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The Role of Geographic Information Systems in Post-Disaster Neighborhood Recovery: Lessons from Hurricanes Katrina and Rita

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The Role of Geographic Information Systems in Post-Disaster Neighborhood Recovery: Lessons from Hurricanes Katrina and Rita

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Abstract

Through partnerships and collaborations with universities, non-profits, local government, and private foundations, neighborhood associations and residents have been using Public Participation Geographic Information Systems (PPGIS) as a tool for neighborhood recovery in post-Katrina and Rita New Orleans. The landfall of Hurricanes Katrina and Rita along the Gulf Coast Region changed the way that Geographic Information Systems (GIS) are used for Emergency Management and Response, PPGIS, and community recovery. This research explores GIS and PPGIS best practices through an evaluation of New Orleans, LA case studies and seeks to present solutions for the development of a post-disaster PPGIS for community recovery.

Keywords: Geographic Information Systems (GIS), Public Participation Geographic Information Systems (PPGIS), Hurricane Katrina, community recovery, Emergency Management and Response

Chapter 1: Prologue

1.1 Introduction

The landfall of Hurricane Katrina along the Gulf Coast Region changed the way that Geographic Information Systems (GIS) are used for Public Participation Geographic Information Systems (PPGIS), Emergency Management and Response, and community recovery. As related to community recovery, the use of GIS has played a central role in the continuing redevelopment and recovery of New Orleans through the use of PPGIS by neighborhood groups and residents. Through community/university PPGIS partnerships, residents used GIS as a tool for neighborhood recovery. For Emergency Management and Response, this change was the result of a concerted effort by students and staff at Louisiana State University (LSU) and existing partnerships and professional relationships in the GIS community that included the National Oceanic and Atmospheric Administration (NOAA), the Regional Planning Commission (RPC), the Louisiana Department of Transportation, the Federal Emergency Management Administration (FEMA), the United States Geological Survey (USGS), National Geospatial Intelligence Agency, GIS volunteers, and others. All of these organizations and people worked to create a robust data clearinghouse that was used by emergency responders for data and map requests (Mills and Curtis 2008). Individuals responded to the disaster by georeferencing and sharing photos and information on *Flickr* and Scipionus.com to alert loved ones, neighbors, and the world, to the unfolding tragedy on a more personal level, thus creating a new definition of what a PPGIS could entail.

Throughout New Orleans, community/university PPGIS partnerships formed to aid neighborhoods in their recovery efforts. This thesis evaluates three of these case studies to develop a framework for the best practices of community/university PPGIS provision in a post-disaster recovery environment. The case studies look at the *Beacon of Hope/University of New Orleans Community Recovery Project (*BUCRP), a collaboration that was started in the fall of 2008 when a previous community mapping and surveying project had stalled due to staff turnover. It also explores partnerships between Harvard University and the Broadmoor Improvement Association, as well as Gentilly and Dartmouth College.

This research will touch briefly on the changing role of GIS in the sphere of Emergency Management and Response, by government agencies, private entities, and individuals. It will look to explore ways that data sharing and collaborations could more closely tie-in with grassroots community recovery. There is a need for closer collaboration and data sharing to exist between both of these worlds.

The role of this study is to look at the provision of PPGIS in New Orleans and evaluate it based on the community/university framework that will be developed. By comparing and contrasting the PPGIS partnerships, a set of best practices is developed for community recovery. In direct response to the early planning efforts after Hurricanes Katrina and Rita, neighborhoods started organizing and planning to ensure that their voices would be heard. This study examines how PPGIS can increase participation and involvement in communities, helping residents play a more direct role in the planning process. The study also explores the ways that the emergency and disaster response efforts can be more closely tied to the recovery process.

1.2 Research Objectives

- An evaluation of the community-university model for the provision of PPGIS
- Documenting the use of GIS in city, state, and federal agencies during the response and recovery efforts of Hurricanes Katrina and Rita

- Documenting the creation of university/community PPGIS initiatives in New Orleans
- Creating a framework for evaluating and developing PPGIS for community and neighborhood groups in a post-disaster recovery environment
- Exploring the need for closer integration between PPGIS and the emergency and disaster response effort

1.3 Contents and Methodology

This thesis is composed of six chapters. Chapter 2, which follows the prologue, will explore the foundations of GIS and PPGIS through a literature review and examine the close relationship between PPGIS and community planning. It will also review three case studies of university/community PPGIS partnerships to showcase the vast differences that can exist in the provision of PPGIS and develop a list of best practices. A framework is developed by the author that can be used to evaluate PPGIS community/university partnerships.

Chapter 3 begins with an introduction to New Orleans geography and topography and a review of past flooding events that have plagued the region. The chapter then discusses the use of GIS in the response phase of Hurricanes Katrina and Rita. The role of government agencies and also the grassroots response of individuals will be discussed. This chapter will address research objective 2.

Chapter 4 summarizes the recovery and planning efforts that occurred in the city of New Orleans after Hurricanes Katrina and Rita. This chapter places the residential recovery in the context of the larger planning and recovery process. Residents and neighborhood organizations were responding to large scale recovery plans with their own tools and plans. This chapter explores the PPGIS initiatives in Gentilly, Lakewood, and Broadmoor, and the collaborations that aided these organizations.

Chapter 5 evaluates the New Orleans community/university PPGIS partnerships. This chapter explores the goals and expectations of these partnerships as well as their successes and limitations. It will also present a framework for evaluating community/university PPGIS partnerships. This chapter will also address research objective 5 and explore the need for closer integration between PPGIS and emergency and disaster response.

Chapter 6 presents the overall conclusions and evaluates how the research objectives were met. It will also explore the limitations of the research and present areas for future study.

Chapter 2: Public Participation Geographic Information Systems (PPGIS)

2.1 Introduction

There is a growing interest in Public Participation Geographic Information Systems (PPGIS) community groups, academics, non-profits, and others, compounded by the growth in pluralistic community planning, as well as internet speed, and hardware availability. PPGIS are at their most basic, ways to empower residents and communities with Geographic Information Systems (GIS). As the use of GIS has spread, there has been strong interest in its broad use for non-profits, community groups, neighborhoods, and other organizations that were unable to use this resource because of cost, staff, time, or other constraints. To understand the development and construction of Public Participation Geographic Information Systems (PPGIS), a thorough understanding of Geographic Information Systems (GIS) and what the components of a PPGIS are follows. PPGIS was a response to the perceived need for community groups and disenfranchised populations to have more control over geographic information (GI) and in turn, the policy discussions and political decisions that GI can directly affect. PPGIS is a promise for community power. It is the delivery of more democratic means for neighborhoods groups, residents, and citizens to engage in their community. As such, it promises to be a strong tool for planning and plan making at the local level and also as a means for influencing and guiding larger scale planning efforts. Yet, there are also drawbacks and problems with the use and construction of GIS for community groups. In better understanding PPGIS and GIS, we can better understand what it can deliver, and what it cannot. PPGIS has the capability to empower residents, but there are many avenues through which it can be created and implemented.

This chapter will identify the best practices for a PPGIS by developing a framework for provision; examine three different case studies to evaluate what a PPGIS can encompass, and explore some of the shortcomings of PPGIS. In Milwaukee WS, Portland OR, and Minneapolis MN, PPGIS was implemented with varying degrees of success. The broad array of projects and programs that can fall under the rubric of PPGIS makes it difficult to narrowly define the term, but there are certain aspects that make some projects more successful than others, and thusly, more representative of the founding principles. The most successful PPGIS projects are those whose goals are well defined, and seek to meet the needs of the community. There is also a strong desire for participation in the project along with access to the data and the GIS itself. By working with a number of stakeholders that include local government, universities, and neighborhood organizations, a stronger collaborative PPGIS can be created that will be more sustainable and empower the community.

2.2 What is Geographical Information and what are Geographic Information Systems?

Geographical information (GI) is data that is related to space (Edmonds 1999). It is data comprised of any host of variables and Cartesian coordinates that link to a spatial reference system, creating a mathematically unique spatial signature (Edmonds 1999). Non-GI datasets can include addresses, names, and descriptions of features or places, but these data are not specifically linked to a spatial location. By creating geographic information, the user is able to perform spatial analysis and queries on data that were previously not linked to. With advances in technology that have allowed users to more easily create, edit, organize, and also map, GI has become much more commonplace and useful over the past 20 years. For example, one widely used feature of geographic information is the geocoding of addresses, which means the linking of addresses to spatial data. When addresses are linked to their spatial location, fire, police, and a range of other local government services are able to use this information to determine efficient routes and service priorities by conducting spatial analyses. While it is possible to conduct spatial analyses with other software and even manually, GIS offers a more thorough, systematic, and dynamic way to layer and analyze multiple datasets. Most importantly, data analysis and interpretation can occur more visually for data that represents spatial phenomena. The use of this data and its organization into systems and databases, along with the software and hardware used to analyze and create maps is known as Geographic Information Systems (GIS).

The use of the term "GIS" has become increasingly common over the past decade. A broad array of individuals and institutions purport to know what GIS is and how to use it. Yet, with such widespread use, there is still a large gap in understanding what exactly GIS is and what it does. GIS has been touted as a piece of software, digital maps, the hardware required to organize and operate spatial software, the network and infrastructure to create maps and analyze data, and more. In fact, GIS is all of these things. The term Geographic Information Systems (GIS) was coined by Roger Tomlinson while he was working for the Canadian government in the early 1960's (Wright, 1997). At this time, the Department of Forestry and Rural Development sought an effective resource management system. Parts of this project involved the need to inventory and map various resources including; water, animal habitats, mineral resources, and other data. For this task, Roger Tomlinson, then Director of the department, suggested that an emerging computational technology might be a good tool for this project. The result was the development of the Canada Geographic Information System (CGIS), the first GIS. The first GIS was a system that was meant to store, input, edit, retrieve, analyze, and output geographic data and information (Demers 2009). The GIS offered a way for the department to quickly analyze and examine spatial data. The term GIS encompassed not only the software program for map creation and the final map products, it included the hardware required for operating the GIS, the software, computing power and space to hold large datasets, the network of end users and clients who will use the products, the vendors, as well as the financial and institutional networks that support the GIS. Defining a GIS has been a struggle between practitioners, especially as new media challenges how it is defined. Haughey (2003) developed a definition of GIS that is rather broad in its scope, but encompasses the core components: “Geographic Information Systems are computerized mapping and database systems capable of integrating various types of data with both spatial and non-spatial elements”. For our purposes, we will also incorporate the analytic nature of GIS into the definition. At its heart, GIS is a tool for the analysis of spatial data. Without an analytic function, it can serve no defining role in policy discussions. Frequently, the software programs that are used to manipulate GIS are mistakenly interpreted as representing the entire system, but this definition misconstrues the complexity involved in creating a GIS.

Here we should make the distinction between Geographic Information Systems and Geographic Information Science. GISystems are primarily the implementation of established paradigms, while GIScience is the creation of and development of these paradigms (Wright, Goodchild et al. 1997). GIScience distinguishes itself from GISystems by critically evaluating the underlying paradigms and application of the GISystem. By incorporating concepts and literature from other disciplines to advance the concepts and representation of knowledge and data in a GISystem, you are conducting GIScience (Fisher 2005). Generally, GISystems are the implementation of developed tools and theories while GIScience is the understanding of, refining, and development of new theories to guide GISystems. As GISystems become more widespread, critiques over what is, and is not, GIS continue to evolve. With the development of

Google Earth[1], *Google Maps*[2] Application Programming Interface (API), and other web based mapping applications, the possibility of developing spatial data has opened up to a broader population . Throughout the rest of this work, GIS will refer to GISystems unless specifically stated.

From the outset, there have been vocal opponents and proponents of GIS. Many of the problems stem from the way that GIS tries to define objects. In a GIS, all features need to be defined in basic terms of place, but applying values to these parameters can be difficult when examining data that is based on cultural, spiritual, and ethnic knowledge. Many of the debates around GIS are focused on the way in which it interprets the world because of its quantitative foundations. GIS is structured to represent the world mathematically and this simply does not apply for all representations of knowledge or perceptions of place. GIS is an optimal way of examining Euclidean space, but it cannot easily quantify and display concepts of place. In this way, there have been critiques leveled at GIS for the Western, science based paradigm through which it analyzes data (Talen 2000; Sieber 2004). It is very difficult for native interpretations or views of the known world to be incorporated into a GIS, so it is claimed that GIS discounts these ways of examining the world because it has become such a ubiquitous tool. Also, ways to display other non-standard views of place or constantly changing senses of place have been a struggle inside a GIS (Fisher 2005). Lastly, representing space and time is a problem for all of the above mentioned aspects of knowledge that anyone attempts to integrate into a GIS. The most basic applications of GIS assume that there are definite fixed boundaries for objects, but this is not always the case and the inability to easily use a GIS for these complicated

[1] http://earth.google.com/
[2] http://maps.google.com/

representations of place becomes controversial and challenging. GIS was formed near the tail-end of the Quantitative Revolution and it is a tool that relies on the quantification and coding of inputs.

Many of the limitations of GIS are linked directly to the way that it physically represents data. There are two ways to represent graphics on a computer, through vector and raster data. When data is represented through raster, each pixel can be coded with a different color. A good example of raster data is a digital photograph. In raster data, each pixel has a unique color assigned to it and the number of pixels varies by the resolution, with higher resolution comes more detail but also a larger file size. Vector data is most often used to represent features that are lines and simple shapes. If you create a line in GIS with vector data, this line is stored as two data points, one at each end of the line. The computer does not store the information for each individual pixel representing the line, just the instructions for creating it. The way that data is visually modeled and coded is directly related to what the data physically represents. Discrete data has known and definable boundaries, like the boundary of a lake, while continuous data is information that varies without discrete steps, temperature for example. Both of these data types can be represented in either vector or raster formats, but the limitations of either should be understood. All data cannot be represented in a GIS and information that is modeled will vary in accuracy and usability based on these physical limitations.

Another problem with the proliferation of GIS have been fears of privacy invasion and in a post-9/11 world, fears of safety related to terrorism (Helft 2009). With advances in aerial imagery and data storage, the monetary limitations that once hampered data collection and preservation no longer exist. Mass amounts of data can be stored for relatively little cost. This also relates to the increased availability of aerial imagery, and the constant backlash against

Google Earth because of the possible security risks and invasions of privacy (Edmonds 1999). GIS is also critiqued because of the possibility for government intrusiveness and monitoring. Now that there are more efficient and accurate ways to monitor, it is in the governments' interest to use these data systems to collect as much data as they deem necessary for a multitude of tasks. Also, the use of this data by the marketing industry to track customers has an infinite number of possibilities and raises issues of privacy intrusion. It is now possible to track and analyze data at the individual level and this is what concerns many people (Edmonds 1999). Yet, the availability of these mass amounts of data and systems has opened up spatial analysis to a wider community, in fact democratizing GIS.

