities that Nonprofit Research Organizations(s) performed as a villain.

<u>Action</u>	<u>Y/N</u>	<u>Action</u>	<u>Y/N</u>
Endangers Human Lives		Endangers Environment	
Endangers Human Health		Resist Regulation	
Resist Technology		Collude with Government- Non-Regulatory Department	
Collude with Scientific Experts		Collude with Government- Regulatory Agency	
Collude with Industry		Ignore Regulations	
Ignore Scientific Experts		Ignore Public	
Deceives Government- Regulatory Agency		Deceives Government- Non-Regulatory Department	
Deceives Public		Deceives Scientific Experts	
Approve Technology			

Step 46- Is the public portrayed as a villain?

- Yes (go to step # 47)
 No (go to step # 48)

Step 47- Identify all activities that the public performed as a villain.

<u>Action</u>	<u>Y/N</u>	<u>Action</u>	<u>Y/N</u>
Endangers Human Lives		Endangers Environment	
Endangers Human Health		Resist Regulation	
Resist Technology		Collude with Government- Non-Regulatory Department	
Collude with Scientific Experts		Collude with Government- Regulatory Agency	
Collude with Industry		Ignore Regulations	
Ignore Scientific Experts		Ignore Public	
Deceives Government- Regulatory Agency		Deceives Government- Non-Regulatory Department	
Deceives Public		Deceives Scientific Experts	
Approve Technology			

Step 48- Is a scientist expert(s) portrayed as a villain?

- Yes (go to step # 49)
 No (go to step # 50)

Step 49- Identify all activities that scientific expert(s) performed as a villain.

<u>Action</u>	<u>Y/N</u>	<u>Action</u>	<u>Y/N</u>
Endangers Human Lives		Endangers Environment	
Endangers Human Health		Resist Regulation	
Resist Technology		Collude with Government- Non-Regulatory Department	
Collude with Scientific Experts		Collude with Government- Regulatory Agency	
Collude with Industry		Ignore Regulations	
Ignore Scientific Experts		Ignore Public	
Deceives Government- Regulatory Agency		Deceives Government- Non-Regulatory Department	
Deceives Public		Deceives Scientific Experts	
Approve Technology			

Step 50- Is a Government- Non-Regulatory Department(s) or its agent(s) portrayed as a villain?

- Yes (go to step # 51)
- No (go to step # 53)

Step 51- Provide Government- Non-Regulatory Department name(s) and agent titles(s) listed in the narrative that were portrayed as a villain.

Titles(s) of government agents:

Names of departments:

Step 52- Identify all activities that Government- Non-Regulatory Department(s) performed as a villain.

<u>Action</u>	<u>Y/N</u>	<u>Action</u>	<u>Y/N</u>
Endangers Human Lives		Endangers Environment	
Endangers Human Health		Resist Regulation	
Resist Technology		Collude with Government- Non-Regulatory Department	
Collude with Scientific Experts		Collude with Government- Regulatory Agency	
Collude with Industry		Ignore Regulations	
Ignore Scientific Experts		Ignore Public	
Deceives Government- Regulatory Agency		Deceives Government- Non-Regulatory Department	
Deceives Public		Deceives Scientific Experts	
Approve Technology			

Step 53- Is a Government- Regulatory Agency or its agent(s) portrayed as a villain?

- Yes (go to step # 54)
- No (go to step # 56)

Step 54- Provide Government- Regulatory Agency name(s) and agent titles(s) listed in the narrative that were portrayed as a villain.

Titles(s) of regulatory agents:

Names of regulatory agencies:

Step 55- Identify all activities that Government- Regulatory Agency performed as a villain.

<u>Action</u>	<u>Y/N</u>	<u>Action</u>	<u>Y/N</u>
Endangers Human Lives		Endangers Environment	
Endangers Human Health		Resist Regulation	
Resist Technology		Collude with Government- Non-Regulatory Department	
Collude with Scientific Experts		Collude with Government- Regulatory Agency	
Collude with Industry		Ignore Regulations	
Ignore Scientific Experts		Ignore Public	
Deceives Government- Regulatory Agency		Deceives Government- Non-Regulatory Department	
Deceives Public		Deceives Scientific Experts	
Approve Technology			

Step 56- Is a university(s) portrayed as a villain?

- Yes (go to step # 57)
- No (go to step # 59)

Step 57- Provide the name(s) of all university(s) listed in the narrative that were portrayed as a villain.

Foundation Name(s):

Step 58- Identify all activities that university(s) performed as a villain.

<u>Action</u>	<u>Y/N</u>	<u>Action</u>	<u>Y/N</u>
Endangers Human Lives		Endangers Environment	
Endangers Human Health		Resist Regulation	
Resist Technology		Collude with Government- Non-Regulatory Department	
Collude with Scientific Experts		Collude with Government- Regulatory Agency	
Collude with Industry		Ignore Regulations	
Ignore Scientific Experts		Ignore Public	
Deceives Government- Regulatory Agency		Deceives Government- Non-Regulatory Department	
Deceives Public		Deceives Scientific Experts	
Approve Technology			

Step 59- Does this narrative mention risk or risk assessment?

- Yes.
- No

Step 60- Does this narrative utilize scientific data and/or mention scientific experts or scientific findings to support claims made in the narrative?

- Yes.
- No

Step 61- Does the document appear to be translated?

- Yes. (go to step 62)
- No (go to step 63)

Step 62- Using the scale below rate the difficulty of analysis due to langue translation.

- Not at All Difficult
- Slightly Difficult
- Somewhat Difficult
- Very Difficult
- Extremely Difficult

Appendix B: Coding Script for Narrative Strategy and Evidence Analysis

Setup

Step 1- Input the following information:

- (Q1) Document Number:
- (Q2) Coding Date:
- (Q3) Coder:
- (Q4) Help Sheet Version #:

Step 2- Read the entire document

Narrative Valence

Step 3- (Q5) What is the general stance of the narrative in regard to the policy decision to use genetically modified (GM) mosquitoes?

- Supports usage of GM mosquitoes
- Opposes usage of GM mosquitoes

Expansion or Maintenance of the Scope of Conflict

Step 4- (Q6) Does the narrative imply or suggest that there are benefit(s) to their preferred policy solution?

- Yes (Go to Step 5)
- No (Go to Step 7)

Step 5- (Q7) Who/what bear the benefit(s) from the preferred policy solution?

Step 6- (Q8) What best describes how the narrative **constructs the benefits** of the preferred policy decision?

- The narrative is constructed as providing **concentrated benefits** (a few gain).
- The narrative is constructed as providing **diffused benefits** (many gain).
- The narrative does not describe the construction of benefits.

Step 7- (Q9) Does the narrative imply or suggest that there are benefit(s) to the opposed policy solution?

- Yes (Go to Step 8)
- No (Go to Step 10)

Step 8- (Q10) Who/what bear the benefit(s) from the opposed policy solution?

Step 9- (Q11) What best describes how the narrative **constructs the benefits** of the opposed policy decision?

- The narrative is constructed as providing **concentrated benefits** (a few gain).

- The narrative is constructed as providing **diffused benefits** (many gain).
- The narrative does not describe the construction of benefits.

Step 10- (Q12) Does the narrative imply or suggest that there are costs to their preferred policy solution?

- Yes (Go to Step 11)
- No (Go to Step 13)

Step 11- (Q13) Who/what bear the bear the cost(s) from their preferred policy solution?

Step 12- (Q14) What best describes how the narrative **constructs the costs** of the preferred policy decision?

- The narrative is constructed as providing **concentrated costs** (a few pay).
- The narrative is constructed as providing **diffused costs** (the many pay).
- The narrative does not describe the construction of costs.

Step 13- (Q15) Does the narrative imply or suggest that there are costs to the opposed policy solution?

- Yes (Go to Step 14)
- No (Go to Step 16)

Step 14- (Q16) Who/what bear the bear the cost(s) from the opposed policy solution?

Step 15- (Q17) What best describes how the narrative **constructs the costs** of the opposed policy decision?

- The narrative is constructed as providing **concentrated costs** (a few pay).
- The narrative is constructed as providing **diffused costs** (the many pay).
- The narrative does not describe the construction of costs.

Rhetorical Devices

Step 16- (Q17) Does this narrative use a **policy surrogate**?