Since inception, what is means to be a GIS has changed and this process continues. Michael Goodchild (1998) says that GIS is almost beyond definition today because it now encompasses so many different aspects. At its most broad, he says that GIS is, "any activity involving geographic information in digital form" (Goodchild 1998). GIS can now be referred to when building a database, analyzing its contents, making decisions, and also making maps (Goodchild 1998). The resulting definition of a GIS is a powerful set of tools for measuring geographic phenomena and processes, representing these measurements and relationships, and analyzing these relationships. Within this paradigm, GIS is still a tool of maps, images, and animation. It remains largely confined to this area although many changes are taking place that could shift this focus of GIS (Goodchild 1998).

Traditionally, GIS has been tied to a spatial location through the use of software and hardware on local computers. The access and use of data was restricted by this, but the internet has started to revolutionize the way that GIS is and can be used. There have been major advances in data transfer rates and data caching, an Achilles Heel of widespread internet GIS use. There have also been recent advances in open source technology that is placing all of this power into the hands anyone with the time to learn to create these systems. Access to Public Participation Geographic Information Systems (PPGIS) might no longer be tethered to a physical geographic location (Edmonds 1999). This growth among internet mapping systems and internet mapping servers has caused another evaluation of what it truly means to be a GIS. This call for a new type of GIS, has put in question the framework that is currently used, and asks whether we might not start re-designing what GIS and PPGIS are (Sieber 2004). To rewire the system so that it is more open and approachable by users whom PPGIS are trying to reach. The headway made by *Google* in providing mapping tools and programming to the public and the emergency response community has also pushed what it means to be a GIS (Miller 2006).

2.3 Introduction to Public Participation GIS (PPGIS)

PPGIS was a response to the centralized, technocratic nature of GIS that was stifling the possibility for more widespread use of geographic data and analysis by disenfranchised groups (Obermeyer 1998). It was during the mid-90's that a group of scholars from the University of Maine developed a workshop focused on the accessibility of GIS for historically under-represented groups (Sieber 2006). From this interest in societal issues as related to technology, two separate meetings of the National Center for Geographic Information and Analysis (NCGIA) were held in 1993 and 1996 that focused on "GIS and Society" (Obermeyer 1998). These early scholars were concerned with the future direction of GIS and its accessibility. They sought to create a GIS that would that be more democratic and accessible. By democratizing the availability of data, training, and software for community members and individuals that are affected by GIS, communities and neighborhoods are empowered with the tools of government and private interests. PPGIS would broaden public involvement in policy-making, opening the door to community-groups, non-profits, grassroots groups, and others (Sieber 2006). Without access to the information and technologies that are guiding policy decisions behind closed doors, neighborhood groups and citizens miss out on a large portion of the discussion. With these technologies in hand, local organizations now have the tools to visualize and analyze their neighborhoods in ways that may not have been considered by policy makers, thus, they are able to broaden the dialogue about decisions that directly affect their environment. PPGIS is very heavy on map creation and software, but it is also about the process (Sieber 2004).

Yet, criticisms have also been leveled at PPGIS because of the negative impact it has had on marginalized group empowerment. While the use of GIS for community empowerment has strong support, there are assertions that GIS has actually hindered community participation, or that it simultaneously empowers and marginalizes (Harris and Weiner 1998). It is constantly stressed that the underlying structure and nature of GIS, unless altered substantially, is simply contradictory to the goals of community empowerment (Sieber 2004). Some of these allegations are based on the quantitative nature of GIS and its inability to easily integrate qualitative and indigenous spatial knowledge. There is a body of research that looks at the inherent discord between using a western, scientific system to organize and analyze qualitative and indigenous knowledge, arguing that GIS disempowers and invalidates these traditional systems (Sieber, 2004). While this discord exists, it does not preclude the fact that community groups are continuing to use GIS and are seeking new ways to adopt this technology.

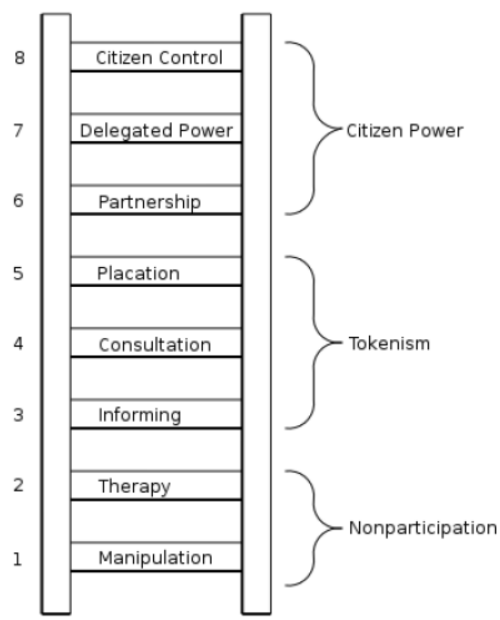
While control of the GIS is of concern, there is also a need for the incorporation of local knowledge into GIS (Haughey 2003). This incorporation of local knowledge and local ways of viewing spatial data is one of the most important aspects of many PPGIS movements. Local knowledge, which has been historically overlooked can add value to existing data sources. To further examine the development of PPGIS, a definition of the concept is due.

2.3.1 *Defining Public Participation GIS*

The term PPGIS was coined in the early 1990's and a conclusive definition of what PPGIS encompasses has been elusive. Sieber (2004) has said that PPGIS is as much a process, as it is software. A PPGIS is not simply the collection or analysis of data, as it is the collective decision making process between residents, community groups, and other affected parties. This process can involve multiple actors and look at solutions, knowledge, and data in a myriad of different ways. Weiner and Harris (2003) state that PPGIS involves some aspect of these qualities: 1) public access, 2) integration of local knowledge, 3) encouragement of local participation, 4) acknowledgement of the potential intrusiveness of GIS, 5) the use of innovative technologies and multimedia to represent quantitative as well as qualitative data, and 6) the integration of the internet. The general tenets that are a hallmark of each project or program calling itself a PPGIS is the participation of the public and the recognition of their role in supplying local knowledge to the decision making process. This is incredibly important in the planning process, as PPGIS provides an effective way to give the community a stake in the process. The effectiveness of PPGIS is largely in the hands of local residents (Hoyt, Khosla et al. 2005). There is also a strong need for cooperation between local groups and an integration of local knowledge (Stewart, Jacobson et al. 2008). The interplay between local government, community organizations, community groups, and associations play a defining role in the successful outcomes of PPGIS projects (Ghose and Elwood 2003). While the overriding goal of PPGIS is the empowerment of local citizens and community groups, the modes that each PPGIS takes is very different, but there are underlying themes that are common to each.

To move forward, there must be a clear understanding of exactly who the 'public' is and what their 'participation' entails. While the term PPGIS seems to express the fact that the public is participating in GIS, this is an incomplete definition that can lead to problems unless it is explicitly understood that there are varying degrees of public and this public's participation. One of the most famous analyses of participation is the work of Susan Arnstein (1969) and her ladder depicting the varying degrees of participation, shown as Figure 2.1.

Figure 2.1 Ladder of Citizen Participation



Source (Arnstein 1969)

This study still rests as one of the pillars to measure and gauge levels of participation. Some of the points that Arnstein stresses are the facts that information cannot be a one way flow. Secondly and most importantly, she emphasizes that citizen participation is in fact citizen power. When participation works, it is a mechanism for ensuring that the have-nots who were excluded from decision making processes are deliberately included (Arnstein 1969). The most lasting impact of Arnstein's work is the fact that participation occurs in varying degrees, from tokenism to full participation. Participation can range from residents filling out a survey, to residents designing and implementing a survey. In terms of PPGIS, examples of participation include residents creating and manipulating data, residents creating maps using GIS software, residents providing input and guidance on the layout of maps, training being provided to residents on how to read and use spatial data, and many other forms. To ensure that a PPGIS is actually creating the means for participation, it must be analyzed to see if there is a two way flow of information. If anything, Arnstein reminds us that the ostensible goal of PPGIS is empowerment. To confirm that a PPGIS is in fact empowering the population engaged in the activity, there must be vigilance to ensure that the 'participation' is not simply part of a checklist for those who are already empowered. Figure 2.1 is adapted from an article by Schlossberg and Shuford (2005) and their analysis of the components of public and participation in a PPGIS. This graph can be used to analyze the development of a PPGIS and the degree to which goals are met, as well as, provide a clearer understanding of expected goals and outcomes of the project.

Figure 2.2 Varying Degrees of Public and Participation

			Public				
			simple →				*complex*
			Decision Makers	**Implementers**	**Affected Individuals**	**Interested Observers**	**Random Public**
Participation	*simple* ↓	**Static Web Page**					
		Interactive Web Page					
		Personal Survey					
		Public Meeting					
		Charrettes					
		Citizen Juries					
	complex	**Collaboration**					

Source: (adapted from Schlossberg and Shuford, 2005)

While we have examined what it means to participate, there is still a lack of understanding about who exactly the 'public' in a PPGIS is. In a PPGIS, the public could be a very broad range of people or communities, it could encompass one street in one neighborhood, or it could be information that is valuable to the entire nation (Shlossberg and Shuford, 2005). The local context is also very important because a PPGIS can be largely influenced and guided by local government and universities, to the aid or detriment of the project. As shown in Figure 2.3, the stakeholders and their roles are instrumental in shaping a project and geographical location still affects how and by who, the system is used. At the beginning of a PPGIS, clear goals must be laid out to ensure that it is understood who the public is and how their needs will be met. *How will the public be affected and what constraints are there in terms of participation? What are the financial constraints of a possible project? Where will the data be housed and how will it be used?* Asking these questions at the start of a study ensures that the limitations, objectives, and opportunities of the project will better present themselves more clearly and accurately (Schlossberg and Shuford, 2005).

Figure 2.3 Dimensions in Difference of Modes of PPGIS Provisions

Dimensions	**Categories**
Stakeholders	*Types of stakeholders:* Local and non-local state agencies Non-governmental organizations (NGOs) Educational institutions Private industry *Types of relationships between stakeholders and community organizations:* Cooperation Compliance Collaboration Control
Communication Structures	*Human-computer interaction* No direct use Passive use Active use Pro-active use *Individual vs. collective decision-making* *Intra- vs. inter-organizational communication*
Geographical Location	*In-house vs. remotely located GIS*

Source: (Leitner, McMaster et al. 2000)

Another key element of PPGIS provision is access. Without access to data, as well as tools to manipulate and analyze, there is no PPGIS. The community must have involvement in the process or have full control, and as Arnstein (1969) says, communication should be a two-way street. Without a clear way to provide this access, the PPGIS is not participatory. As PPGIS has evolved there has also been a distinct battle between the importance of access, specifically how much access is required for a successful project (Sieber, 2006). In terms of access, one of the biggest problems confronting PPGIS is the sharing of data. When residents and neighborhoods collect data, they expend a great deal of time and effort. These groups are then hesitant to place this information on the web, where government and private interests can take control of their data and use it without giving credit or compensation. The same is true for government and private firms who spend millions of dollars for access to proprietary datasets. Yet, scholars have recently looked at the ways in which access does not influence the success of a program as much as once thought (Tulloch and Shapiro 2003). The fact is that GIS participation and access can both be very high, but the PPGIS can still not meet its goals (Tulloch and Shapiro 2003). But as shown in Figure 2.2, there is still a high degree of success that comes with higher access and participation. In judging the success of a PPGIS, there is still a strong connection between participation and access. The way that access can be addressed comes in many different forms. With the spread of the internet and availability of connections and increased speed of home connections, it is easier to share data through web pages and servers. It is now possible to collaborate, build, design, and maintain a GIS server that can host data and information for residents with high levels of participation in the process.

Figure 2.4 Assessing Levels of Participation and Access

		No or Low Levels of Access	**High Levels of Access**
No or Low Levels of Participation		***Type I*** Successful: Least likely Unsuccessful: Most likely	***Type II*** Successful: More likely Unsuccessful: Somewhat likely
High Levels of Participation		***Type III*** Successful: Less likely Unsuccessful: Somewhat likely	***Type IV*** Successful: Most likely Unsuccessful: Less likely

Source: (adapted from Tulloch and Shapiro 2003)

Closely related to access is the need to understand who owns and controls the data. *Where is data stored after it is created? Who controls the rights to the data? While the "public" might have access to the data, do they own it?* These questions address the issues of data ownership and control. While data access and participation might not be an issue for community groups, these groups should also have control of the data and the means for its sustainable production.

To ensure that an effective PPGIS is provided, there needs to be wide access, high participation, and involvement by the audience whom you are designating as the public and trying to reach and empower. The success of a PPGIS is also highly contingent on and shaped by the locale in which it is situated (Ghose and Elwood 2003). There is such a broad degree of ways to look at designing and implementing a PPGIS that it is hard to develop one model for PPGIS provision. The following case studies point to the degree of variation that can exist among a PPGIS and that there are numerous reasons for success and also for shortcomings.

2.3.2 *Modes of Public Participation GIS Provision*

There are a broad range of PPGIS case studies and models that exist and each has its benefits and shortcomings. Leitner suggests that there are six separate PPGIS models: community-based GIS, university and public library facilities, internet map servers, university-community partnerships, map rooms, and neighborhood GIS centers (Leitner, McMaster et al. 2002). These are just some of the ways that PPGIS could be provided, but this categorization misses some important aspects of GIS provision. Haughey (2003) deconstructs these models into a more useful structure; by looking at the levels of participation and what the PPGIS looks to accomplish. This deconstruction placing the modes into three separate categories: Planning and Participation, Community Development, and Geographic Information Systems perspectives (Ibid.). While Leitner, et al (2002) recognize that there are different levels and modes of participation, they do not incorporate the influence of government, consultants, and public-private partnerships, which will tend to make PPGIS initiatives that are less participatory (Haughey 2003).

2.3.3 *Grassroots PPGIS, New Media, and the Web*

With the development of the web, wikis, blogs, *Google Maps*, *Google Earth*, *OpenLayers*, and others, the traditional desktop based model of GIS, and in turn, PPGIS provision, is being challenged. To create the most inclusive PPGIS, it is argued that it needs to be constructed outside of the confines of the traditional GIS architecture, and the web is providing that (Miller 2006). With the release of the *Google Maps* API code, the public is allowed to create mash-up's, which are personalized maps (Miller 2006). Using relatively simple code, it is possible to create layers, add photos, write descriptions and maintain databases using *Google Maps*. The public can now create interactive maps that have limited analysis ability, but are relatively easy to create and share. Some of these advancements promise to increase participation, and more importantly put the data and control of all aspects of the PPGIS into the hands of the group or person designing and operating the system. *OpenLayers*[3], an open-source mapping project gives the public full access to the source code, allowing for unlimited customization. These web based initiatives could be what Miller (2006) states are the future of PPGIS. The possibilities for creating a locally operated and controlled PPGIS are within reach. There will no longer be constraints on system hardware and resources, but there will still be need for staff to understand the simple coding. With open-source program development in the area of spatial applications, the definition of PPGIS will continue to shift. In addition, we must continue to evaluate what the opportunities and limitations to these types of PPGIS and GIS are.

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[3] http://openlayers.org/

2.3.4 *Assessment of a PPGIS*

As explored earlier, there are many attempts to measure and assess the success of a PPGIS project. This section presents an eleven question framework that was developed by the author and builds on past research (Arnstein 1969; Leitner, McMaster et al. 2000; Tulloch and Shapiro 2003; Schlossberg and Shuford 2005). By examining three community/university case studies and the best practices from past PPGIS initiatives, the eleven question framework will present general answers for creating a successful community/university PPGIS partnership. These metrics measure the level of access, participation, and who the public is, thereby attempting to gauge how successful projects are in meeting the goals of PPGIS. To measure the effectiveness of the community-university PPGIS case studies, the following set of questions will be addressed:

1) Does the project empower?
2) Who participates?
3) What are the projects goals?
4) Who has access and how?
5) What is the projects timeline?
6) What are the products?
7) What are the partners' roles?
8) What is the projects scale?
9) Is the project sustainable?
10) What local knowledge is supplied?
11) Who controls and owns the data?

A successful PPGIS can vary considerably in the way it attempts to answer each of these questions. Yet, there are commonalities that exist between successful PPGIS projects that will aid in the establishment of an evaluative tool.

2.4 Community/University PPGIS Case Studies

This research is primarily concerned with the role of the community/university PPGIS model of GIS provision. It looks to understand the myriad ways that partnerships and collaborations can be established and the ways that participation, access, and control can vary within the confines of the community/university PPGIS model. An examination of three case studies will aid in the understanding of best practices and limitations that exist in these partnerships. The partnership that was created in New Orleans with The Beacon of Hope Resource Center, a local non-profit, and The University of New Orleans/Department of Planning & Urban Studies was built within the context of a community-university partnership that very closely reflects the limitations and strengths of the following models and their implementation. The community-university partnership also served as a model for many of the other PPGIS and mapping initiatives that were created in New Orleans post-Katrina. This model offers one of the most promising avenues for community groups and universities to build sustainable PPGIS initiatives. Many of the shortcomings that non-profits and community groups face in developing a PPGIS are overcome through this model, but also has its drawbacks.

2.4.1 *Milwaukee's Non-Profit Data Center*

GIS has been used in Milwaukee to empower residents for neighborhood revitalization efforts. The *Milwaukee Non-Profit Center*[4] has been implementing PPGIS initiatives throughout the city of Milwaukee. The Data Center Program is a part of the Milwaukee Non-Profit Center, an organization that was founded in 1967 and seeks to provide tools and training to local non-profits. The Program was started in 1992, with the collective organization of more than 200 local Milwaukee non-profits and community organizations (Barndt and Craig 1994). The goals of the Data Center (Lin and Ghose 2008) are to:

1) Work as a clearinghouse;

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[4] *Milwaukee Non-Profit Center:* http://www.nonprofitcentermilwaukee.org

2) Provide on-going GIS services for free or low cost;
3) Increase capacity of local organizations;
4) Expand citizen access to participation.

The motivation behind the development of the Data Center and PPGIS in Milwaukee was the creation of a Neighborhood Strategic Planning (NSP) program developed by the city's Community Development Block Grant Administration (CDBG). The CDBG requires neighborhoods to develop neighborhood plans with statistics and maps in order to receive federal funds. To aid in the development of these plans, the CDBG funds the Data Center Program of the Non-Profit Center so that neighborhoods and residents have the tools at their disposal to prepare data for these plans (Ghose and Elwood 2003). This partnership demonstrates the use of federal funds to drive local neighborhood development and plan making. While the development of the plans and the organization comes from the grassroots level, the funding from the national level provides an impetus to organizing.

Partnerships were instrumental to many of the successes that were realized in Milwaukee. The most successful PPGIS projects occurred when community groups were partnered with universities. In one of these cases, the University of Wisconsin Milwaukee partnered with a neighborhood to use GIS for quality of life studies and these studies were then brought to city hall in an effort to create a tax increment financing district. Yet, even in these partnerships, there were limiting factors. As Ghose and Elwood (2003) explain, "the organizations with greatest success in such partnerships tended to be those with pre-existing technology and spatial analysis experiences, a stable resource base, histories of collaborative partnerships, and strong internal support for such collaborations". In these specific cases, multi-layered cooperation was the key to successful PPGIS initiatives. One of the other successes of the project was the reception of donated Environmental Systems Research Institute (ESRI) software and donated hardware. The

Data Center itself had a strong connection to the local University of Wisconsin Milwaukee, which has provided a steady stream of graduate students who have helped staff the program. Lastly, while the relationship between community groups and local government was not always positive, it created a link for positive developments to occur. The Data Center was able to bring community groups and neighbors visions of their communities closer to the lens of city government.

While this model has been successful at getting neighborhoods and residents mobilized, they are very much on their own when it comes to starting the process. Some neighborhoods were better at realizing the potentials of a PPGIS while other groups simply felt that the time and energy was not worth it. There are a few drawbacks to implementing a PPGIS through a third-party, the biggest problem with this model is that the CDBG provides limited funding, so community groups are working against each other for a limited pool of money (Barndt 1998). With a competitive process around the procurement of funds for specific neighborhoods, there is little incentive to share data and resources between neighborhoods. Secondly, there have been problems with inter-organizational and inter-government communication. With minimal coordination between the city government and the CDBG Administration, residents have watched their community plans sit on the shelves of the planning department. While neighborhoods spent time and effort to create plans and visions for their communities, the lack of coordination between city departments means that these plans are likely to sit idly. Improving the coordination between city agencies and also fostering an environment of cooperation between communities are two of the biggest problems that can be experienced when trying to implement a PPGIS. In any city, neighborhoods view each other as competing for residents, city services, businesses, and more. Yet, to show community groups that a strong working relationship between groups can help foster a stronger region needs to be implemented.

The Milwaukee Data Center is still active and continues to work in the community. Michael Barndt, a faculty member with the University of Wisconsin-Milwaukee, has written extensively about the project and serves as the Data Center Analyst.

2.4.2 *The Community Geography Project at the Institute of Portland*

The Community Geography Project is a PPGIS that was started by the Institute of Portland Metropolitan Studies at Portland State University (Merrick 2003). The goal of the Institute of Portland Metropolitan Studies is to extend the resources of the university to a broader municipal area (Seltzer 1999). The Institute was started in 1992 and its Board is composed entirely of community-based representatives. By relying on community-based board members, the Institute shows that it has a strong commitment to address the needs of the community. The mission of the Institute (Seltzer 1999)is to:

1) Provide access to the resources of higher education for area communities;
2) Help to make an understanding of the metropolitan area of strategic value to citizens, faculty, students, elected officials, and civic leaders;
3) Provide a neutral forum for the discussion of critical metropolitan policy issues;
4) Create partnerships linking faculty, students, and community groups to meet community and scholarly objectives;
5) Sponsoring public service research.

One project that has been undertaken by the Institute is *The Community Project*. *The Community Project* focuses on citizen empowerment through the use of GIS by providing the tools and expertise of a large university to residents and neighborhood organizations. This model of PPGIS is a blend between a university-community partnership and the university acting as a resource center. *The Community Project* is considered an open resource for any neighborhood or resident group to utilize, instead of partnering directly with a specific neighborhood. *The*

Community Project looks somewhat like *The Non Profit Center* in Milwaukee, but the operation is housed completely within the university. The goal of the project is one of the main tenets of the PPGIS movement, to try and empower non-professional residents to utilize and more importantly, to understand GIS. While the ability to use and understand GIS was a goal, the program required participants to have an understanding of the importance of spatial concepts, spatial implications, and spatial data (Merrick 2003). Herein lays one of the many shortcomings of PPGIS and this case in particular. When residents lack a prerequisite knowledge of the product that a PPGIS can provide or lack basic geographic and spatial literacy, they will fail to seek out the tools that are available to them. While *The Community Project* is a fantastic resource for community groups that are educated about the possible benefits, the resident groups and neighborhoods who embody the spirit of PPGIS and would be the largest beneficiaries of the program, may not completely understand its aims or the benefits.

This PPGIS example demonstrates that while it was conducted fairly recently, hardware procurement can still be a major hurdle for community groups to overcome. While the price of computer hardware has decreased significantly in the past decade, the computer resources required to install and operate GIS software continue increasing, sometimes outpacing the financial ability of smaller organizations. Secondly, the ability to effectively utilize a GIS precludes some knowledge of the importance of spatial data and concepts. It is wrong to assume that this knowledge exists in a community and the goals of a PPGIS must coincide with this potential roadblock. Thirdly, *The Community Project* is still tied to a university facility and many of the successful programs that are undertaken will be the result of dedicated faculty. Many faculty members want to help the community, but faculty are also working with their own research interests and have an incentive to produce articles; interests which may not match the exact needs of the community (Seltzer 1999). When programs and partnerships are being created, these interests must be taken into account when the amount of work that the faculty will do is considered. Lastly, overworked staff and the rotational nature of adult staff made it hard to provide training (Merrick 2003). With many community and non-profit groups, much of the work of the organization is done by a hard working core of individuals. For any project to be successful, the goals of the PPGIS must be clearly enmeshed with the priorities of these individuals.

The Community Project has also experienced a great deal of success and offers lessons that other PPGIS initiatives would be wise to heed. The first of these is the importance of partnerships longer than a semester. It takes a lot of time and energy to set up a partnership between a community group and a university, so this time and energy should not be wasted with semester long projects. The Institute has found that the best projects range from 3-5 years. Secondly, when these partnerships are established, there must be a clear contract of services to be rendered and this contract must be clearly understood by all parties (Seltzer 1999). Lastly, to solve the problem of untrained staff and quick volunteer turnover in neighborhood groups, it was a proposed solution to promote partnerships between K-12 schools and the community (Merrick 2003). With mini-training and educational sessions, students can become involved in the local PPGIS process and learn skills and aid in the development of their community. While there will still be turnover in the community organization, there should no longer be the loss of all individuals with the requisite skills to continue the PPGIS at the local level.

2.4.3 *Minneapolis Community GIS Project*

The *Minneapolis Community GIS Project* was developed by the University Neighborhood Network, funded by the Minneapolis Foundation, and operated by the University of Minnesota's Center for Urban and Regional Affairs in Minneapolis, Minnesota (Leitner, McMaster et al. 2000). This PPGIS was developed, in part, to involve university students in projects related to community development and revitalization. This created opportunities for partnerships between neighborhood organizations, faculty, staff, and students (Leitner, McMaster et al. 2000). The projects that were developed in the *Minneapolis Community GIS Project* range broadly in their scope. Some of the projects have provided assistance with operation and analysis of GIS, whereas other projects have simply provided mapping or analysis without providing training or capacity building. The *Minneapolis Community GIS Project* had two goals: 1) assessing community groups access to, needs for, perceived utility or, and concerns about GIS and GIS based data sources; and 2) facilitating access to and use of GIS and GIS based information for community based planning (Elwood and Leitner 1998). To have a successful PPGIS, Elwood and Leitner (1998) found that there needed to be an awareness of the need for GIS and the tools available, these tools and data had to be acquired by the groups, then these tools and data needed to be applied (Elwood and Leitner 1998). Yet, all of these steps could prove difficult to a community group or organization. While a group can have all of the tools and data and understand how important implementing a PPGIS is, they may not have the staff or resources to fulfill their goal.

One of the biggest resources that the *Minneapolis Community GIS Project* put together was a database that would interest the four priority neighborhoods they were working with. This data was packaged and the neighborhoods were asked whether or not they would be interested in trying to obtain GIS software; two of the four neighborhoods expressed interest (Elwood and Leitner 1998). The goal of the project was to work collaboratively with the neighborhood groups and assess their needs and perceptions of the utility of GIS. The project would also work to facilitate access to GIS and spatial data (Leitner, McMaster et al. 2000). Yet, the project was limited by some of the initial shortcomings, specifically, the lack of awareness. When community groups and residents are unaware of what a GIS is, a major hurdle needs to be overcome before a program can be started. Secondly, another failure of the program is that small organizations do not have the staff or resources to continue projects on their own (Elwood and Leitner 1998). This is also the case for many other PPGIS and GIS initiatives. Organizations feared that they would not be able to maintain the database, nor have qualified staff to use the GIS. If this is the reality or simply a fear, an organization will be unwilling from the outset to expend any energy into the creation of a sustainable program. Thirdly, there is still an issue since access alone does not mean that a community is participating. Lastly, neighborhood groups wanted to collect their own data, but this necessitates that they are collecting it with a standardized methodology. Closely related to this was the fact that neighborhoods did not see the need for data beyond the local parcel level (Elwood and Leitner 1998). The failure to link their own problems with broader regional or citywide goals tends to isolate the issues. If these neighborhoods and community groups were able to see their common interests and goals, they would be more willing to work together and share data and resources.

The *Minneapolis Community GIS Project* offers one of the most important lessons of the PPGIS case studies: the first result of a GIS project should provide something tangible that residents can see and use. Neighborhoods do not have the time to collect data for data's sake (Elwood and Leitner 1998). The drawback to community/university partnerships can sometimes be the desire to create data and research for faculty and graduate students, without producing tangible results for community partners. Yet, any PPGIS should be responding to a need in the community and the community should be able to see the results of their collaboration. This reaches back to the formulation of the goals for the project. When the community members see the results, the GIS helps to quantify and present community knowledge, which can galvanize support around specific issues. While the students and staff of a university are working on research interests of learning as they go, they are also providing an invaluable tool to the community groups. To meet the staff needs of the community, university faculty and students provide many of the necessary services. As part of service learning exercises or as graduate assistants, students provide much of the work that neighborhood groups would otherwise be unable to afford (Leitner, McMaster et al. 2000).

In the *Minneapolis Community GIS Project*, different PPGIS projects were developed within the community. Each project involves varying relationships between each of the actors involved, how these actors communicate, the physical location of the GIS, and the relationship between physical location and access. While the variations in terms of participation and access, which were highlighted earlier in Figures 2.1 and 2.2 are important, there are also variations in the geographical location of the GIS and in the communication structures of the actors, which both play a direct role in discussions revolving around access and participation.