- Yes (go to step 17)
- No (go to step 18)

Step 17 – (Q18) Which of the following **policy surrogates** are present in the narrative? (Can choose more than one)

- Can't trust GM technology since it is developed and owned by large corporations that can't be trusted
- Developed countries' governments and businesses are pushing a technological solution they developed and support into a less developed country without proper review and consultation
- Current mosquito control methods are sufficient
- Current mosquito control methods are insufficient
- Regions suffering from mosquito borne diseases are losing money due to labor loss and sickness
- Deployment of GM mosquito technology could cost more
- The ability to innovate is important

- GM mosquito technology is better for environment as it reduces pesticide use
- GM mosquito technology can harm ecosystems/environment
- The regulatory approval process for GM mosquito technology is not transparent
- The regulatory approval process for GM mosquito technology is not participatory/democratic
- The regulatory approval process for GM mosquito technology provides safety/security
- The regulatory approval process for GM mosquito technology doesn't account for social/cultural concerns
- Other

Step 18 – (Q19) Does this narrative use a **condensation symbol**?

- Yes (go to step 19)
- No (go to step 20)

Step 19 – (Q20) Provide a brief description of the **condensation symbol**.

Types and Usage of Evidence

Step 20 – (Q21) Does the narrative use a **scientific study(s)** as a type of evidence?

- Yes (go to step 21)
- No (go to step 22)

Step 21 – (Q22) How is the **scientific study(s)** used as evidence in the narrative? (Can choose more than one)

- Used to demonstrate a policy problem
- Used to prove that there is no policy problem
- Used to support the policy solution
- Used to refute the policy solution of others
- Used in association with the hero of the narrative
- Used in association with the villain of the narrative
- Is the center of the document's plot
- Other

Step 22 – (Q23) Does the narrative use **statistics** as a type of evidence?

- Yes (go to step 23)
- No (go to step 24)

Step 23 – (Q24) How are **statistics** used as evidence in the narrative? (Can choose more than one)

- Used to demonstrate a policy problem
- Used to prove that there is no policy problem
- Used to support the policy solution
- Used to refute the policy solution of others
- Used in association with the hero of the narrative
- Used in association with the villain of the narrative
- Is the center of the document's plot
- Other

Step 24 – (Q25) Does the narrative use a **poll(s)** as a type of evidence?

- Yes (go to step 25)
- No (go to step 26)

Step 25 – (Q26) How is a **poll(s)** used as evidence in the narrative? (Can choose more than one)

- Used to demonstrate a policy problem
- Used to prove that there is no policy problem
- Used to support the policy solution
- Used to refute the policy solution of others
- Used in association with the hero of the narrative
- Used in association with the villain of the narrative
- Is the center of the document's plot
- Other

Step 26 – (Q27) Does the narrative use **ipso dictum** as a type of evidence?

- Yes (go to step 27)
- No (go to step 28)

Step 27 – (Q28) How is **ipso dictum** used as evidence in the narrative? (Can choose more than one)

- Used to demonstrate a policy problem
- Used to prove that there is no policy problem
- Used to support the policy solution
- Used to refute the policy solution of others
- Used in association with the hero of the narrative
- Used in association with the villain of the narrative
- Is the center of the document's plot
- Other

Step 28 – (Q29) Does the narrative use **laws and legal rulings** as a type of evidence?

- Yes (go to step 29)
- No (go to step 30)

Step 29 – (Q30) How are **laws and legal rulings** used as evidence in the narrative? (Can choose more than one)

- Used to demonstrate a policy problem
- Used to prove that there is no policy problem
- Used to support the policy solution
- Used to refute the policy solution of others
- Used in association with the hero of the narrative
- Used in association with the villain of the narrative
- Is the center of the document's plot
- Other

Step 30 – (Q31) Does the narrative use **tacit or localized knowledge** as a type of evidence?

- Yes (go to step 31)
- No (go to step 32)

Step 31 – (Q32) How are **tacit or localized knowledge** used as evidence in the narrative? (Can choose more than one)

- Used to demonstrate a policy problem
- Used to prove that there is no policy problem
- Used to support the policy solution
- Used to refute the policy solution of others
- Used in association with the hero of the narrative
- Used in association with the villain of the narrative
- Is the center of the document's plot
- Other
-

Step 32- (Q58) Does the document appear to be translated?

- Yes (go to step 33)
- No (go to step 34)

Step 33- (Q59) Using the scale below rate the difficulty of analysis due to language translation.

- Not at All Difficult
- Slightly Difficult
- Somewhat Difficult
- Very Difficult
- Extremely Difficult
- Go to **Step 59**

Step 34- End

Appendix C: Help Sheet for Narrative Character Analysis

Characters

Heroes

Hero- individuals or collectives who fix or attempt to fix a problem. The problem the hero attempts to fix doesn't necessarily need to be the policy question under consideration.

Hero Characters in this analysis

- Foundations
- NGO Activist Organization
- Company
- Nonprofit Service Provider
- Public
- Scientific Experts
- Government- Non-Regulatory Department
- Government- Regulatory Agency
- Universities

Villains

Villain- an individuals or collectives who cause or attempt to make the problem worse. The problem the villain exacerbates doesn't necessarily need to be the policy question under consideration.

Villain Characters in this analysis

- Foundations
- NGO Activist Organization
- Company
- Nonprofit Service Provider
- Public
- Scientific Experts
- Government- Non-Regulatory Department
- Government- Regulatory Agency
- Universities

Foundation

- Typically, foundations are nonprofit organization that provides provide funding for research and implementation of important social and health related policy and projects
- Many organizations will utilize foundation in their name
- Bill and Melinda Gates Foundation and The Rockefeller Foundation are typically the foundations associated with GM mosquitoes.
- **Coding Rule-** Aside from the Gates and Rockefeller Foundations only code an organization as a foundation if it is described as a foundation or has the word foundation in its title

Universities

- These organization are mainly focused on formalized undergraduate/graduate education and research that can be located in any part of the world
- Most universities will have university in their name
- **Coding Rule-** Only code an organization as a university if it has university in its name or is a commonly known university
- **Coding Rule-** Only include an organization as a university in the analysis if the narrative directly identifies that the university is involved in GM mosquito research and/or outreach.
- **Coding Rule-** Do not include an organization as a university in the analysis if its name is only listed as an affiliation label for an personnel associated with it

NGO Activist Organization

- These are civil society organizations that are mostly funded by donations or grants
- They actively advocate for a specific policy solution through press releases, issuing reports and briefs, communicating with government leaders and organizing public events.
- In this analysis, NGO Activist Organizations will either oppose or support the use of GM mosquitoes
- **Coding Rule-** Only include an organization in this analysis as an NGO-Activist if
 - it is included in the list below **or**
 - it is not a university, foundation or listed as an NGO- Service Provider, and performs some of the activities listed in bullet point two

Characters

Heroes

Hero- individuals or collectives who fix or attempt to fix a problem. The problem the hero attempts to fix doesn't necessarily need to be the policy question under consideration.

Hero Characters in this analysis

- Foundations
- NGO Activist Organization
- Company
- Nonprofit Service Provider
- Public
- Scientific Experts
- Government- Non-Regulatory Department
- Government- Regulatory Agency
- Universities

Villains

Villain- an individuals or collectives who cause or attempt to make the problem worse. The problem the villain exacerbates doesn't necessarily need to be the policy question under consideration.

Villain Characters in this analysis

- Foundations
- NGO Activist Organization
- Company

- Nonprofit Service Provider
- Public
- Scientific Experts
- Government- Non-Regulatory Department
- Government- Regulatory Agency
- Universities

Foundation

- Typically, foundations are nonprofit organization that provides provide funding for research and implementation of important social and health related policy and projects
- Many organizations will utilize foundation in their name
- Bill and Melinda Gates Foundation and The Rockefeller Foundation are typically the foundations associated with GM mosquitoes.
- **Coding Rule-** Aside from the Gates and Rockefeller Foundations only code an organization as a foundation if it is described as a foundation or has the word foundation in its title

Universities

- These organization are mainly focused on formalized undergraduate/graduate education and research that can be located in any part of the world
- Most universities will have university in their name
- **Coding Rule-** Only code an organization as a university if it has university in its name or is a commonly known university
- **Coding Rule-** Only include an organization as a university in the analysis if the narrative directly identifies that the university is involved in GM mosquito research and/or outreach.
- **Coding Rule-** Do not include an organization as a university in the analysis if its name is only listed as an affiliation label for an personnel associated with it

NGO Activist Organization

- These are civil society organizations that are mostly funded by donations or grants
- They actively advocate for a specific policy solution through press releases, issuing reports and briefs, communicating with government leaders and organizing public events.
- In this analysis, NGO Activist Organizations will either oppose or support the use of GM mosquitoes
- **Coding Rule-** Only include an organization in this analysis as an NGO-Activist if
 - it is included in the list below **or**
 - it is not a university, foundation or listed as an NGO- Service Provider, and performs some of the activities listed in bullet point two
- List of known NGO Activists in the documents to be analyzed

GeneWatch UK	Third World Network	Food and Water Watch	ETC Group
Friends of the Earth	Friends of the Earth Brazil	Red América Latina Libre de Transgénicos (RALLT)	Agricultura Familiar e Agroecología (AS-PTA)
Genetic Literacy Project	Center for Food Safety		

Nonprofit Service Provider

- These are civil society organizations that are mostly funded through private donations and government grants.