2.5 PPGIS Best Practices

With each project or program that describes itself as PPGIS, time should be spent defining exactly who the public is and what their participation will be. The public could be anyone viewing data that is placed on the web in a map server, and their participation may be submitting geo-referenced photographs. The public could also be a small neighborhood community and their participation might involve the collection, creation, and training to develop an in house GIS (Schlossberg and Shuford 2005). Many different projects fall under the umbrella of PPGIS, which shows the need for a thorough definition of the actors and their role in the project to ensure that there are clear expectations and goals. By definition, PPGIS seeks to enhance the democratic process by empowering stakeholders and can take on many forms in the pursuit of this goal. To create a successful community/university PPGIS project, there are a number of best practices that can be gleaned from these case studies. Figure 2.5 represents an attempt by the author to create a functional framework through which to evaluate and develop community-university PPGIS. This chart represents the best practices of the case studies and PPGIS literature. Each of the eleven components of the framework are explored in depth following the figure.

Figure 2.5 PPGIS Best Practices

1) Does the project empower?		Influenced policy or increased visibility
2) Who participates?		High participation leads to more successful projects
3) Who has access and how?		High access leads to more successful projects
4) What is the projects scale?		Smaller is better
5) What local knowledge is supplied?		Integrated local knowledge
6) What are the products?		Project should have tangible deliverables
7) What are the projects goals?		Establish goals at projects start
8) What is the projects timeline?		Should be >2 years
9) What are the partners' roles?		Develop a clear contract
10) Is the project sustainable?		Provided training, education, staff, etc.
11) Who controls and owns the data?		Data is owned and controlled by the community

Source: Author

The ability to empower residents and the community is largely based on the local political climate and cooperation between various organizations, but this is also one of the primary goals of a PPGIS (Hoyt, Khosla et al. 2005). While the university provides community groups a number of resources including staff, hardware, data, and software, it can empower them by opening doors to larger political network and increase the broader visibility of the neighborhood. Yet, to truly provide empowerment through a PPGIS, something productive needs to happen. The community must be able to exercise power and see changes as a result of their participation in the community-university partnership. This empowerment could be the result of coordinated work between neighborhoods that would have otherwise operated independently. It could also include closer networking with local government and regional political organizations.

To create a viable PPGIS, there must be participation. The level of participation in the community/university partnership should be at the partnership, delegated power, or citizen control levels of the Arnstein ladder (Arnstein 1969). This ensures that the community members are guiding and developing the partnership. The level of participation is closely linked to the creation of a contract before the PPGIS begins. The possibility for a university to limit community participation at the levels of informing or manipulation is too real. The practice of helicopter research, projects where researchers fly in and out without involving the community, is a common occurrence. The ultimate failure of the community/university partnership is placation or manipulation that masquerades itself as participation. These efforts cause frustration and a distrust of future partnerships.

Before a partnership gets underway, a contract should be established that outlines the goals of the project. With the establishment of these goals, both parties understand what the expectations of each other are. This contract should be revised on an annual basis to ensure that the PPGIS is meeting the expectations and fulfilling the promises that were spelled out. Approaching the creation of the PPGIS as a business partnership will create a clearly defined project that will be more likely to succeed.

Full community access to data promises to be a problem for community/university partnerships if the community does not have the necessary resources to store the data locally.

The questions that need to be raised are: *Where is the data housed? Who will conduct the quality assurance and quality control? Do residents have full control of the data? Will residents be trained in the use of GIS or will this work be done by students and faculty? Will data be hosted on map servers? Do residents have computers and internet access that allows them to use the PPGIS?* While these questions can be answered in a variety of ways and still meet the goals of providing a PPGIS, they need to be addressed by the actors involved in the development of the project. The higher the degree of access, the more likely the PPGIS is to succeed (Tulloch and Shapiro 2003).

When a community/university partnership is proposed, the university should be able to commit itself to a long-term project. In semester long projects there is not suitable time to establish a clear understanding of the goals, get the project started, and accomplish the tasks. With a timeframe of at least two years, there is enough time to understand the community's needs and also for the community to understand the motives and role of the university (Seltzer 1999). Yet, a partnership can also carry on for too long, with one of the parties becoming dependent on the other. The PPGIS must strike a balance between these two extremes.

University-community partnerships need to stress the creation of useful products (Merrick 2003; Henry-Nickie, Kurban et al. 2008). These products will exist even in the event of the partnerships dissolution and can hopefully continue to be used by the community. Products are tangible proof that the partnership is creating something. A university can provide printed maps, reports, database development, and other services that the community does not have the resources or ability to buy or produce.

The roles of the university and community group should be established by the PPGIS contract. The university can provide graduate assistants, training, data, management, and other valuable resources, but it must be clear what is being provided. Secondly, the community should commit its resources and time to show an investment in the project.

The smaller the geographic scale of the project, the more manageable and successful it will be. A PPGIS partnership can always grow. By attempting to expand too quickly or cover too much territory, the project will not be sustainable. A PPGIS relies on committed and devoted community members and without establishing these relationships and growing the partnership over time, it threatens to implode.

To create a sustainable PPGIS, the university must try to envisage the end of the partnership and the resources the community would need to keep the PPGIS operational. This includes helping the community with grant writing, software training, the development of manuals and guides, and other products. Professors with coterminous research interests and graduate and research assistants can provide a broad array of talent and skills that non-profits would otherwise be unable to afford. These efforts should work towards ensuring that the PPGIS would be functional without a large investment of time from the university. While a university might have a long-term commitment to a community, it is most likely that the partnership will end at some point and the partnership should be preparing for this termination.

Lastly, the community should control and own the data developed through the partnership. While the university can aid in developing methodologies for data development and database design, the community should have ultimate control and ownership.

2.6 Limitations

The community-university partnership serves as a strong model of PPGIS provision, but it has a number of constraints. One of the biggest limitations of the model is that decisions about the PPGIS and control of the GIS are not directly in the hands of the community. Yet, as explored earlier, this is only a limitation if this conflicts with the goals of the PPGIS. If full control of the GIS is a community necessity, a community-university partnership might not be the best model for the delivery of a PPGIS. When the goals and needs of the community are not placed in the forefront of the PPGIS mission, the university is co-opting the community to accomplish its own goals. While community-university partnerships may not begin as PPGIS, when they evolve as such, a full review of the project should be undertaken by both parties.

The university calendar is a crux in the creation of a sustainable and well functioning partnership. When the university goes on break, or when graduate students matriculate, the needs of the community group do not stop. This creates a stop/start scenario where a lot of work can be front-loaded into the months when school is in session, but if a community has needs during a break, they are stranded without the proper resources and skills to accomplish their goals. With the matriculation of students, there is a constant turnover of volunteers who will constantly need to be re-trained, which can add a burden to the limited time and staff of the community group.

While the university is working to assist the community group, it cannot be forgotten that the university has its own motivations. The faculty members working on a PPGIS have a motivation to produce research, which can guide many of the partnerships decisions. If a faculty member leaves the university or shifts their focus of interest, a community group can be left without the skills or resources needed to continue. This is where the responsibility for creating clear contracts of service and duration become most important. This also relates closely to control and ownership of the data. The community group needs to clearly understand what the motivations are for the university faculty and staff.

There needs to be a stronger component of outreach to community groups that have a limited understanding of what GIS and the development of PPGIS projects could yield. Many of the partnerships that move forward occur because the community had a pre-existing understanding of the value of spatial data. This lack of geographic or spatial knowledge hampers many of the initiatives that seek to create PPGIS projects. Universities need to provide outreach efforts to schools and communities that demonstrate the benefits of PPGIS.

2.7 Summary

PPGIS offers community groups and disenfranchised populations the chance to display and use spatial data for their own objectives. The use of GIS by these groups empowers them with the tools to influence policy, yet only when planners and local power listen. This tool empowers only when the community sees change happen as a result of the PPGIS. GIS offers a way for residents to organize and present their concerns in a language that officials understand. Using PPGIS, residents control the dialogue but adopt the technical language and tools of the planner. The way that community groups can use GIS varies, but the development of the community/university PPGIS model provides an easy entry point into the world of PPGIS provision. This background into the history and development of GIS and PPGIS shows that there is a wide degree of variability in GIS provision, but that there are commonalities between successful projects.

The following chapter will look at the historical development of New Orleans and its relationship to water. This relationship guided the physical construction of the city and created areas of risk. The chapter will then explore the ways that the emergency response community used GIS to respond to Hurricanes Katrina and Rita and how improvements to this system could be initiated. The topography of the city and the response to the storm relates directly to the data sharing, partnerships, and access to data that would play a role in the development of PPGIS in the city's recovery after Hurricanes Katrina and Rita.

Chapter 3: Initial GIS Response to Hurricane Katrina

3.1 Introduction

The role of GIS in emergency response and management is not the focus of this work, or this chapter. This section focuses on the GIS tools and resources that were used and developed in the direct emergency response effort of Hurricane Katrina and Rita and discusses the need for cooperation with and integration of PPGIS. Comprehensive Emergency Management is divided into four components: mitigation, preparedness, response, and recovery (Cova 1999). This chapter is primarily concerned with the response phase in the aftermath of Hurricane Katrina and Rita. Looking at the way that GIS was used in the response phase of the disaster, by both the government and the public, it is clear that there is room to create a GIS that identifies all phases of a disaster. By laying out the development of the response phase of the GIS, we can see that there are tools and resources that could and should be utilized for the recovery phase. While public agencies responded to the disaster and created a GIS clearinghouse model for emergency responders, there were publically created GIS that formed to fill the vacuum of public spatial needs and these PPGIS have continued to play an important role in the recovery.

This chapter starts by looking at the historical development of New Orleans and its relationship to the Mississippi River, levees, and flooding. The topography of New Orleans played a pivotal role in guiding the development of the city through the 19th century and the built environment and topography were also closely related to issues of class and race. Without a clear understanding of the development of the city and this close relationship to water, the response of residents, government, and planners who worked in the response and recovery phases of the city cannot be understood.

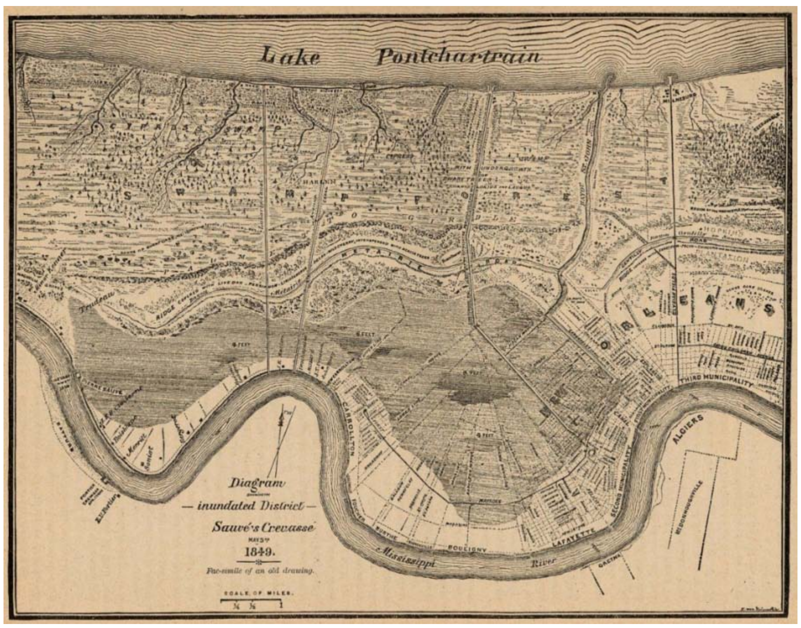
3.2 New Orleans Historical Development and Flooding

New Orleans was founded at the site of the present day French Quarter, as a city that sat along the natural Mississippi River levee, some 12 feet above sea level (Colten 2006). New Orleans development is a history that deals with the control of water and understanding this struggle is crucial to an understanding of the city and the city's response, planning, and recovery from Hurricane Katrina. Sitting in the middle of a vast flood plain, the city has been intrinsically tied to water and the control of that water, with development linked to the slight variations in topography that placed homes either above or below sea level (Colten 2006).

The development of New Orleans continued along the Mississippi levee and the Metairie, Esplanade, and Gentilly ridges through the 18th and early 19th centuries. The most affluent residents, balanced themselves between risk and nuisance; the malarial swamps north towards Lake Pontchartrain and in present day Central City, and the noise and stench of the Mississippi docks and wharves (Campanella 2007). The less affluent residents of New Orleans, typically African-American and recent European immigrants, were forced to live in the areas of the city with the lowest land prices, which was land sited in the lowest elevations or along the wharves of the Mississippi.

The high-ground that the most affluent residents settled on were the historic levees of the Mississippi River that formed in the thousands of years of natural floodplain development. Map 3.1 below shows the flooding of New Orleans in the year 1849, resulting from the Sauvé Crevasse levee breach. This map shows that the city's development up to 1849 was still restricted to the naturally occurring ridges, which spanned from the present day French Quarter to the Carrollton neighborhood along the Mississippi levee. The center of the present day city was surrounded by the Mississippi levees and the historic levees, or ridges, creating a natural bowl. In present day Mid-City and Central City these neighborhoods were swamp reserved for pasture. The vast cypress swamps and marshes that led to Lake Pontchartrain, where present day Lakeview, Gentilly, and New Orleans East sit, were the city's natural storm drains, allowing water that fell inside the levees to drain towards the lake. These areas had yet to develop and would not develop extensively until the 20th century. Yet, development pressure was already starting to increase construction in lower lying areas in the mid 19th century.

Map 3.1 New Orleans in 1849



Source: (George E. Waring 1886)

In 1903, the Drainage Commission merged with the Sewerage and Water Board, which had been founded in 1899, with the mission to provide water, sewerage, and drainage for New Orleans (Board 1971). The proposed drainage plan would provide drainage for every part of the city (Colten 2006). Any water that falls in the City of New Orleans must be pumped out of the city by way of the extensive canal and pump network developed by the Sewerage and Water

Board. In 1917, newly designed wood screw pumps added much needed capacity to the system, allowing the Sewerage and Water Board to lower the water table even further (Gomez 2000; Colten 2006). In effect, topography was neutralized (Campanella 2007) Thus began the drainage of Central City and the large expanses of swamp and marsh in present day Lakeview and Gentilly. It was this expansion of the system that opened up the Broadmoor neighborhood to development. While the pumps solved the initial problem presented by swamp land, these areas were still well below sea level and were prone to flooding and subsidence. The seasonal flooding that had added soil and sediment to build up the New Orleans region was now being flushed into the Gulf. With the water now drained from these low-lying regions, the soils started subsiding and compounded the threat from flooding (Colten 2006). As depicted in Figure 3.1 below, the city acts like a bowl, with any water that falls within the levee system needing to be pumped out. With both the Mississippi River and Pontchartrain Lake now heavily fortified with levees, natural drainage from the city could no longer occur.