- Usually associated with a government agency and assist in research and outreach on important public health and social issues
- **Coding Rule-** only code **Moscamed** as NGO- Service Provider
- **Moscamed Background**
 - Nonprofit service provider based in Brazil
 - Worked in partnership with University of São Paulo (USP) to develop transgenic mosquito and carry out field trials
 - Built a breeding facility (bio-factory/biofabrica) to rear the transgenic mosquitoes.
 - Transgenic Aedes Project (PAT)- project run by Moscamed in conjunction with University of São Paulo (USP) and LEMI that reared, released and monitored GM mosquitos in various parts of Brazil for field releases. The project was also involved in public engagement
 - Itaberaba district of Juazeiro, Bahia
 - Mandacaru District of Juazeiro, Bahia
 - Pedra Branca neighborhood of Jacobina, Bahia
 - **Coding Rule-** Transgenic Aedes Project (PAT) it should be coded as Moscamed. If other organizations such as Oxitec, LEMI or government agencies that support it are identified in the same paragraph as PAT they should be coded with the same hero actions.
 - **Coding Rule-** LEMI is a governmental organization that performed the trial releases and monitored the results. **This should be coded as a Government- non-regulatory**

Company

- A for-profit organization that will receive some type of financial benefit from a policy decision regarding the release of GM mosquitoes
- Other terms to describe a company include corporation or business interest
- Oxitec and Oxitec do Brasil are examples
- **Coding Rule-** Only code for a company if its name is explicitly provided

Public

- Group of individuals that will be affected by the policy decision regarding the release of GM mosquitoes. They are often the focus of hero and villain actions.
- When a group of people are identified in a narrative, but don't fall into the any of the other hero or villain categories, they should be coded as public.

Scientific Experts

- There is an individual or collective that has been identified as possessing greater knowledge about a specific topic due to formal education or training
- They can be described as scientists, professors, technicians, or professionals like doctors or lawyers
- They can be members of various organizations including foundations, NGOs, universities, companies, and the government
- **Coding Rule-** Only code an organization or individual as a scientific expert if the narrative includes some context about greater knowledge due to title, formal education or training. This includes titles such as Professor, Dr., technician, noted authority, expert in the field, scientist, PhD. following name.
- **Coding Rule-** If a narrative contains text about
 - an organization that might contain scientific experts
 - **and** an individual scientific expert from that organization

the organization and individual should be coded separately. In other words, the organization may fall into another category while the individual should be coded as a scientific expert

Government- Non-Regulatory Department

- This category contains the government departments and personnel that aren't part of a regulatory agency.
- This category can include civil servant positions such as school teachers, police, sanitation workers etc., or politically elected officials such as mayors, members of parliament or government board members.
- Individuals can be linked to government department through their title.
- **Coding Rule-** Any government department or their personnel that aren't listed as a regulatory agency in the Government- Regulatory Agency category belongs in this category
- **Coding Rule-** Do not include scientific experts associated with a University or a University in this category
- **Coding Rule-** Consolidate the actions of multiple individuals representing the same governmental department.
- **Coding Rule-** If an individual representing a government department is also identified as a scientific expert, they should be coded as a scientific expert as well.

Government- Regulatory Agency

- This category contains the government agencies and their personnel that make legislatively defined approval decision regarding the use of GM mosquitoes
- Individuals can be linked to regulatory agency through their title.
- **Coding Rule-** Consolidate the actions of multiple individuals representing the same regulatory agency.
- **Coding Rule-** If an individual representing a regulatory agency is also identified as a scientific expert, they should be coded as a scientific expert as well.
- **Coding Rule-** The list below identifies the only organizations that should be coded as a Government- Regulatory Agency

Brazil's National Technical Commission for Biosecurity (CTNBio)	Brazilian Health Surveillance Agency (ANVISA)
FDA	USDA
EPA	Florida Keys Mosquito Control District
Panama National Biosafety Committee	Panama Ministry of Agricultural and Livestock Development
Panama Ministry of Commerce and Industries	

Hero Actions

Combat Mosquitoes – narrative identifies that the hero is taking action to kill, combat, or eliminate mosquitoes.

- **Coding Rule-** Only code when specifically identified that the hero is doing this. Combating mosquitoes is different entry from combating disease.

Combat Disease- narrative identifies that the hero is taking action to combat or eliminate disease (Denque, Zika, malaria, etc.).

- **Coding Rule-** Only code when specifically identified that the hero is doing this.

- **Coding Rule-** Narrative needs to identify that combating a specifically named disease or a virus that transmits a disease. Combating disease is different entry from combating mosquitoes.

Educate Public- narrative identifies that the hero is taking action to educate the public about GM mosquitoes. Education can be in the form of a presentation at meetings or events, flyers, briefs or reports, media advertising, or jingle.

Educate Scientific Experts- narrative identifies that the hero is taking action to educate scientific experts about GM mosquitoes. Education can be in the form of a presentation at meetings or events, flyers, briefs or reports, media advertising, or jingle.

Educate Government- Non-Regulatory Departments narrative identifies that the hero is taking action to educate non-regulatory government personnel about GM mosquitoes. Education can be in the form of a presentation at meetings or events, flyers, briefs or reports, media advertising, or jingle.

Educate Industry- narrative identifies that the hero is taking action to educate industry/company employees about GM mosquitoes. Education can be in the form of a presentation at meetings or events, flyers, briefs or reports, media advertising, or jingle.

Educate Government- Regulatory Agency- narrative identifies that the hero is taking action to educate regulatory agency personnel about GM mosquitoes. Education can be in the form of a presentation at meetings or events, flyers, briefs or reports, media advertising, or jingle.

Resist Regulation- narrative identifies that the hero is taking specific actions to resist current regulation regarding GM mosquitoes. These actions can include identifying issues with the regulation, attempting to revise the current regulation, participating in organized protests (meetings or petitions) or performing actions in violation of current regulation. The focus of this action is the regulations, not the technology.

Resist Technology- narrative identifies that the hero takes specific action to resist the GM mosquito technology. This can include identifying issues with the technology, highlighting/recommending other technologies that perform similar functions or participating in organized protests. The focus of this action is the technology, not the regulation of it.

Advocate Technology- narrative identifies that the hero takes specific action to support the use of the GM mosquito technology. Support could be in form of providing financial and/or technical resources, political backing or providing favorable comments about the GM mosquito technology. Example Oxitec supplies technical assistance or the transgenic mosquito, Moscamed provides the breeding facility and SIT expertise. Also need to be aware of situations where a member of the public comments favorably or endorses the GM mosquito technology.

Advocate Regulation- narrative identifies that the hero takes specific action to support the regulations that govern GM mosquito technology. Support could be in the form of complying with regulations, politically backing the regulations or speaking favorably about the regulations governing GM mosquito technology.

- **Coding Rule-** Only code for this action if the regulatory process is a major theme of the narrative.

Approve Technology- narrative identifies that a government regulatory agency, either local or national, has approved the use of GM mosquito technology.

- **Coding Rule-** Only a Government- Regulatory Agency can be coded for this action.

Warn Public- narrative identifies that the hero takes specific action to warn the public about the potential harm or danger of GM mosquito technology.

- **Coding Rule-** The narrative needs to contain some type of statement or reference that the public is unaware or would be surprised to learn something about GM mosquito technology or regulation. This differs from education in that the tone or message implies some type of danger or harm unless some action is taken.

Warn Government Leaders- narrative identifies that the hero takes specific action to governmental leaders about the potential harm or danger of GM mosquito technology.

- **Coding Rule-** The narrative needs to contain some type of statement or reference to government leaders about issue/concern with GM mosquito technology or regulation. This differs from education in that the tone or message implies some type of danger or harm unless some action is taken.

Admonish Scientific Experts- narrative identifies that the hero takes specific action to call out scientific experts for inappropriate behavior or lack of responsibility with respect to GM mosquitoes.

Admonish Government- Non-Regulatory Departments- narrative identifies that the hero takes specific action to call out non-regulatory government department and/or its personnel for inappropriate behavior or lack of responsibility with respect to GM mosquitoes.

Admonish Industry- narrative identifies that the hero takes specific action to call out a company and/or its employees for inappropriate behavior or lack of responsibility with respect to GM mosquitoes.

Admonish Government- Regulatory Agency- narrative identifies that the hero takes specific action to call out a government regulatory agencies and/or its personnel for inappropriate behavior or lack of responsibility with respect to GM mosquitoes.

Assemble Public- narrative identifies that the hero takes specific action to gather the public so that additional activity can occur with them regarding GM mosquitoes.

Assemble Scientific Experts- narrative identifies that the hero takes specific action to gather scientific experts so that additional activity can occur with them regarding GM mosquitoes.

Assemble Government- Non-Regulatory Departments- narrative identifies that the hero takes specific action to gather non-regulatory government personnel so that additional activity can occur with them regarding GM mosquitoes.

Assemble Government- Regulatory Agency- narrative identifies that the hero takes specific action to gather regulatory agency personnel so that additional activity can occur with them regarding GM mosquitoes.

Inspect Technology- narrative identifies that the hero takes specific action to inspect and/or observe the technology associated with GM mosquitoes. This could be a visit to a laboratory, rearing facility or release site. The public also inspects the technology if education events contain samples of mosquitoes or discussions of the GM mosquito technology.

Inspect Regulation- narrative identifies that the hero takes specific action to inspect, investigate or review regulations related to GM mosquitoes. This is typically a meeting of some sort.

- **Coding Rule-** Only code for this action if the regulatory process is a major theme of the narrative.

Save Human Lives- narrative identifies that the hero takes specific action to save human lives.

- **Coding Rule-** The term “save(s) lives” need to be present in the narrative to use this code. This is different that protecting human health. Can code for both save human lives and protect human health.

Protect Environment- narrative identifies that the hero takes specific action to protect the environment.

- **Coding Rule-** Some type of reference to specific protection of the environment needs to be present in the narrative to use this code.

Protect Human Health- narrative identifies that the hero takes specific action to protect human health. Some type of reference to specific protection of human health needs to be present in the narrative to use this code.

- **Coding Rule-** Narrative needs to identify that humans are suffering from disease/affected by disease and that that GM mosquito technology will control/lower/eliminate disease. This is different that saving human lives. Can code for both save human lives and protect human health.

Villain Actions

Endangers Human Lives- narrative identifies that the villain is taking action that will harm or put at risk human life.

- **Coding Rule-** Only code when narrative specifically identifies that human life is at risk. Endangering human lives is different from endangers health.

Endangers Environment- narrative identifies that the villain is taking action that will harm or damage the environment.

Endangers Human Health- narrative identifies that the villain is taking action that will harm or put at risk human health.

- **Coding Rule-** Only code when narrative specifically identifies that human health is at risk. Endangering human health is different from endangers human lives.

Resist Regulation- narrative identifies that the villain is taking specific actions to resist current regulation regarding GM mosquitoes. These actions can include identifying issues with the regulation, attempting to revise the current regulation, participating in organized protests (meetings or petitions) or performing actions in violation of current regulation. The focus of this action is the regulations, not the technology.

Resist Technology- narrative identifies that the villain takes specific action to resist the GM mosquito technology. This can include identifying issues with the technology, highlighting/recommending other technologies that perform similar functions or participating in organized protests. The focus of this action is the technology, not the regulation of it.

Collude with Government- Non-Regulatory Department- narrative identifies that the villain secretly plans and cooperates with non-regulatory government personnel to advance their preferred solution for GM mosquitoes.

Collude with Scientific Experts- narrative identifies that the villain secretly plans and cooperates with scientific experts to advance their preferred solution for GM mosquitoes.

Collude with Government- Regulatory Agency- narrative identifies that the villain secretly plans and cooperates with government regulatory personnel to advance their preferred solution for GM mosquitoes.

Collude with Industry- narrative identifies that the villain secretly plans and cooperates with a company to advance their preferred solution for GM mosquitoes.

Ignore Regulations- narrative identifies that the villain performed actions that violate regulatory requirements. This could include not filing correct documentation to blatantly disregarding regulatory requirements.

Ignore Scientific Experts- narrative identifies that the villain performed actions that are contrary to scientific findings or recommendations.

Ignore Public- narrative identifies that the villain performed actions that ignore public concerns such as human health and environmental concerns, need for public participation in the decision-making process and the receipt of informed consent from the public.

Deceives Government- Regulatory Agency- narrative identifies that the villain attempts to deceive regulatory agencies by performing any of the following actions.

- Not providing results of experiments or review
- Not allowing an independent third party to review results
- Not divulging conflicts of interest
- Using fear of Zika virus to push for accelerated regulatory decisions
- Not properly identifying and addressing certain risks of GM mosquito technology
 - Impact on other mosquito populations
 - Impact on other serotypes of dengue fever
 - Release of biting females
 - Survival and spread of GM mosquitoes
 - Transfer of other traits to wild mosquitoes
 - Bio-terrorism
 - Creation of superbugs
 - Scale and cost of sterile insect technique technology
 - allergenic or toxic effects in animals or humans

Deceives Government- Non-Regulatory Department- narrative identifies that the villain attempts to deceive non-regulatory government personnel by performing any of the actions listed in **Deceives Government- Regulatory Agency**.

Deceives Public- narrative identifies that the villain attempts to deceive the personnel by performing any of the actions listed in **Deceives Government- Regulatory Agency**.

Deceives Scientific Experts- narrative identifies that the villain attempts to deceive scientific experts by performing any of the actions listed in **Deceives Government- Regulatory Agency**.

Approve Technology- narrative identifies that a government regulatory agency, either local or national, has approved the use of GM mosquito technology.

- **Coding Rule-** Only a Government- Regulatory Agency can be coded for this action.

Additional Notes

- When coding a newsletter or an article within a magazine only analyze the sections of these documents that deal with GM mosquitoes in Brazil, or the Florida Keys

GeneWatch UK	Third World Network	Food and Water Watch	ETC Group
Friends of the Earth	Friends of the Earth Brazil	Red América Latina Libre de Transgénicos (RALLT)	Agricultura Familiar e Agroecologia (AS-PTA)
Genetic Literacy Project	Center for Food Safety		

Nonprofit Service Provider

- These are civil society organizations that are mostly funded through private donations and government grants.
- Usually associated with a government agency and assist in research and outreach on important public health and social issues
- **Coding Rule-** only code **Moscamed** as NGO- Service Provider
- Moscamed Background
 - Nonprofit service provider based in Brazil
 - Worked in partnership with University of São Paulo (USP) to develop transgenic mosquito and carry out field trials
 - Built a breeding facility (bio-factory/biofabrica) to rear the transgenic mosquitoes.
 - Transgenic Aedes Project (PAT)- project run by Moscamed in conjunction with University of São Paulo (USP) and LEMI that reared, released and monitored GM mosquitos in various parts of Brazil for field releases. The project was also involved in public engagement
 - Itaberaba district of Juazeiro, Bahia
 - Mandacaru District of Juazeiro, Bahia
 - Pedra Branca neighborhood of Jacobina, Bahia
 - **Coding Rule-** Transgenic Aedes Project (PAT) it should be coded as Moscamed. If other organizations such as Oxitec, LEMI or government agencies that support it are identified in the same paragraph as PAT they should be coded with the same hero actions.
 - **Coding Rule-** **LEMI** is a governmental organization that performed the trial releases and monitored the results. **This should be coded as a Government- non-regulatory**

Company

- A for-profit organization that will receive some type of financial benefit from a policy decision regarding the release of GM mosquitoes
- Other terms to describe a company include corporation or business interest
- Oxitec and Oxitec do Brasil are examples
- **Coding Rule-** Only code for a company if its name is explicitly provided

Public

- Group of individuals that will be affected by the policy decision regarding the release of GM mosquitoes. They are often the focus of hero and villain actions.
- When a group of people are identified in a narrative, but don't fall into the any of the other hero or villain categories, they should be coded as public.

Scientific Experts

- The is an individual or collective that has been identified as possessing greater knowledge about a specific topic due to formal education or training
- They can be described as scientists, professors, technicians, or professionals like doctors or lawyers
- They can be members of various organizations including foundations, NGOs, universities, companies, and the government
- **Coding Rule-** Only code an organization or individual as a scientific expert if the narrative includes some context about greater knowledge due to title, formal education or training. This includes titles such as Professor, Dr., technician, noted authority, expert in the field, scientist, PhD. following name.
- **Coding Rule-** If a narrative contains text about
 - an organization that might contain scientific experts
 - **and** an individual scientific expert from that organizationthe organization and individual should be coded separately. In other words, the organization may fall into another category while the individual should be coded as a scientific expert

Government- Non-Regulatory Department

- This category contains the government departments and personnel that aren't part of a regulatory agency.
- This category can include civil servant positions such as school teachers, police, sanitation workers etc., or politically elected officials such as mayors, members of parliament or government board members.
- Individuals can be linked to government department through their title.
- **Coding Rule-** Any government department or their personnel that aren't listed as a regulatory agency in the Government- Regulatory Agency category belongs in this category
- **Coding Rule-** Do not include scientific experts associated with a University or a University in this category
- **Coding Rule-** Consolidate the actions of multiple individuals representing the same governmental department.
- **Coding Rule-** If an individual representing a government department is also identified as a scientific expert, they should be coded as a scientific expert as well.