Figure 3.2 City of New Orleans Ground Elevations

Source: (Alexdi 2009)

3.2.1 *New Orleans Continues to Grow*

With the continued expansion of the drainage system, the bottom of the bowl became a residential neighborhood that was predominantly African American by the 1930's. Secondly, the drainage systems expansion northwards towards the lake made it possible to develop the lakefront neighborhoods (Shallat 2000). With the creation of the seawall along Lake Pontchartain, higher levees, and dredging that created more land, the post-WWII population boom expanded into New Orleans East, Gentilly, and Lakeview. With blatantly racist deed covenants, the white middle class exploded into the lowest elevations. Yet, the levee and drainage systems created a false sense of security. Much the new construction was built at grade, with little heed paid to the areas' history as a cypress swamp.

3.2.2 *New Orleans Major Flood Events in the 20th Century*

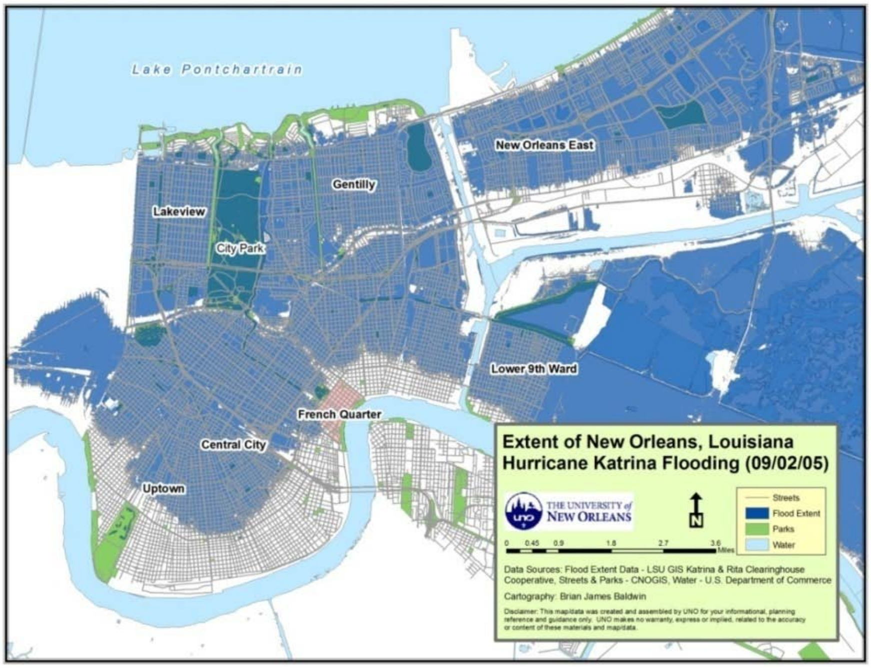
Over 9 square miles of Orleans Parish and 30 square miles of Jefferson Parish were inundated with water along the lakefront during a storm event in September 1947 (Colten 2006). In 1956, Hurricane Flossy filled 2.5 miles of Gentilly as the levees were overtopped (Roth 2010). Levee breaches during Hurricane Betsy in 1965 caused severe flooding in Gentilly and the 9th ward (Colten 2006; Roth 2010). Owed to an over reliance on structural protection, all of the low-lying areas in the New Orleans region are at risk to flood loss and many areas have experienced flooding numerous times. It was not until the 1990's that floodplain management policies started to influence building standards (Colten 2006). Federal policy shifted with the passage of the National Flood Insurance Act of 1968, which promoted a land-use approach to development and discouraged flood protection projects (Colten 2006). While New Orleans had experienced years of flooding and levee failures in its history, no one was prepared for the cataclysmic engineering failure caused by the storm surge from Hurricane Katrina. Yet, years of local, state, and federal policy that placed emphasis on the structural safety provided by levees, led to the development of the highest risk areas of the city.

3.3 The Storm

On Monday, August 29th 2005, Hurricane Katrina made landfall as a category 3 hurricane along the Louisiana coastline. Katrina caused billions in damage along the Gulf Coast, largely a result of the storm surge that inundated coastal towns and cities in Louisiana, Mississippi, and Alabama. With a storm surge predicated to be near 28 feet in the New Orleans region, the worst was assumed for the metropolitan area. With such high levels of water, it was predicted that the earthen levee and flood walls protecting the city would easily be topped (Drye 2005). As the storm made landfall and hurricane force winds hit the city, a great deal of damage was caused.

The roof of the Superdome was nearly sheared off and the Hyatt Regency of New Orleans experienced extensive damage, with the majority of its windows being blown out. Yet, New Orleans escaped the direct effects of the storm relatively unscathed. It looked as if the city had been saved from the cataclysmic flooding that had been predicted. While the winds started receding, the storm surge coupled with design flaws in the city's levee and flood wall system caused multiple failures across the region, the most devastating of which occurred in Orleans Parish (Anderson, Battjes et al. 2007). The storm surge led to 53 failures in the federally built levee and flood wall system that surrounded and protected New Orleans. These failures left 80% of the city flooded (Swenson and Marshall 2005). Structural failure of the flood walls along the London Avenue Canal, 17th Street Canal, and the Industrial Canal flooded major residential portions of the city. As Map 3.2 depicts, the lowest lying areas of the city were filled with water. The water sat in many places for days, causing damage to the vast majority of New Orleans residential housing stock, its streets, sewer, and water lines. Three weeks after Katrina, a second storm, Hurricane Rita made landfall in Western Louisiana. While 90% of the city had been drained, easterly gales coming off of Lake Pontchartain caused a second breach of the industrial canal and led to re-flooding in the Lower 9th ward (Murphy 2005; Roth 2010). It was not until mid-October that all of the water was removed from the city (Colten 2006). The estimated damage to both residential and non-residential property was nearly $21 billion (Anderson, Battjes et al. 2007). As of August 2, 2006, 1,118 people were confirmed dead in Louisiana as a result of Hurricane Katrina (Anderson, Battjes et al. 2007). The flooding caused by the levee failures during Hurricanes Katrina and Rita represent one of the worst disasters in the history of the United States. While New Orleans had experienced flooding throughout its history, the sheer scale of the flooding caused by the levee breaches was unlike anything dealt with heretofore.

Map 3.2 Extent of New Orleans, Louisiana Flooding, September 2nd, 2005



Source: (Baldwin 2009)

3.4 The Role of GIS in the Hurricane Katrina and Rita Emergency Response

3.4.1 *Introduction*

A broad coalition of volunteers, paramedics, police, firefighters, and countless others responded quickly and bravely to the needs for displaced residents and New Orleanians who found themselves trapped in the flooded city. The response of many of these personnel, some of them stepping into New Orleans for the first time, was directly hinged on their orientation in the ravaged city. Many personnel used simple road atlases and maps with great success. Yet, the response of the GIS community in creating custom maps, disseminating information, and coordinating this work between agencies played a vital role. The sheer scale of the storm resulted in a multitude of different GIS response efforts across the region. Along the Mississippi Gulf Coast, volunteers worked with the Mississippi Emergency Operations Center to provide mapping and search and rescue operations. In Baton Rouge, GIS work to assist search and rescue and any other need was completed at the Department of Transportation, which housed the dislocated Regional Planning Commission and its planning operations in the aftermath of the storm. There was also a strong collaboration between the Louisiana State University (LSU) and the Federal Emergency Management Agency (FEMA), which created a storage space for sharing and housing data. By laying out the development of the response phase of the GIS, we can see that there are tools and resources that could and should be utilized for the recovery phase. While public agencies responded to the disaster and created a GIS clearinghouse model for emergency responders, there were publically created GIS that formed to fill the vacuum of public spatial needs. Yet, these aspects of the post-Hurricane Katrina and Rita effort have not been well documented (Mills 2008).

3.4.2 *The Regional Planning Commission (RPC) in Baton Rouge*

Much of the response to the emergency at the state level occurred at the Louisiana Department of Transportation and Development (LA DOTD) in Baton Rouge Louisiana. The role of the LA DOTD was to work search and rescue with the Coast Guard, produce data and obtain resources for state agencies, and process requests that came down through the Governor's office or the Secretary's office. Many of the staff were working 18-20 hour days producing maps and processing data (Dupont 2010). The products that were the most valuable were maps of aerial imagery with grid and street overlays. These maps were being used by the helicopter pilots and other first responders for orientation in the still heavily flooded city. The process worked well because there was production of maps and data outside of the chaos that was the Emergency Operations Center (EOC) in Baton Rouge (Katrina 2006).

In the aftermath of the storm, staff members started arriving at the LA DOTD in a few days time. A temporary working environment for the Regional Planning Commission for Jefferson, Orleans, Plaquemines, St. Bernard, and St. Tammany Parishes (RPC) was created on the second floor of the LA DOTD. As calls started coming in from different agencies, it was clear that there were datasets that were still unaccounted for and would be needed. The datasets that were of crucial need were aerial imagery, sewerage and water board information, signalization, and the parcel information for the city of New Orleans. Many of these datasets were either housed in the RPC's New Orleans downtown office, or spread between various private and public agencies. The Louisiana Geographic Information Center[5] (LAGIC), headed by Director Craig Johnson was one of the points of contact for agencies when they were looking for data and wondering where it might be found. LAGIC served as one of the main contact points for data dissemination because it already housed a great number of the datasets that would be needed and more importantly, knew the contacts for who had data and who would need what data. This was possible through its service as staff to the Louisiana GIS Council. There were also proprietary concerns about sharing datasets because a great deal of the data had no data sharing agreements in place. With the vast majority of communication infrastructure down in Louisiana, there was no way to contact agencies and staff to get these much needed permissions. With vital datasets housed in the RPC's New Orleans office, it was necessary to make a trip and physically obtain the data.

To get the data from the RPC, roughly one week after the storm and soon after the Louisiana Superdome had been cleared, a van from LA DOTD made the trip to downtown New

[5] http://lagic.lsu.edu/

Orleans to obtain computers and hard drives. Without the ability to contact the New Orleans Sewerage and Water Board about distributing their data because no one was able to get in contact with them, it was decided that it was necessary to try and get the data and then figure out what to do afterwards. Provided with passes to enter into Orleans Parish by the Port Authority, the team made their way downtown. One of the team members (Dupont 2010) recalled this scene after arriving in Downtown New Orleans:

> "...There was garbage piled up, you could see water down the street, helicopters were flying, we were told to make sure we were out of the city by 3'o clock, it was probably 10 when we got in. There was no electricity and windows were falling, we parked on the side of the building, by the Hyatt, just pulled up on the glass. We go into the back door by the loading dock and were met there by National Guard, they had secured the building and everyone had bullet proof vests on and knives strapped to their legs, and I had a gun put in my face, the second one that day. My biggest memory was an ice cream machine in the basement of the building, it had melted and soured all over the floor and when you opened that door, it was horrible"

With the RPC's offices on the 21st floor and with no power, the staff staggered themselves in the stairwell and spent the following hours moving computers and hard drives out of the building. Using duct tape to create temporary handles, the computer towers were moved carefully down to the van. Any data that might have been of use was taken, because no one knew exactly where certain datasets were stored. Windows had broken in some of the offices, but most of the data and computers were visually intact. One of the most important pieces of equipment that was removed that day, was the server used by RPC. When the server was brought back to Baton Rouge, e-mail for RPC was reestablished, which gave access to contacts that had been unavailable. The server was also paramount in that it was an early link to the Louisiana State University (LSU) GIS-Store, the central data storehouse. While the server at LA DOTD was initially firewalled from sending and receiving data from LSU, the RPC server acted as an important link between both worlds. The data that was removed from the RPC office was also invaluable. While it was nearly impossible to set up formal data sharing agreements in the midst of the disaster, data requests came and went and data was shared with whomever needed it.

Both LAGIC and RPC witnessed a flood of contractors that started offering their services. LAGIC spent hours collecting and categorizing aerial imagery that was flown by a number of private companies (Johnson 2010). Much of this data was provided for free, but a great deal of it was useless because it did not cover the areas for which aerial imagery was needed. Secondly, some of the aerial imagery also came to LAGIC without any reference, it was simply raw imagery that was downloaded and placed on a shelf, where a trained staff person would need to take the time to look at the data and process it. To obtain imagery for the entire Gulf Coast, a private firm, 3001, was contracted by FEMA. Yet, the contract was drawn up hastily and did not include simple measures that would have provided a more useful product. The lack of overlap between the FEMA response and recovery phases of the disaster contributed to this error. The Department of Defense (DOD) was also spending time flying the coast to create aerial imagery, but they did not have the permissions to share this data. In many of the rural parishes that covered vast areas, the DOD were some of the earliest agencies to collect imagery and this imagery was needed badly in these areas, but was unavailable for local government use. In the end General Electric conducted flights of the coastal regions and released this data. Yet, less strict sharing and controls of the data on the part of the DOD would have aided greatly in the disaster response.

The primary role of the GIS staff at the LA DOTD was to get data, dump the data to the GIS-Store and let people know what data was available, and then just let the emergency responders work. The staff also produced maps. One of the earliest maps that was produced by a staff member at the RPC showed flood depths and the location of signalization boxes (Dupont 2010). This map would go on to be used by the National Guard to start restoring signal boxes in places where they would still be operable.

As RPC continued to work, they ran into trouble with how the Federal Emergency Management Agency (FEMA) was rotating personnel every 30 days. With the lack of trained FEMA staff, a great deal of training had to be dealt with by the staff at RPC before the FEMA staff could help. Also, when these staff finally understood the situation on the ground, or made promises to local officials and contacts, they would be rotated out with a new staffer that needed to be trained. Secondly, there was a lack of trained staff from the Louisiana Office of Homeland Security and Emergency Preparedness (LOHSEP), renamed GOHSEP (Katrina 2006)

The sheer scale of the disaster was something that most people had a difficult time comprehending. When FEMA officials arrived on the ground, many of them had come from other emergency situations or started to use lessons from other disasters, but the scale of Katrina was beyond comparison and big ideas needed to be brought forward.