Government- Regulatory Agency

- This category contains the government agencies and their personnel that make legislatively defined approval decision regarding the use of GM mosquitoes
- Individuals can be linked to regulatory agency through their title.
- **Coding Rule-** Consolidate the actions of multiple individuals representing the same regulatory agency.
- **Coding Rule-** If an individual representing a regulatory agency is also identified as a scientific expert, they should be coded as a scientific expert as well.

- **Coding Rule-** The list below identifies the only organizations that should be coded as a Government- Regulatory Agency

Brazil’s National Technical Commission for Biosecurity (CTNBio)	Brazilian Health Surveillance Agency (ANVISA)
FDA	USDA
EPA	Florida Keys Mosquito Control District
Panama National Biosafety Committee	Panama Ministry of Agricultural and Livestock Development
Panama Ministry of Commerce and Industries	

Hero Actions

Combat Mosquitoes – narrative identifies that the hero is taking action to kill, combat, or eliminate mosquitoes.

- **Coding Rule-** Only code when specifically identified that the hero is doing this. Combating mosquitoes is different entry from combating disease.

Combat Disease- narrative identifies that the hero is taking action to combat or eliminate disease (Denque, Zika, malaria, etc.).

- **Coding Rule-** Only code when specifically identified that the hero is doing this.
- **Coding Rule-** Narrative needs to identify that combating a specifically named disease or a virus that transmits a disease. Combating disease is different entry from combating mosquitoes.

Educate Public- narrative identifies that the hero is taking action to educate the public about GM mosquitoes. Education can be in the form of a presentation at meetings or events, flyers, briefs or reports, media advertising, or jingle.

Educate Scientific Experts- narrative identifies that the hero is taking action to educate scientific experts about GM mosquitoes. Education can be in the form of a presentation at meetings or events, flyers, briefs or reports, media advertising, or jingle.

Educate Government- Non-Regulatory Departments narrative identifies that the hero is taking action to educate non-regulatory government personnel about GM mosquitoes. Education can be in the form of a presentation at meetings or events, flyers, briefs or reports, media advertising, or jingle.

Educate Industry- narrative identifies that the hero is taking action to educate industry/company employees about GM mosquitoes. Education can be in the form of a presentation at meetings or events, flyers, briefs or reports, media advertising, or jingle.

Educate Government- Regulatory Agency- narrative identifies that the hero is taking action to educate regulatory agency personnel about GM mosquitoes. Education can be in the form of a presentation at meetings or events, flyers, briefs or reports, media advertising, or jingle.

Resist Regulation- narrative identifies that the hero is taking specific actions to resist current regulation regarding GM mosquitoes. These actions can include identifying issues with the regulation, attempting to revise the current regulation, participating in organized protests (meetings or petitions) or performing actions in violation of current regulation. The focus of this action is the regulations, not the technology.

Resist Technology- narrative identifies that the hero takes specific action to resist the GM mosquito technology. This can include identifying issues with the technology, highlighting/recommending other technologies that perform similar functions or participating in organized protests. The focus of this action is the technology, not the regulation of it.

Advocate Technology- narrative identifies that the hero takes specific action to support the use of the GM mosquito technology. Support could be in form of providing financial and/or technical resources, political backing or providing favorable comments about the GM mosquito technology. Example Oxitec supplies technical assistance on the transgenic mosquito, Moscamed provides the breeding facility and SIT expertise. Also need to be aware of situations where a member of the public comments favorably or endorses the GM mosquito technology.

Advocate Regulation- narrative identifies that the hero takes specific action to support the regulations that govern GM mosquito technology. Support could be in the form of complying with regulations, politically backing the regulations or speaking favorably about the regulations governing GM mosquito technology.

- **Coding Rule-** Only code for this action if the regulatory process is a major theme of the narrative.

Approve Technology- narrative identifies that a government regulatory agency, either local or national, has approved the use of GM mosquito technology.

- **Coding Rule-** Only a Government- Regulatory Agency can be coded for this action.

Warn Public- narrative identifies that the hero takes specific action to warn the public about the potential harm or danger of GM mosquito technology.

- **Coding Rule-** The narrative needs to contain some type of statement or reference that the public is unaware or would be surprised to learn something about GM mosquito technology or regulation. This differs from education in that the tone or message implies some type of danger or harm unless some action is taken.

Warn Government Leaders- narrative identifies that the hero takes specific action to warn governmental leaders about the potential harm or danger of GM mosquito technology.

- **Coding Rule-** The narrative needs to contain some type of statement or reference to government leaders about issue/concern with GM mosquito technology or regulation. This differs from education in that the tone or message implies some type of danger or harm unless some action is taken.

Admonish Scientific Experts- narrative identifies that the hero takes specific action to call out scientific experts for inappropriate behavior or lack of responsibility with respect to GM mosquitoes.

Admonish Government- Non-Regulatory Departments- narrative identifies that the hero takes specific action to call out non-regulatory government department and/or its personnel for inappropriate behavior or lack of responsibility with respect to GM mosquitoes.

Admonish Industry- narrative identifies that the hero takes specific action to call out a company and/or its employees for inappropriate behavior or lack of responsibility with respect to GM mosquitoes.

Admonish Government- Regulatory Agency- narrative identifies that the hero takes specific action to call out a government regulatory agencies and/or its personnel for inappropriate behavior or lack of responsibility with respect to GM mosquitoes.

Assemble Public- narrative identifies that the hero takes specific action to gather the public so that additional activity can occur with them regarding GM mosquitoes.

Assemble Scientific Experts- narrative identifies that the hero takes specific action to gather scientific experts so that additional activity can occur with them regarding GM mosquitoes.

Assemble Government- Non-Regulatory Departments- narrative identifies that the hero takes specific action to gather non-regulatory government personnel so that additional activity can occur with them regarding GM mosquitoes.

Assemble Government- Regulatory Agency- narrative identifies that the hero takes specific action to gather regulatory agency personnel so that additional activity can occur with them regarding GM mosquitoes.

Inspect Technology- narrative identifies that the hero takes specific action to inspect and/or observe the technology associated with GM mosquitoes. This could be a visit to a laboratory, rearing facility or release site. The public also inspects the technology if education events contain samples of mosquitoes or discussions of the GM mosquito technology.

Inspect Regulation- narrative identifies that the hero takes specific action to inspect, investigate or review regulations related to GM mosquitoes. This is typically a meeting of some sort.

- **Coding Rule-** Only code for this action if the regulatory process is a major theme of the narrative.

Save Human Lives- narrative identifies that the hero takes specific action to save human lives.

- **Coding Rule-** The term “save(s) lives” need to be present in the narrative to use this code. This is different that protecting human health. Can code for both save human lives and protect human health.

Protect Environment- narrative identifies that the hero takes specific action to protect the environment.

- **Coding Rule-** Some type of reference to specific protection of the environment needs to be present in the narrative to use this code.

Protect Human Health- narrative identifies that the hero takes specific action to protect human health. Some type of reference to specific protection of human health needs to be present in the narrative to use this code.

- **Coding Rule-** Narrative needs to identify that humans are suffering from disease/affected by disease and that that GM mosquito technology will control/lower/eliminate disease. This is different that saving human lives. Can code for both save human lives and protect human health.

Villain Actions

Endangers Human Lives- narrative identifies that the villain is taking action that will harm or put at risk human life.

- **Coding Rule-** Only code when narrative specifically identifies that human life is at risk. Endangering human lives is different from endangers health.

Endangers Environment- narrative identifies that the villain is taking action that will harm or damage the environment.

Endangers Human Health- narrative identifies that the villain is taking action that will harm or put at risk human health.

- **Coding Rule-** Only code when narrative specifically identifies that human health is at risk. Endangering human health is different from endangers human lives.

Resist Regulation- narrative identifies that the villain is taking specific actions to resist current regulation regarding GM mosquitoes. These actions can include identifying issues with the regulation, attempting to revise the current regulation, participating in organized protests (meetings or petitions) or performing actions in violation of current regulation. The focus of this action is the regulations, not the technology.

Resist Technology- narrative identifies that the villain takes specific action to resist the GM mosquito technology. This can include identifying issues with the technology, highlighting/recommending other technologies that perform similar functions or participating in organized protests. The focus of this action is the technology, not the regulation of it.

Collude with Government- Non-Regulatory Department- narrative identifies that the villain secretly plans and cooperates with non-regulatory government personnel to advance their preferred solution for GM mosquitoes.

Collude with Scientific Experts- narrative identifies that the villain secretly plans and cooperates with scientific experts to advance their preferred solution for GM mosquitoes.

Collude with Government- Regulatory Agency- narrative identifies that the villain secretly plans and cooperates with government regulatory personnel to advance their preferred solution for GM mosquitoes.

Collude with Industry- narrative identifies that the villain secretly plans and cooperates with a company to advance their preferred solution for GM mosquitoes.

Ignore Regulations- narrative identifies that the villain performed actions that violate regulatory requirements. This could include not filing correct documentation to blatantly disregarding regulatory requirements.

Ignore Scientific Experts- narrative identifies that the villain performed actions that are contrary to scientific findings or recommendations.

Ignore Public- narrative identifies that the villain performed actions that ignore public concerns such as human health and environmental concerns, need for public participation in the decision-making process and the receipt of informed consent from the public.

Deceives Government- Regulatory Agency- narrative identifies that the villain attempts to deceive regulatory agencies by performing any of the following actions.

- Not providing results of experiments or review
- Not allowing an independent third party to review results
- Not divulging conflicts of interest
- Using fear of Zika virus to push for accelerated regulatory decisions
- Not properly identifying and addressing certain risks of GM mosquito technology
 - Impact on other mosquito populations
 - Impact on other serotypes of dengue fever
 - Release of biting females
 - Survival and spread of GM mosquitoes
 - Transfer of other traits to wild mosquitoes
 - Bio-terrorism
 - Creation of superbugs
 - Scale and cost of sterile insect technique technology
 - allergenic or toxic effects in animals or humans

Deceives Government- Non-Regulatory Department- narrative identifies that the villain attempts to deceive non-regulatory government personnel by performing any of the actions listed in **Deceives Government- Regulatory Agency**.

Deceives Public- narrative identifies that the villain attempts to deceive the personnel by performing any of the actions listed in **Deceives Government- Regulatory Agency**.

Deceives Scientific Experts- narrative identifies that the villain attempts to deceive scientific experts by performing any of the actions listed in **Deceives Government- Regulatory Agency**.

Approve Technology- narrative identifies that a government regulatory agency, either local or national, has approved the use of GM mosquito technology.

- **Coding Rule**- Only a Government- Regulatory Agency can be coded for this action.

Additional Notes

- When coding a newsletter or an article within a magazine only analyze the sections of these documents that deal with GM mosquitoes in Brazil, or the Florida Keys

Appendix D: Help Sheet for Narrative Strategies and Evidence Analysis

Expansion or Maintenance of the Scope of Conflict

Distribution of Costs and Benefits

Coding Rule- If there is any mention of organization or agency paying for project or release of mosquitoes then should mark yes that there are costs for the preferred policy solution

Coding Rule- If in question 12 and 13 it is identified that government or an organization pays for the release then should choose "The narrative is constructed as providing concentrated costs (a few pay)."

Coding Rule- If mosquito population reduction or control is mentioned this can be assumed to be a diffuse benefit where general population will benefit

Coding Rule- receivers of benefits or those that incur cost can be an individual, group, or non-human element.

- Examples include company, citizens, community, humans, environment, other animal/plant/insects

Definitions

Concentrate Benefits- a few (if any) groups will gain benefits with the proposed policy solution

Diffuse Benefits- many groups will gain benefits from proposed policy decision

Concentrate Costs- only a small number of groups are will incur costs (monetary and other) from the proposed policy decision

Diffuse Costs- many separate groups will incur costs (monetary and other) with the proposed policy solution

Rhetorical Devices

Policy Surrogate

Examples of Policy Surrogates

- Critique of GM technology outside human health and environmental concerns
 - Can't trust GM technology since it is developed and owned by large corporations that can't be trusted and only motivated by profit
 - Developed countries' governments and businesses are pushing a technological solution they developed and support into a less developed country without proper review and consultation
- Effectiveness of current mosquito control strategies
 - Current mosquito control methods are sufficient
 - Current mosquito control methods are insufficient
- Economic Concerns
 - Regions suffering from mosquito borne diseases are losing revenue due to labor loss, sickness, loss of tourism, etc
 - Deployment of new technology could cost more
 - The ability to innovate is important
- Environmental/Ecological
 - GM technology is better for environment as it reduces pesticide use

- GM technology can damage ecosystems
- Regulatory Process
 - The regulatory approval process is not transparent
 - The regulatory approval process is not participatory/democratic
 - The regulatory approval process provides safety
 - The regulatory approval process doesn't account for social/cultural concerns

Condensation Symbol

- Symbol, image or language that “reduce[s] complicated concepts into simple, manageable, or memorable forms”
- “accommodates (condenses) diverse ideas or references within a single positive or negative connotation.
- Examples
 - “Friendly Mosquito”
 - Frankenstein Mosquito
 - PAT or “Transgenic Aedes Project”
 - Flight less mosquito
 - RIDL mosquito
- **Coding Rule-** Use of “PAT” or “Transgenic Aedes Project” should be coded as a condensation symbol
- **Coding Rule-** Use of “Friendly Mosquito” when describing the Oxitec transgenic mosquito should be coded as a condensation symbol

Types and Usage of Evidence

Types of Evidence

Scientific Studies

- any occasion that a narrative invokes a study, in general, as a source of facts
 - any citation, mention, or reference to a scientific study.
 - general references to science or the scientific method
 - instances where the description of the evidence indicated it was of a scientific nature (e.g., study and research)
 - **Coding Rule-** Citing Oxitec results that demonstrate a reduction in mosquito population should be coded as a scientific study
 - Example- *With the results presented in Juazeiro, between 89% and 100% reduction of the Aedes aegypti mosquito population in two communities, and in Jacobina an already proven reduction of more than 50% in the five-month period*
 - **Coding Rule-** if a narrative mentions an opinion poll, even if it was reported in a scientific study that this should be coded as a Poll
 - **Coding Rule-** the scientific study does not have to be a publication in a peer reviewed journal. Description of study needs to reference use of science or scientific method to produce the results
 - **Coding Rule-** any appeal or mention to an individual such as scientist, expert or technician due to their authority as such should be coded as *ipso dictum*

Statistics

- the use of any numbers, or figures/graphs that represent numbers, that is not connected to a scientific study or public opinion poll
- **Coding Rule-** If statistics or graphs/figures are presented as part of a scientific study or Oxitec results DO NOT code as statistics

Polls

- Any citation or reference to a public opinion poll

ipso dictum

- Any appeal to an individual as authority owing to their fame, position or title
- this in an appeal to the individual's authority that could be either scientific, political, celebrity, or legal
 - **Examples-** Famous scientist that researched mosquito borne diseases...; Important researcher has been quoted as saying...; Regulator stated that GM mosquitoes are
 -

Coding Rule- When a scientific study is cited by the author's name this should be coded as Scientific Study and NOT *ipso dictum*.

Coding Rule- Use *ipso dictum* when job titles are included for people that work/associate with organizations like NGOs, Oxitec, Moscamed, government agencies

Coding Rule- The important person doesn't need to express or talk about the technology. Presence alone is sufficient.

Coding Rule- DO NOT use *ipso dictum* for generic job descriptions such as scientist, regulator, government agent, etc. unless the article is describing or strongly focuses on such a person.

Laws and legal rulings

- Any reference, mention, or citation of a law or legal ruling or regulatory decision as evidence
- The presence or mention of a legal ruling or regulation is not sufficient. It needs to be used as a type of evidence.

Coding Rule- any appeal or mention to an individual such as legal expert, lawyer or regulator due to their authority as such should be coded as *ipso dictum*

Tacit or localized knowledge

- Any appeal to a knowledge source found outside of scientific and legal origin
- May be unwritten knowledge based on local, indigenous, or experience

Uses of Evidence

Demonstrate a policy problem

- Evidence is used to argue/identify/validate that a problem exists and that a policy change is needed
- **Coding Rule-** Evidence that is coded for "Support the policy solution" should NOT be coded as this.