3.4.3 *The Louisiana State University (LSU) GIS Clearinghouse Cooperative*

On August 31st, a meeting between the Louisiana State University (LSU) and the Federal Emergency Management Agency (FEMA) laid the groundwork for what would become the LSU GIS Clearinghouse Cooperative (LGCC) (Mills, Curtis et al. 2008). One of the most fundamental components of the LGCC cooperative was the establishment of the FEMA-store, a 20 terra-byte dedicated server space for spatial data relating to the recovery effort. FEMA-store would later be renamed GIS-Store[6]. Computers were moved to the Emergency Operations

[6] The site is still active at: http://www.katrina.lsu.edu/

Center (EOC) in Baton Rouge on September 1st and on September 3rd staff gathered to discuss the operations and management of the GIS desk and the functioning of the LGCC (Curtis, Mills et al. 2006a). Relationships between members of local organizations that included the Louisiana State University Computer Aided Design and Geographic Information Systems Research Laboratory (LSU CADGIS), the LSU Hurricane Center, World Health Organization Collaborating Center for Remote Sensing and GIS for Public Health (WHOCC), the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP), and others were used to bring staff and resources into the operation (Boyd and Mills 2007). The mapping and spatial visualization needs of the emergency response personal were not complex, they consisted primarily of basic atlases and the use of web based mapping services (Boyd and Mills 2007). One of the earliest needs for spatial data came from the emergency services helicopter pilots who needed aerial imagery and coordinates of evacuee centers (Curtis, Mills et al. 2006a). Secondly, another vital need was for a map book of New Orleans, which could include updated data and layers to respond to changing circumstances on the ground (Boyd and Mills 2007). With emergency personnel that started arriving from all across the United States, there was a strong need for basic maps that would orient staff to the local geography.

The GIS desk was just one of the many stations in the EOC, with personnel from all levels and agencies of the government. With such limited space and resources in the EOC, the LGCC was not equipped to handle all of the GIS needs of the emergency response effort in house and its operation required a great deal of cooperation behind the scenes to support the GIS desk at the EOC. The WHOCC lab donated laptops and plotters and the CADGIS lab at LSU was staffed by students and faculty who used its 5 plotters and 60 PCs for data and map production (Boyd and Mills 2007). The faculty and staff in the CADGIS lab were in constant contact with the LSU team in the EOC. Finished products were posted to the GIS-store so the GIS staff could print finished maps directly at the EOC. When the plotter in the EOC was overwhelmed with print requests, maps were printed at the CADGIS lab and hand delivered to the EOC (Boyd and Mills 2007). All of the data that was relevant to the recovery was placed in the GIS-store, with limited access to the staff at the EOC, LSU CADGIS lab, and RPC (LA DOTD). The data was secured based on the agencies that provided the data, meaning that different agencies could view and use data, but not edit across agencies. Much of the base data that went into the GIS-store was purchased by FEMA and other agencies, which included satellite and aerial imagery (Mills, Curtis et al. 2008).

The role of the GIS desk evolved over the phases of the disaster, but its primary goal was to provide any spatial information and coordinates as quickly and effectively as possible from inquiries by a host of agencies. The LGCC provided road atlases, analyzed and delivered aerial imagery, and printed maps for daily progress maps for briefings with political figures (Curtis, Mills et al. 2006b). The GIS desk at the EOC also responded by answering spatial questions verbally and by text. If a map could not be provided because someone was already in the field, the GIS desk provided an invaluable resource by giving directions and information over the phone (Curtis, Mills et al. 2006b). The goal of the EOC was the production of maps that were functional, not aesthetically pleasing (Boyd and Mills 2007). It became apparent very quickly that cartographic clarity and accuracy needed to be suspended because of the urgency. The lack of basic layouts and map templates set up with logos and base layers was an early problem (Curtis, Mills et al. 2006a). If these layouts been created before the emergency response, a standardized base map could have been adapted very quickly to fill different needs.

One of the most important roles of the LGCC staff in the EOC was not for traditional map production or desktop GIS, but the use of web based mapping services similar to *Google Earth*. Traditional GIS is not always the best use of time in a disaster response and there are a host of tools like *MapQuest*, *Google Maps*, and *Google Earth* that can be used for a majority of the questions and problems that arise during an emergency situation (Boyd and Mills 2007). One of the favorite uses of *Google Earth* in the EOC looking at a flood overlay on aerial imagery (Curtis, Mills et al. 2006b). *Google Earth* was able to provide a quick and efficient answer to common inquiries regarding flooded areas (Curtis, Mills et al. 2006a; Boyd and Mills 2007). Rather than employing the time and skills of someone trained in GIS to perform these basic queries, *Google Earth* proved its usefulness very quickly.

3.4.4 *Grassroots Public Participation GIS During the Emergency Response*

In a search for basic answers to spatial questions, PPGIS arose during the response phase of Katrina. In the most well documented case following Katrina, two software engineers in Texas, one of whom was a New Orleans native created the *Google Maps* application programming interface (API) mashup, *Scipionus.com* (Laituri and Kodrich 2008). One of the founders of the site saw the need for a more spatial approach to people's inquiries in the aftermath of the storm. Message boards were useful, but they failed to answer spatial questions in the most efficient way (Singel 2005). In only 3 hours, a 23 year old designed the website and layout and went to bed thinking nothing of it. On August 31st, only two days after Katrina made landfall, the site started receiving thousands of hits after only one day (Singel 2005). The layout, functionality, and ease of use of this website was something that had not yet been developed in any PPGIS community (Miller 2006). With direct user input, *Scipionus* showed the location of pets, people, and also let individuals post responses. Users placed markers across the map and added comments. The website proved the vital functionality that a PPGIS could serve during an emergency response effort. Yet, underscoring the problems that face PPGIS efforts, this website is no longer active. If a similar website could have been developed and cultivated, as a stable, trusted and reliable source that residents and community groups could go to before and during the next emergency, it would meet an even more important goal. By creating a stable and sustainable PPGIS website such as *Scipionus*, residents and community groups would know that the tool was available before and immediately after a disaster event. Emergency responders and local government would be able to use the tool as well.

3.5 Best Practices

As a result of the way that the GIS and data needs of the Katrina and Rita response effort were handled, FEMA is considering using the LSU GIS Clearinghouse Cooperative as the model for all other disaster management situations (Curtis, Mills et al. 2006b). The LGCC proved its effectiveness and GIS played a major role in the emergency response effort. There were a number of best practices and lessons that the staff and workers learned from establishing and running the LGCC and many of these will only go towards improving the LGCC model the next time it is implemented.

The City of New Orleans opened up its data sharing policy and has allowed for more access to data, but not full access. There have also been important data sharing agreements established between the city and The Sewerage and Water Board, to ensure that there are duplicate datasets and that more than one individual has access to important data.

While the organization of staff and resources at the GIS desk in the EOC was not as efficient as it could have been, the lack of a set structure allowed for the LGCC team to respond and adjust to changes rapidly (Curtis, Mills et al. 2006b).

One of the most important lessons from the Katrina and Rita emergency response was the need to establish a volunteer pool of GIS practitioners that could quickly respond to the next disaster (Boyd and Mills 2007). With proper training and networks in place prior to the next disaster, the critical first hours in the disaster response will be much more organized and effective. The faster a GIS team could arrive and understand their role, the more effective they make everyone's job in the emergency response effort. One of the results of Hurricane Katrina and Rita was the exponential growth of the organization GISCorps[7]. GISCorps is part of the Urban and Regional Information Systems Association (URISA) and it is a group of GIS professionals who volunteer their time for a long list of GIS projects across the world. In the aftermath of Katrina and Rita, the number of GISCorps members tripled in nearly four days (Unknown 2005). The astounding growth of the GISCorps provides an even more stable foundation of volunteers and professionals who are ready to respond to the next emergency.

The importance of strong relationships in the GIS community ahead of the disaster, including public-private partnerships and university partnerships, played a direct role in the success of the LGCC, RPC, and LAGIC (Boyd and Mills 2007; Dupont 2010). Without prior relationships, much of the work that was undertaken just days after Katrina made landfall would not have been possible. Secondly, one of the best resources for any local community in preparing for a disaster is by fostering a strong university partnership. A university is vitally important when it comes to harnessing all of the manpower and physical resources that are necessary to operate a GIS in an EOC (Curtis, Mills et al. 2006b). The graduate students, staff, and hardware at LSU, coming from a myriad of departments and research institutes were able to

[7] http://www.giscorps.org/

start working very quickly. The rate of recovery is based in part on the conditions and organization of the people pre-disaster (Mills 2008). By establishing strong working relationships between emergency groups, universities, local government, and others, the resources and roles of each organization can be better understood before the disaster situation.

During the Katrina and Rita response, the hectic nature of the EOC showed that it was clearly not the place for the majority of map production or data analysis to occur. The GIS desk in the EOC was used primarily for immediate needs map production and GIS. The GIS desk in the EOC should function primarily as a request collection center and then the real GIS processing will occur off-site, possibly in a university setting (Curtis, Mills et al. 2006b). By removing the majority of the GIS work from the epicenter of the response effort, it is possible to have more space and a more dedicated lab to function as the GIS headquarters.

Having the GIS-Store and all of the relevant data it contains, along with the metadata and organizational structure will prove invaluable during the next disaster event. The LGCC created a repository of data that is available to analyze trends from both Katrina and Rita. While much of the data proved valuable for the initial response effort of the disaster, the data can be used in the post-event analysis and recovery phase of the disaster (Mills, Curtis et al. 2008). The LGCC is not simply a hard drive filled with data, if it is updated and managed correctly, it will be a working resource for the recovery effort and serve as a mitigation tool for the next disaster event.

3.6 Limitations

During Hurricane Gustav in 2008, the GIS lab at LSU was left useless when the power went out soon after the storm struck Louisiana. The system established by Katrina and Rita that kept the EOC separate from the GIS lab worked well during the previous storm, but showed its frailty. Plotters were moved from LSU to the EOC and the work was accomplished, but the set back was unanticipated (Dupont 2010). Gustav proved that the data center should be as far removed from the potential epicenter of the disaster. Katrina and Rita also emphasized the need for off-site data backups so that trips into a disaster area would no longer be necessary to retrieve data. Offsite data backups have since become part of the RPC and City of New Orleans operating procedure.

In the more rural parishes, problems did not revolve around the lack of coordination to share data; it was simply that a lot of the data that was needed did not exist. In many places, there were still paper maps being used and there were no digital copies of parcels or infrastructure. When these datasets were needed, they simply did not exist. A more thorough effort needs to be conducted to ensure that these rural parishes have the data that they need and that this data is stored offsite as well. Aerial imagery of the rural parishes was a dataset that was in strong demand.

The need to have qualified and competent staff who can respond to changing needs and circumstances will not ever get around the increased speed and agility that standardization would bring. Standardized map layouts and data are important, but they can also have their drawbacks. When civilian pilots responded to the disaster and needed maps with grids they were familiar with, these maps were produced. If a standardized grid system had been in place, the pilots may not have been as effective in their role.

The GIS-Store provides a wealth of data, yet this database is not accessible to the public. During the response to the disaster, the GIS-Store needs to be accessible only to emergency responders. Yet, this wealth of information could aid neighborhoods and residents in the recovery phase. Access to the LSU GIS-Store is currently limited to LSU Staff, Federal Emergency Management Agency staff, as well government officials (Mills, Curtis et al. 2008).

Data that is strictly proprietary does not need to be shared with the public, but a better effort needs to be undertaken to allow more access. While portable document format (PDF) and *Joint Photographic Experts Group* (JPEG) maps are available for the public, there are no interactive maps or shapefile layers that can be imported into a GIS (Mills, Curtis et al. 2008). Secondly, the GIS-Store should improve its metadata, and explore ways to let more people contribute data (Brown, Dixon et al. 2006). Keeping data up to date and organized along with having helpful metadata is something that is undervalued and forgotten many times, especially in the disaster response phase.

While data could be shared more readily with the public after the disaster, the public could also aid emergency responders in the disaster response. The on-line disaster response community (ODRC) is an ad-hoc collection of interested individuals collecting and disseminating data through blogs, podcasts, websites, pictures, maps, and through other means (Laituri and Kodrich 2008). The failure to use the ODRC is one of the biggest drawbacks of the official GIS response. Both groups would benefit from sharing information and resources. In the aftermath of Katrina and Rita, the ODRC responded by creating Scipionus, a fully functioning PPGIS. The emergency response effort could have been buttressed if officials knew about this resource and if it was promoted. Coordination before an emergency event should occur and would add value to both sides (Laituri and Kodrich 2008). There is a need to bring all levels of community and government together in order for a systematic approach to recovery to occur (Mills 2008).

Hurricane Katrina caused a great deal of change in the GIS community. One of these changes has been the increased role of the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP). Post-Katrina, there was a real understanding of the need for aerial imagery (Johnson 2010). In the aftermath of Hurricane Katrina, GOHSEP developed Virtual Louisiana[8], a website that hosts a variety of data layers and imagery, yet all of this data is not available to the public. To request access to the data, it is necessary to have a .gov e-mail address. While the coordination and centralization of data is vitally important in preparation for the next emergency event, the tight controls that are placed on data sharing will continue to stymie creative and productive uses.

The nature of the disaster opened doors and created collaborations for data sharing that would have otherwise not existed. Yet, the LGCC was created just days before the disaster. It took time to collect data and disseminate this to the agencies that needed it. While the storm created a better climate for data sharing, proprietary concerns trumped the need for collaboration and cooperation (Mills, Curtis et al. 2008). After a few months, data stopped being submitted for inclusion in the LSU GIS Clearinghouse Cooperative (LGCC). While the recovery stage of planning was beginning, there was no longer an open, sharing environment in regard to data (Mills 2009). This would prove to hamper the recovery effort in neighborhood organizations.

An early problem in the emergency response operation was the fact that response personal were unaware of what GIS was and what it could do. So while resources were available, they were not being used as quickly as they could have been (Boyd and Mills 2007). Providing basic training about the use of GIS and maps for emergency responders would have minimized the learning curve.

The need to have unfettered access to the City of New Orleans parcel information was a problem for every agency that was trying to aid in the response effort. This information was not

[8] http://www.virtualla.la.gov/site/

forthcoming, owing partly to the fact that the City of New Orleans GIS department was primarily a contractual department. This data has also been important for community organizations that are trying to develop PPGIS in New Orleans, but the dataset have never been released publically.

3.7 Summary

This chapter addressed the second research objective, focusing on the use of GIS during the response and recovery efforts of Hurricanes Katrina and Rita. GIS played an important role in the response phase of the disaster, but it has played an equally important role in the ongoing New Orleans community recovery effort. Many of the issues relating to data access and data sharing have been similar for community groups and non-profits as they look for ways to develop PPGIS. As the floodwaters started to recede, the planning efforts of local, state, and federal government for the New Orleans area got underway. Many of these planning efforts were started without the input of local citizens and neighborhoods. With a wealth of data available in the GIS-Store that could have aided the community recovery effort, an opportunity for sharing and collaboration was lost. Partly in response to this exclusion, neighborhoods and community groups began forming partnerships with universities to develop PPGIS projects in an effort to redirect the official planning processes.