Prove that there is no policy problem

- Evidence is used to argue/invalidate that a problem exists
- Use evidence to demonstrate that the policy problem defined by the opposing coalition does not exist or that its extent is not problematic,

Support the policy solution

- Evidence is used to demonstrate the superiority of the proposed policy solution
- Demonstrates that the problem can be solved, and the situation controlled

Refute the policy solution of others

- Evidence is used to identify the faults and issues of an alternative policy solution
- Used to counter the policy solutions of the opposing coalition, it demonstrates that the policy problem cannot be controlled with the proposed solution but needs to be addressed differently

Used in association with the hero of the narrative

- Definition: Hero- individuals or collectives who fix or attempt to fix a problem.
- **Coding Rule**- First identify the hero of the narrative.
 - NGO Activist Organization
 - Company
 - Nonprofit Service Provider
 - Government- Non-Regulatory Department
 - Government- Regulatory Agency
 - Universities
- Evidence is used to embellish the hero as a character that uses evidence to fix the policy problem
- Evidence is used by the hero to control the situation and to find the best possible policy solution

Used in association with the villain of the narrative

- Definition: Villain- an individuals or collectives who cause or attempt to make the problem worse
- **Coding Rule**- First identify the villain of the narrative
 - NGO Activist Organization
 - Company
 - Nonprofit Service Provider
 - Government- Non-Regulatory Department
 - Government- Regulatory Agency
 - Universities
- Evidence is used to demonize the narrative's villain or buttress the villain's evilness
- Narrative suggests that evidence is misused by villain

Is the center of the document's plot

- The document is almost specifically focused on how evidence or types of evidence are used
- The evidence itself is the focal point of the narrative
- Narrative is used to question/critique the evidence
- May be used to undermine the evidence presented by an opposing coalition

Appendix E: Hero Ego Alter Dyad

Foundation Combat Mosquitoes
Foundation Combat Disease
Foundation Educate Public
Foundation Educate Scientific Experts
Foundation Educate Government- Non-Regulatory Departments
Foundation Educate Industry
Foundation Educate Government- Regulatory Agency
Foundation Resist Regulation
Foundation Resist Technology
Foundation Advocate Technology
Foundation Advocate Regulation
Foundation Warn Government Leaders
Foundation Warn Public
Foundation Admonish Scientific Experts
Foundation Admonish Government- Non-Regulatory Departments
Foundation Admonish Government- Regulatory Agency
Foundation Admonish Industry
Foundation Assemble Scientific Experts
Foundation Assemble Public
Foundation Assemble Government- Regulatory Agency
Foundation Assemble Government- Non-Regulatory Departments
Foundation Inspect Regulation
Foundation Inspect Technology
Foundation Save Human Lives
Foundation Protect Human Health
Foundation Protect Environment
NGO- Activist Organization Combat Mosquitoes
NGO- Activist Organization Combat Disease
NGO- Activist Organization Educate Public
NGO- Activist Organization Educate Scientific Experts
NGO- Activist Organization Educate Government- Non-Regulatory Departments
NGO- Activist Organization Educate Industry
NGO- Activist Organization Educate Government- Regulatory Agency
NGO- Activist Organization Resist Regulation
NGO- Activist Organization Resist Technology
NGO- Activist Organization Advocate Technology
NGO- Activist Organization Advocate Regulation
NGO- Activist Organization Warn Government Leaders
NGO- Activist Organization Warn Public
NGO- Activist Organization Admonish Scientific Experts
NGO- Activist Organization Admonish Government- Non-Regulatory Departments

NGO- Activist Organization Admonish Government- Regulatory Agency
 NGO- Activist Organization Admonish Industry
 NGO- Activist Organization Assemble Scientific Experts
 NGO- Activist Organization Assemble Public
 NGO- Activist Organization Assemble Government- Regulatory Agency
 NGO- Activist Organization Assemble Government- Non-Regulatory Departments
 NGO- Activist Organization Inspect Regulation
 NGO- Activist Organization Inspect Technology
 NGO- Activist Organization Save Human Lives
 NGO- Activist Organization Protect Human Health
 NGO- Activist Organization Protect Environment
 Company Combat Mosquitoes
 Company Combat Disease
 Company Educate Public
 Company Educate Scientific Experts
 Company Educate Government- Non-Regulatory Departments
 Company Educate Industry
 Company Educate Government- Regulatory Agency
 Company Resist Regulation
 Company Resist Technology
 Company Advocate Technology
 Company Advocate Regulation
 Company Warn Government Leaders
 Company Warn Public
 Company Admonish Scientific Experts
 Company Admonish Government- Non-Regulatory Departments
 Company Admonish Government- Regulatory Agency
 Company Admonish Industry
 Company Assemble Scientific Experts
 Company Assemble Public
 Company Assemble Government- Regulatory Agency
 Company Assemble Government- Non-Regulatory Departments
 Company Inspect Regulation
 Company Inspect Technology
 Company Save Human Lives
 Company Protect Human Health
 Company Protect Environment
 Nonprofit Service Provider Combat Mosquitoes
 Nonprofit Service Provider Combat Disease
 Nonprofit Service Provider Educate Public
 Nonprofit Service Provider Educate Scientific Experts
 Nonprofit Service Provider Educate Government- Non-Regulatory Departments
 Nonprofit Service Provider Educate Industry

Nonprofit Service Provider Educate Government- Regulatory Agency
 Nonprofit Service Provider Resist Regulation
 Nonprofit Service Provider Resist Technology
 Nonprofit Service Provider Advocate Technology
 Nonprofit Service Provider Advocate Regulation
 Nonprofit Service Provider Warn Government Leaders
 Nonprofit Service Provider Warn Public
 Nonprofit Service Provider Admonish Scientific Experts
 Nonprofit Service Provider Admonish Government- Non-Regulatory Departments
 Nonprofit Service Provider Admonish Government- Regulatory Agency
 Nonprofit Service Provider Admonish Industry
 Nonprofit Service Provider Assemble Scientific Experts
 Nonprofit Service Provider Assemble Public
 Nonprofit Service Provider Assemble Government- Regulatory Agency
 Nonprofit Service Provider Assemble Government- Non-Regulatory Departments
 Nonprofit Service Provider Inspect Regulation
 Nonprofit Service Provider Inspect Technology
 Nonprofit Service Provider Save Human Lives
 Nonprofit Service Provider Protect Human Health
 Nonprofit Service Provider Protect Environment
 Public Combat Mosquitoes
 Public Combat Disease
 Public Educate Public
 Public Educate Scientific Experts
 Public Educate Government- Non-Regulatory Departments
 Public Educate Industry
 Public Educate Government- Regulatory Agency
 Public Resist Regulation
 Public Resist Technology
 Public Advocate Technology
 Public Advocate Regulation
 Public Warn Government Leaders
 Public Warn Public
 Public Admonish Scientific Experts
 Public Admonish Government- Non-Regulatory Departments
 Public Admonish Government- Regulatory Agency
 Public Admonish Industry
 Public Assemble Scientific Experts
 Public Assemble Public
 Public Assemble Government- Regulatory Agency
 Public Assemble Government- Non-Regulatory Departments
 Public Inspect Regulation
 Public Inspect Technology

Public Save Human Lives
 Public Protect Human Health
 Public Protect Environment
 Scientific Expert Combat Mosquitoes
 Scientific Expert Combat Disease
 Scientific Expert Educate Public
 Scientific Expert Educate Scientific Experts
 Scientific Expert Educate Government- Non-Regulatory Departments
 Scientific Expert Educate Industry
 Scientific Expert Educate Government- Regulatory Agency
 Scientific Expert Resist Regulation
 Scientific Expert Resist Technology
 Scientific Expert Advocate Technology
 Scientific Expert Advocate Regulation
 Scientific Expert Warn Government Leaders
 Scientific Expert Warn Public
 Scientific Expert Admonish Scientific Experts
 Scientific Expert Admonish Government- Non-Regulatory Departments
 Scientific Expert Admonish Government- Regulatory Agency
 Scientific Expert Admonish Industry
 Scientific Expert Assemble Scientific Experts
 Scientific Expert Assemble Public
 Scientific Expert Assemble Government- Regulatory Agency
 Scientific Expert Assemble Government- Non-Regulatory Departments
 Scientific Expert Inspect Regulation
 Scientific Expert Inspect Technology
 Scientific Expert Save Human Lives
 Scientific Expert Protect Human Health
 Scientific Expert Protect Environment
 Government- Non-Regulatory Combat Mosquitoes
 Government- Non-Regulatory Combat Disease
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 Government- Non-Regulatory Educate Scientific Experts
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 Government- Non-Regulatory Resist Regulation
 Government- Non-Regulatory Resist Technology
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 Government- Non-Regulatory Advocate Regulation
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 Government- Non-Regulatory Warn Public
 Government- Non-Regulatory Admonish Scientific Experts