The next chapter will explore the recovery planning process and three community/university PPGIS partnerships that formed to influence that process. It will seek to document the creation of these partnerships to meet the third research objective.

Chapter 4: Public Participation GIS in post-Hurricane Katrina Recovery Efforts

4.1 Introduction

With an influx of planners and plans invading post-Katrina and Rita New Orleans, visions for the city's recovery started quickly. Yet, it was rumor, hearsay, and the lack of strong policies or direction, along with the multiple plans and planning efforts being played out sometimes simultaneously, that placed residents and neighborhoods into an advocate role. In order to restore services and prove the viability of their neighborhoods, residents started to organize and develop their own plans. The Broadmoor neighborhood of New Orleans, aided by a partnership with Kennedy School at Harvard University, developed plans, reports, and maps to engage residents. Gentilly, relying on a neighborhood organization that formed in the wake of the storm, worked with Dartmouth to establish a mapping and survey system to report on the neighborhoods recovery. Lakewood, starting with Denise Thornton and The Beacon of Hope Resource Center, created residentially driven surveys and mapping tools. Then, with the Beacon of Hope partnering with The University of New Orleans Department of Planning and Urban Studies, the Beacon of Hope/University of New Orleans Community Recovery Project (BUCRP) was founded. With the official planning processes threatening the future existence of whole neighborhoods, residents were spurred into action. By building partnerships and sharing data, communities were able to start mapping and planning by themselves, or with the help of university partnerships.

This chapter is not an opportunity to explore the myriad plans and planning processes that occurred in post-Katrina New Orleans, but a chance to look at the way that communities and neighborhoods responded to these processes with their own plans and developed PPGIS within community/university partnerships as a tool to reclaim their voices. The recovery phase in New Orleans has been filled with uncertainties driven by mixed policy from the top echelons of city, state, and national government. Residents and neighborhood groups responded to these uncertainties in similar ways to ensure the survival and redevelopment of their communities.

4.2 Recovery Planning Begins

Planning efforts to rebuild New Orleans started shortly after the emergency response effort. Mayor Ray Nagin appointed a 17 member commission called Bring New Orleans Back (BNOB) on September 30th, to create a master plan for the city's recovery. The commission was filled with political figures, local businessmen, musicians, and others. The members of the panel were picked to show how ethics and integrity would drive the recovery process (Eggler 2005b). While the BNOB contained a diverse group of members, the City Planning Commission and the City Council were virtually left out of the process. In response to the Mayor's commission, the New Orleans City Council announced that they would be forming an 11 person recovery committee (Donze and Eggler 2005). The City Council commission started off sluggishly and was criticized for adding to the long list of recovery task forces (Donze and Eggler 2005). The BNOB on the other hand, got to work quickly, touring neighborhoods and meeting with high level officials. Yet, throughout the planning process, there was a failure to engage with the public.

In the aftermath of the storm, with severe flooding and damage in major portions of the city, there was a strong degree of sentiment that certain parts of the city could not and should not be rebuilt. While testifying on Capitol Hill on October 18th, Mayor Ray Nagin expressed doubt about whether the Lower 9th Ward or New Orleans East should undergo rebuilding (Alpert and Carr 2005). A firestorm of controversy erupted after the Mayor's comments. One day later, Nagin reversed his statement and promised to rebuild New Orleans East and the Lower 9th as soon as possible (Eggler 2005a). While residents of New Orleans were still trying to grapple with the fact that their lives had been upended just a month earlier, there were already questions about whether redevelopment would occur in certain areas of the city.

One of the guiding forces behind the BNOB commission was the Urban Land Institute (ULI), who offered $100,000 towards the planning process. On November 18th 2005, the ULI discussed their preliminary plans for the redevelopment of New Orleans. In this meeting, ULI presented the first iteration of the now infamous ‘green dot’ map, included below as Map 4.1.

Map 4.1 Urban Land Institute Investment Zones

Source: (Committee 2006)

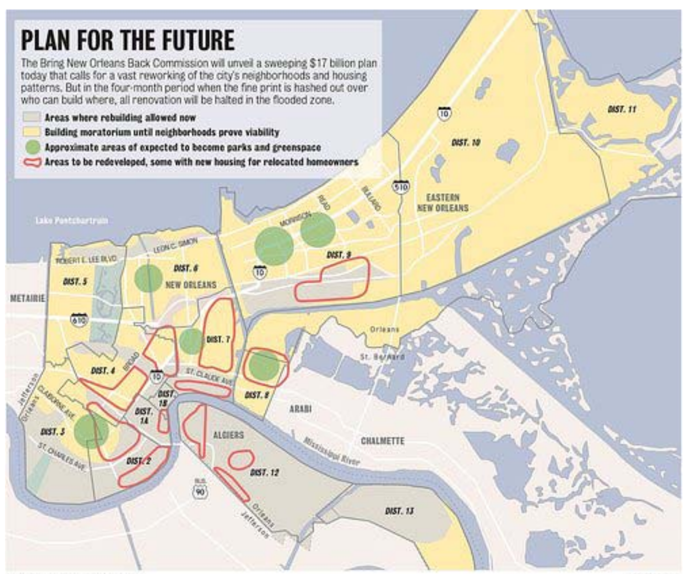
This map presented the New Orleans area carved into three ‘investment zones’. The darker shades represented areas that would receive investment only after reinvestment in the city’s less damaged zones. It was also proposed that the darker shades on the map could be the sites of mass buyouts and conversion of the land back into green space. It was stressed that the darker shaded areas needed additional study to determine what their future might be (Williams 2005).

The ULI recommendation warned of scattered development that would create shanty-towns with little to no property value if residents were allowed to rebuild without a plan (Carr 2005b). Mayor Nagin was not present at the meeting, which was seen largely as the main focus of the work of the BNOB commission (Carr 2005a). The methodology that the group used to create this map would also drive much of the neighborhood planning and grassroots movements and also the future iterations of the plan. The ULI focused on the perceived viability of each neighborhood, saying that neighborhood health was one of the most important factors in determining which areas should be redeveloped.

Mayor Ray Nagin avoided commenting on the plan directly and said he was reserving judgment for the proposal to abandon neighborhoods (Donze 2005). Yet, Nagin also reiterated his intention to rebuild all of New Orleans neighborhoods (Donze 2005). Contradictions such as these would continue to befuddle residents and neighborhoods that were looking for guidance on rebuilding. While Mayor Nagin had mentioned the idea about not redeveloping certain areas of the city soon after the disaster, he had since publically advocated for the redevelopment of New Orleans East and the Lower 9th for more than a month. With the Mayoral election only a few months away, the support of any decision that would be interpreted as the wholesale destruction of major portions of the city would certainly not gain votes. While Mayor Nagin was failing to provide leadership or guidance, the vast majority of residents were left out of the early stages of the ULI and BNOB process. The problem with these early plans was the fact the none of the residents were involved in these early planning decisions (Williams 2005). Amid all of the planning, residents were already returning and rebuilding in these areas. The city was issuing permits to rebuild if you experienced less than 50% damage and people were returning (Grace 2005). It was already being asked if it was too late to stop reconstruction in any neighborhood.

On January 11th, 2006, the *Times-Picayune* published a story summarizing the land use portion of the BNOB plan developed by the Urban Planning Committee (Donze and Russell 2006). The story included a map that became the focal point for the controversy surrounding the plan, included below as Map 4.2. Residents in the neighborhoods that were ‘green dotted’, interpreted the act as a vicious land grab by developers (Russell and Donze 2006b). As spelled out in the BNOB Lane Use report, the green dotting plan was far more innocuous than the symbology of the *Times-Picayune* map led readers to believe, yet the line had been drawn in the sand.

Map 4.2 Plan for the Future



Source: (Donze and Russell 2006)

Through all of the planning controversy, the city was continuing to issue building permits in every corner of the city, at 100 per day, and this number fails to account for the large number of returnees who did not bother to apply for building permits (Carr and Meitrodt 2005; Donze and Russell 2006). A quote from Mike Centineo, the Director of the city's Department of Safety and Permits sums up the problem with the disconnect between reality and the planning process succinctly, "We are issuing permits everywhere in the city…there is no place we are turning people down" (Carr and Meitrodt 2005). Just days after the release of the BNOB Land Use report, residents rallied at City Council chambers in opposition to the report and separate rallies occurred in Broadmoor, Gentilly, and Lakeview (Donze 2006b; Filosa 2006). Following closely on the heels of the BNOB land use plans preliminary release, came Mayor Nagin's Chocolate City speech, the Louisiana Recovery Authority's reception of $6.2 billion, the formulation of the City Council's Hurricane Advisory Recovery Committee a day before the BNOB released its final report, and the renouncement of the building moratorium by Nagin himself (Donze 2006a; Filosa 2006; Maggi 2006). With no clear consensus or direction coming from the planning process, yet spurred on by the BNOB Land Use plan, grassroots planning by residents and neighborhoods picked up.

4.3 The Use of PPGIS in Neighborhood Planning and Recovery

4.3.1 *Introduction*

With the bar for recovery tacitly set by the BNOB commission, neighborhoods began to organize, create plans, and create PPGIS initiatives that became integral parts of their recovery plans and operations. The PPGIS activities that occurred around the city happened in all corners and in many different ways. There were remarkably successful community/university PPGIS partnerships that empowered residents and allowed for active participation and access. There were also less successful examples that restricted data access, relied too heavily on student volunteers, and had poor data maintenance. The wide-range of PPGIS provision in post-Katrina recovery New Orleans should be reviewed not simply to document the best practices of New

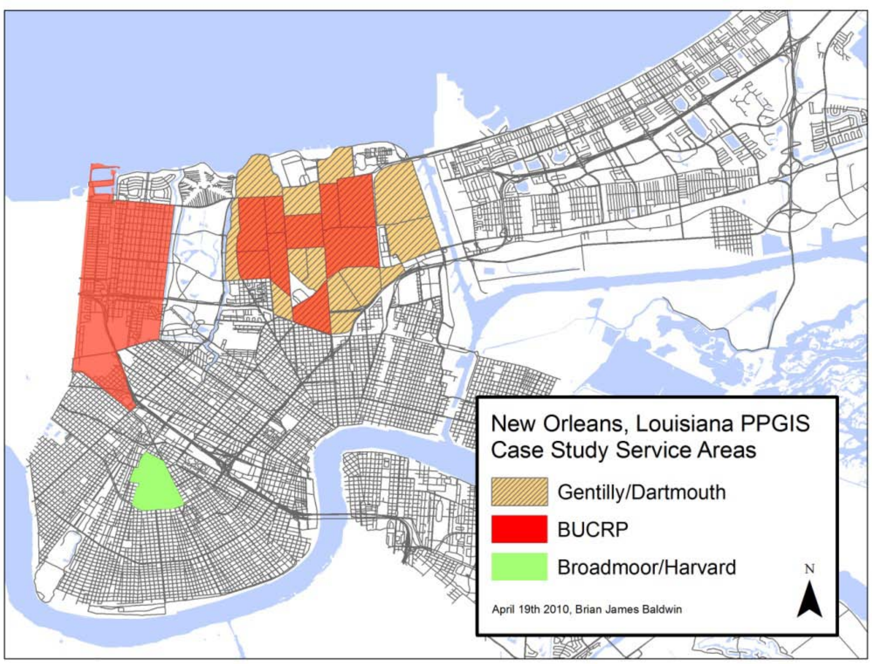
Orleans recovery, but to look for broader trends in the best practices for PPGIS formulation in a post-disaster recovery environment. While the importance of data that is practical and useful is important for any PPGIS, it is all the more so in a post-disaster environment. With limited resources, community organizations need to use and develop data that will aid in their recovery. Yet,w hat data do residents need to come back?

Amid the calls for building a 'new' New Orleans, there was little recognition that the tendency for post-disaster reconstruction, is for redevelopment as it was. Residents and neighborhoods want to rebuild the place and community where they lived. In disregarding this concept and the voices of the residents who were already rebuilding, the ULI plan failed to recognize what was happening. While the plans for creating a more sustainable and 'better' New Orleans were being created, the momentum for building this 'new' New Orleans needed to come from the grassroots. With the BNOB failing to work with and for the vast majority of New Orleans residents, community organizations started planning their recoveries.

PPGIS initiatives became a need for New Orleans neighborhoods that were looking to monitor the recovery of their places. To track blight, the occupation status of residences, home elevations, empty lots, and countless other commercial and residential indicators of recovery, residents and community groups took control of their places. In many instances, the impetus for creating these survey tools was from the grassroots, but supported and enhanced by university-community partnerships. In the Broadmoor neighborhood, surveying and mapping was needed to prove the neighborhoods viability. To conduct this work, a relationship was established with Bard College and Harvard University. In Gentilly, a newly formed neighborhood organization started working with Dartmouth College to conduct condition surveys that would track recovery. In Lakewood, Denise Thornton started tracking properties in her neighborhood to market properties and also restore services, which later evolved into the Beacon of Hope/University of New Orleans Community Recovery Project (BUCRP). In Lakeview, Rita Legrand and Freddie Yoder coordinated activities using maps that were provided by the RPC for infrastructure planning and neighborhood surveys. The RPC provided maps to any neighborhoods upon request with permission from the overworked and understaffed City of New Orleans GIS Department.

The case studies presented below capture a portion of the PPGIS projects that have occurred in Post-Katrina and Rita New Orleans. Map 4.3 shows the geographic extent of each PPGIS partnership. The Broadmoor area contains roughly 2,200 parcels while both the Gentilly and BUCRP areas contain roughly 13,000 parcels.

Map 4.3 New Orleans, Louisiana PPGIS Case Study Service Areas



Source: Author

The case studies that are not examined include work conducted by Neighborhood Housing Services of New Orleans in the Freret and Central City neighborhoods, work by Cornell University to develop the New Orleans Neighborhood Analysis Project (NONAP), and mapping conducted by the University of North Carolina at Chapel Hill, among others. Yet, the case studies that are examined present the most visible and oft-cited community/university partnerships. These projects not only expose some of the best practices and limitations of PPGIS as related to the literature review, but to PPGIS in a community recovery framework.