Government- Non-Regulatory Admonish Government- Non-Regulatory Departments
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 Government- Non-Regulatory Assemble Scientific Experts
 Government- Non-Regulatory Assemble Public
 Government- Non-Regulatory Assemble Government- Regulatory Agency
 Government- Non-Regulatory Assemble Government- Non-Regulatory Departments
 Government- Non-Regulatory Inspect Regulation
 Government- Non-Regulatory Inspect Technology
 Government- Non-Regulatory Save Human Lives
 Government- Non-Regulatory Protect Human Health
 Government- Non-Regulatory Protect Environment
 Government- Regulatory Combat Mosquitoes
 Government- Regulatory Combat Disease
 Government- Regulatory Educate Public
 Government- Regulatory Educate Scientific Experts
 Government- Regulatory Educate Government- Non-Regulatory Departments
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 Government- Regulatory Educate Government- Regulatory Agency
 Government- Regulatory Resist Regulation
 Government- Regulatory Resist Technology
 Government- Regulatory Advocate Technology
 Government- Regulatory Advocate Regulation
 Government- Regulatory Approve Technology
 Government- Regulatory Warn Government Leaders
 Government- Regulatory Warn Public
 Government- Regulatory Admonish Scientific Experts
 Government- Regulatory Admonish Government- Non-Regulatory Departments
 Government- Regulatory Admonish Government- Regulatory Agency
 Government- Regulatory Admonish Industry
 Government- Regulatory Assemble Scientific Experts
 Government- Regulatory Assemble Public
 Government- Regulatory Assemble Government- Regulatory Agency
 Government- Regulatory Assemble Government- Non-Regulatory Departments
 Government- Regulatory Inspect Regulation
 Government- Regulatory Inspect Technology
 Government- Regulatory Save Human Lives
 Government- Regulatory Protect Human Health
 Government- Regulatory Protect Environment
 University Combat Mosquitoes
 University Combat Disease
 University Educate Public
 University Educate Scientific Experts

University Educate Government- Non-Regulatory Departments
University Educate Industry
University Educate Government- Regulatory Agency
University Resist Regulation
University Resist Technology
University Advocate Technology
University Advocate Regulation
University Warn Government Leaders
University Warn Public
University Admonish Scientific Experts
University Admonish Government- Non-Regulatory Departments
University Admonish Government- Regulatory Agency
University Admonish Industry
University Assemble Scientific Experts
University Assemble Public
University Assemble Government- Regulatory Agency
University Assemble Government- Non-Regulatory Departments
University Inspect Regulation
University Inspect Technology
University Save Human Lives
University Protect Human Health
University Protect Environment

Appendix F: Villain Ego-Alter Dyads

Foundation Endangers Human Lives
Foundation Endangers Environment
Foundation Endangers Human Health
Foundation Resist Regulation
Foundation Resist Technology
Foundation Collude with Government- Non-Regulatory Department
Foundation Collude with Scientific Experts
Foundation Collude with Government- Regulatory Agency
Foundation Collude with Industry
Foundation Ignore Regulations
Foundation Ignore Scientific Experts
Foundation Ignore Public
Foundation Deceives Government- Regulatory Agency
Foundation Deceives Government- Non-Regulatory Department
Foundation Deceives Public
Foundation Deceives Scientific Experts
NGO- Activist Organization Endangers Human Lives
NGO- Activist Organization Endangers Environment
NGO- Activist Organization Endangers Human Health
NGO- Activist Organization Resist Regulation
NGO- Activist Organization Resist Technology
NGO- Activist Organization Collude with Government- Non-Regulatory Department
NGO- Activist Organization Collude with Scientific Experts
NGO- Activist Organization Collude with Government- Regulatory Agency
NGO- Activist Organization Collude with Industry
NGO- Activist Organization Ignore Regulations
NGO- Activist Organization Ignore Scientific Experts
NGO- Activist Organization Ignore Public
NGO- Activist Organization Deceives Government- Regulatory Agency
NGO- Activist Organization Deceives Government- Non-Regulatory Department
NGO- Activist Organization Deceives Public
NGO- Activist Organization Deceives Scientific Experts
Company Endangers Human Lives
Company Endangers Environment
Company Endangers Human Health
Company Resist Regulation
Company Resist Technology
Company Collude with Government- Non-Regulatory Department
Company Collude with Scientific Experts
Company Collude with Government- Regulatory Agency
Company Collude with Industry

Company Ignore Regulations
Company Ignore Scientific Experts
Company Ignore Public
Company Deceives Government- Regulatory Agency
Company Deceives Government- Non-Regulatory Department
Company Deceives Public
Company Deceives Scientific Experts
Nonprofit Service Provider Endangers Human Lives
Nonprofit Service Provider Endangers Environment
Nonprofit Service Provider Endangers Human Health
Nonprofit Service Provider Resist Regulation
Nonprofit Service Provider Resist Technology
Nonprofit Service Provider Collude with Government- Non-Regulatory Department
Nonprofit Service Provider Collude with Scientific Experts
Nonprofit Service Provider Collude with Government- Regulatory Agency
Nonprofit Service Provider Collude with Industry
Nonprofit Service Provider Ignore Regulations
Nonprofit Service Provider Ignore Scientific Experts
Nonprofit Service Provider Ignore Public
Nonprofit Service Provider Deceives Government- Regulatory Agency
Nonprofit Service Provider Deceives Government- Non-Regulatory Department
Nonprofit Service Provider Deceives Public
Nonprofit Service Provider Deceives Scientific Experts
Public Endangers Human Lives
Public Endangers Environment
Public Endangers Human Health
Public Resist Regulation
Public Resist Technology
Public Collude with Government- Non-Regulatory Department
Public Collude with Scientific Experts
Public Collude with Government- Regulatory Agency
Public Collude with Industry
Public Ignore Regulations
Public Ignore Scientific Experts
Public Ignore Public
Public Deceives Government- Regulatory Agency
Public Deceives Government- Non-Regulatory Department
Public Deceives Public
Public Deceives Scientific Experts
Scientific Expert Endangers Human Lives
Scientific Expert Endangers Environment
Scientific Expert Endangers Human Health
Scientific Expert Resist Regulation

Scientific Expert Resist Technology
 Scientific Expert Collude with Government- Non-Regulatory Department
 Scientific Expert Collude with Scientific Experts
 Scientific Expert Collude with Government- Regulatory Agency
 Scientific Expert Collude with Industry
 Scientific Expert Ignore Regulations
 Scientific Expert Ignore Scientific Experts
 Scientific Expert Ignore Public
 Scientific Expert Deceives Government- Regulatory Agency
 Scientific Expert Deceives Government- Non-Regulatory Department
 Scientific Expert Deceives Public
 Scientific Expert Deceives Scientific Experts
 Government- Non-Regulatory Endangers Human Lives
 Government- Non-Regulatory Endangers Environment
 Government- Non-Regulatory Endangers Human Health
 Government- Non-Regulatory Resist Regulation
 Government- Non-Regulatory Resist Technology
 Government- Non-Regulatory Collude with Government- Non-Regulatory Department
 Government- Non-Regulatory Collude with Scientific Experts
 Government- Non-Regulatory Collude with Government- Regulatory Agency
 Government- Non-Regulatory Collude with Industry
 Government- Non-Regulatory Ignore Regulations
 Government- Non-Regulatory Ignore Scientific Experts
 Government- Non-Regulatory Ignore Public
 Government- Non-Regulatory Deceives Government- Regulatory Agency
 Government- Non-Regulatory Deceives Government- Non-Regulatory Department
 Government- Non-Regulatory Deceives Public
 Government- Non-Regulatory Deceives Scientific Experts
 Government- Regulatory Endangers Human Lives
 Government- Regulatory Endangers Environment
 Government- Regulatory Endangers Human Health
 Government- Regulatory Resist Regulation
 Government- Regulatory Resist Technology
 Government- Regulatory Collude with Government- Non-Regulatory Department
 Government- Regulatory Collude with Scientific Experts
 Government- Regulatory Collude with Government- Regulatory Agency
 Government- Regulatory Collude with Industry
 Government- Regulatory Ignore Regulations
 Government- Regulatory Ignore Scientific Experts
 Government- Regulatory Ignore Public
 Government- Regulatory Deceives Government- Regulatory Agency
 Government- Regulatory Deceives Government- Non-Regulatory Department
 Government- Regulatory Deceives Public

Government- Regulatory Deceives Scientific Experts
Government- Regulatory Approve Technology
University Endangers Human Lives
University Endangers Environment
University Endangers Human Health
University Resist Regulation
University Resist Technology
University Collude with Government- Non-Regulatory Department
University Collude with Scientific Experts
University Collude with Government- Regulatory Agency
University Collude with Industry
University Ignore Regulations
University Ignore Scientific Experts
University Ignore Public
University Deceives Government- Regulatory Agency
University Deceives Government- Non-Regulatory Department
University Deceives Public
University Deceives Scientific Experts