4.3.2 *Broadmoor Mapping Initiative*

The Broadmoor Civic Improvement Association was established in 1930 as one of the earliest neighborhood organizations is New Orleans and then incorporated in 1970 as the Broadmoor Improvement Association (BIA) (Association 2008). This neighborhood has felt the brunt of most major storm events, as it sits at the base of the New Orleans topographic bowl (Colten 2006). With a strong civic organization already in place, Broadmoor was better positioned to plan and organize in the aftermath of Katrina and Rita than many other New Orleans neighborhoods. Secondly, the geographic location of Broadmoor played both a positive and negative influence on the neighborhoods potential viability. When the pumps in Broadmoor begin to back up, water starts moving into the higher-income neighborhoods of Uptown New Orleans (Colten 2006). The Broadmoor neighborhoods proximity to these wealthier areas provided more visibility to the residents struggle. Yet, these wealthier neighborhoods would also benefit in terms of flood mitigation if Broadmoor were to be converted into greenspace.

In the weeks after the release of the BNOB report, residents in Broadmoor were organizing to take action to prove their neighborhoods viability. Reacting to the BNOB's call for neighborhood planning and Broadmoor's 'green dotting', Broadmoor took up the initiative and started organizing committees to start the planning process (Donze 2006b; Russell and Donze 2006a). Latoya Cantrell, President of the Broadmoor Improvement Association (BIA) said, "When this neighborhood planning team is assigned to our district, we want to already have a vision in hand. We want to craft our own vision, and this is our way of getting ahead of the game" (Russell and Donze 2006a).

As well as getting the Broadmoor community members activated, it started to centralize and organize the movement. After the release of the plan in early 2006, the BIA message board centralized in one location so that residents could better coordinate. There were also inclinations that the BIA would take the planning process into its own hands:

> "It would be more accurate at this point to say that we are consulting with true, professional urban planners on these issues, and that we may hire someone to do some mapwork (sp.) and planning for us down the line if we feel that is eventually necessary" (Roark 2006)

There was also strong sentiment on the message board that residents would need to work with the plan, because it was the only one that existed to date, and would presumably be the only one moving forward. There was no sense of impending doom on the message boards or forum, just a sense that residents needed to organize and plan to deliver for themselves, the future they wanted for their neighborhood (jmuskratt 2006; Roark 2006)

> "As the city staggered to its feet and our own neighborhood rose from the flood and dust, I saw the Broadmoor association begin to respond. From a handful of individuals with no electricity, gas, phone lines, newspaper, computers, and often no fuel for their cars, they fostered the notion "What do we need to do to heal and rebuild?"… As a neighborhood, the Broadmoor association has encouraged us to take action, to serve ourselves…" (Beard 2006)

Broadmoor started forming block captain groups to collect data from the residents of each block. The goal was to get contact information and also see if each former resident intended to return. The neighborhood was also looking for other volunteers to help form these committees (Smith 2006). By the time that the Kennedy School at Harvard University made contact with Broadmoor, the BIA was already one of the most active and vocal neighborhood groups in the city. The BIA had formed committees focused on revitalization and repopulation, were holding community meetings, and were using the web to communicate (Association). The next phase in the recovery involved creating partnerships with a diverse array of universities, architects, private businesses, faith based organizations, and others to aid in the planning process.

Doug Ahlers, a fellow from the Kennedy School at Harvard, was sent down to New Orleans in order to find a community partner for Harvard to work with (Ahlers 2010). The goal was to find a neighborhood that would match with the skills and resources Harvard was looking to bring down. Rather than bringing in one department, Harvard was interested in using the resources of the entire Kennedy School and engaging for a multi-year commitment. After reviewing the demographic and flood damage data for the city, Gentilly and Broadmoor were chosen as possibilities. Upon meeting Latoya Cantrell, the President of the BIA, Mr. Ahlers felt that Broadmoor was the right fit for Harvard (Ahlers 2010). After the initial meeting, Mr. Ahlers met with the entire BIA board and was interrogated by members who wanted to know what Harvard expected out of a partnership, and what Broadmoor looked to gain. The last thing that BIA wanted were researchers studying the neighborhood that would conduct helicopter research and not provide them with anything in return (Ahlers 2010). Yet, Mr. Ahlers was encouraged because Broadmoor was already so involved in the planning process. Harvard would be able to provide resources and tools that could further empower the neighborhood group, without co-opting or taking control of their work.

With the help of Harvard, Bard College, and Plan Ready, a California based mapping firm, Broadmoor developed and conducted its first condition survey of the neighborhood. The surveying itself was conducted by Bard students in June and July of 2006 (Tremaine 2006). Early on in this process, Broadmoor received the New Orleans Parcel layer in a digital format. A dataset that was elusive even for state and local agencies during the emergency response effort. This data contained the outlines of all the parcel boundaries in the city. With this data, Broadmoor could easily map the survey information they collected in a GIS. The lack of this piece of data would continue to be a crutch for other neighborhood organizations that were trying to start PPGIS projects.

To conduct the surveys, it was important to Harvard that a standard methodology and approach was being used. BIA relied on students to collect data to ensure that there would be no bias. It was assumed that residents would be more willing to mark properties as occupied or under progress because they had something to gain from a visible improvement. The survey provided a marketing tool that would encourage growth and redevelopment, and would hopefully prove the viability of the neighborhood. In the first stages of the surveying, when Broadmoor was still trying to prove its viability through data, removing the surveying from the hands of residents seemed necessary to ensure less bias in the data collection. Yet, all of the data was turned over to residents and used however residents wanted. Broadmoor has continued to use their data and mapping for things besides recovery indicators, including noise complaints and blight (Ahlers 2010). The use of the data has evolved over the course of the surveying and mapping processes lifespan.

This survey conducted by the Bard/Harvard/BIA collaboration involves a detailed survey form and two photographs for each lot (Tremaine 2006). A detailed survey form was established and 10-15 buildings could be surveyed in an hour with a two-person team. The *Community Mapping Project Guidebook* that was developed by Bard University shows screenshots of the web application with photos, aerial imagery, and survey data (Tremaine 2006). This mapping application was developed by the California based technology firm Plan Ready and there is no mention of a possible cost.

With the aid of all these partnerships, BIA was able to develop *The Redevelopment Plan for Broadmoor* by July 2006. The plan was developed by Broadmoor residents through extensive participation in community wide, community subgroup, committee, and sub-committee meetings (Association 2006). The process was directed by residents, but the partnerships added resources and tools that helped create a stronger final product (Association 2006).

Harvard has also provided Broadmoor with training, software, and other resources. One tool that Broadmoor has continued to use for case management is Saleforce software[9], and this was introduced to Broadmoor through Harvard. The software is no-cost, easy to learn, and supports the BIA in its daily activities.

Harvard is still working with the BIA and Broadmoor to build future capacity. Harvard's role has shifted over time, but the involvement of the entire Harvard Kennedy School has allowed for these shifts to occur more seamlessly. The resources that Harvard now provides encompass Board training and development as well as laying the groundwork for future leaders to be developed within the BIA organization (Ahlers 2010). Involvement in youth, teen, and senior programs has also increased and the Kennedy School sees no timeframe for a departure.

4.3.3 *The Gentilly Project*

The *Gentilly After Katrina Yahoo! Group* was formed by David Welch and had its first post on September 18th, 2005 (Welch 2010). This informal web based message board, like those

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[9] http://www.salesforce.com/

for other neighborhoods, served as a virtual gathering place for residents who were displaced across the country to learn about the state of their neighborhood, the whereabouts of friends, and anything else. From the virtual organizing on this message board, the Gentilly Civic Improvement Association (GCIA) was born. While some neighborhood organizations and groups were formed before the storm and did not have to go through a long process to find members and organize, the GCIA did not have that advantage. The GCIA was officially formed in November 2005. In early December, they held their first meeting and attracted 65 attendees (Welch 2009). Compounding the problem of creating a comprehensive neighborhood organization was the fact that Gentilly is comprised of 22 separate neighborhoods and was one of the most flooded areas of the city.

In 2006 GCIA obtained printed maps of Gentilly with all of the parcel addresses. Yet, the GCIA was unable to get to this data in a digital format. Without the data in a digital format, David Welch created a map of Gentilly with all of the parcels and address numbers in Adobe Illustrator by scanning the printed maps provided by the city and digitizing them by hand. One of the uses of the maps was to see where New Orleans Redevelopment Authority (NORA) properties were in their neighborhood (Welch 2010). Without receiving the correct data files to easily create and manage a mapping system, Welch made a system that worked for him and the GCIA was able to use this system for limited applications. Yet, the time required to create new datasets and change the maps was immense.

In April 2006, Dr. Quintus Jett, a professor with Dartmouth College made contact with the GCIA because he was interested in conducting a survey of the conditions of properties in Gentilly (Sommers 2006). With the help of Dartmouth students and local residents, Jett wanted to create a color coded map that would monitor the rebuilding effort. The map would list the conditions of every single property in Gentilly, as red, yellow, blue, green, or white, and would be an on-going project updated to reflect conditions on the ground.

In June of 2006, Dr. Jett and a small group of Dartmouth students arrived in New Orleans and started a color-coded survey system. The early iteration of the map was primarily resident driven, with residents submitting survey data to Dr. Jett and Dartmouth students that was then added to an online map. Through the fall of 2006, the map lacked data in significant sections of Gentilly. The ability for residents to have access to the database for updating was still being worked out as well (Henehan 2006a). One resident complained that portions of the map portrayed inaccurate data and when she attempted to submit corrections, she never heard anything back (Miller and Miller 2006).

In December 2006, Dr. Jett returned to New Orleans for a total of three weeks with a team of Dartmouth students with the goal of surveying all of Gentilly. Jett used space at the University of New Orleans as a temporary workspace for students to input data from the field. Jett made a request for residents to donate 90 minutes of their time to help with the survey (Jett 2006). Residents discussed redesigns to the on-line map and also the incorporation of more data and features. Part of the mission of Dr. Jett's visit in December was to collect ideas about how the survey tool and map could be improved upon (Henehan 2006b). By January 1st 2006, Dr. Jett thanked Gentilly residents for their major contribution in helping to color code 50% of Gentilly since the winter surveying started on December 7th (Jett 2007f).

In March of 2007, the December and January survey data had been integrated into the web mapping application. Dr. Jett was also answering questions that residents had about problems with the map. Residents chief concerns were the fact that property numbers were wrong or missing and that the conditions of certain properties were inaccurate (Allen 2007;

Miller and Miller 2007). Local resident Tom Henehan (2007) spelled out some of the frustrations that residents were having with the Dartmouth map:

> "What is needed most, I believe, is a greater amount of local participation… but I do hope that more local folks get in on the process, at least to keep information current on their own immediate neighborhoods. This information can ONLY be kept up-to-date if local folks are monitoring it, and have access to make the changes…There do not seem to be any real web-design professionals involved in this project… there are obvious shortcomings… First and most importantly, it's very difficult for first-time visitors to learn how to get involved…" (Henehan 2007b)

Dr. Jett addressed most of these resident concerns and agreed that there had been problems with the map. He also let residents know that he would be making his third trip down to Gentilly with a group of students during March to conduct more surveying (Jett 2007f). While the initial baseline survey captured all of Gentilly, he stressed that the first phase of mapping was completed and now they were focusing on the clean-up of the data. With a larger group of students and the help of local residents, Dr. Jett had the goal of re-surveying all of Gentilly in ten days, which the group successfully accomplished (Jett 2007d; Jett 2007b). With the help of residents, Dr. Jett managed to re-survey all of Gentilly, which included more than 16,000 addresses. The impressive under-taking by Dartmouth was the first large-scale effort to create a detailed snapshot of the New Orleans recovery (Charpentier 2007). All of the survey data was going to be available on a publically accessible website, www.gentillyproject.com. A founder of the GCIA, Scott Darrah saw how the data could be used to aid developers and residents who were still struggling with the decision to return and rebuild (Charpentier 2007).

In April, Dr. Jett let residents know that the map was being updated with the most current data and said that the data showed how Gentilly was coming back (Jett 2007g). The next steps for moving forward involved trying to get more residents involved in the project and also the need to build a more effective organization of block captains to monitor the recovery process. Dr. Jett's goal was to try and transfer the responsibility of the updating and surveying to residents (Jett 2007e). Returning to map in July, Dr. Jett was continuing to work with residents and student volunteers, but focus was increasingly put on the need for residents to carry out the work. Dr. Jett also made mention publically that funding was starting to get tight (Jett 2007a).

As outlined in a posting on the Gentilly After Katrina *Yahoo!* message board, Dr. Jett said that residents could receive limited portions of the data by contacting him:

> "If you'd like to receive a copy, please e-mail me your name and physical address of your home (or business) in Gentilly. The results we send cover over about 1,000 homes surrounding yours. When our resources permit, we can sometimes send results that provide closer detail surrounding your home" (Jett 2007c).

While the results for specific neighborhoods were promised to neighborhood organization leaders, the full Gentilly database of the survey results was never promised, nor did it ever seem to be delivered. When asked to share the survey data, Jett begrudgingly gave one resident only two neighborhoods worth of data (Welch 2010).

In October, Jett returned to New Orleans and helped with mapping in the Lower 9th ward and no mention is made of Gentilly on his blog or through the Gentilly After Katrina *Yahoo!* message board (Jett 2007h). By December 2007, residents were discouraged with the work that Dartmouth was doing, and Quintus was discouraged as well. The Gentilly map created by Dartmouth was still experiencing problems related to usability as well as maintenance (Henehan 2007a; Welch 2010). Many of the neighborhood organizations were starting to question what the project had done for them, residents were saying that it was a waste of time, and they also felt like they had been used. (Welch 2007; Welch 2010). The project came to a halt in early 2008.

4.3.3 *Lakewood and the Beacon of Hope Resource Center*

In the direct aftermath of Hurricanes Katrina and Rita, Ms. Thornton, a resident of the Lakewood neighborhood in Orleans Parish started communicating with other members of her neighborhood association through a *Google* user group. Ms. Thornton was able to reach about 15 members because the neighborhood had maintained a directory prior to the storm. With communication that was very informal, the former Lakewood residents began meeting weekly in Harahan, and after a month, the group was up to roughly 75 members (Thornton 2009). Early on in the process, Ms. Thornton and her husband decided that they were going take the leap and move back to their neighborhood. Ms. Thornton mailed out surveys to former residents to let them know about the meetings and also to inquire about everyone's plans. She also discovered that most people were waiting to see what everyone else was doing.

The day after the Lakewood zip code was cleared for residents to return, the Thornton's had contractors begin gutting their home. Initially there were only eight other families in the Lakewood neighborhood who also began the work to return immediately. It was through these initial steps that Ms. Thornton saw the need to share the knowledge that she was learning through the process of rebuilding her home. The Thornton's were among some of the first New Orleanians to begin the now well known process towards recovery, but many of the tips and tricks that people take for granted now, were then unknown. The process of mold remediation was something that Ms. Thornton saw a need to share information about. By starting a *Google* group to share information and resources with other residents who had not yet decided to return, the tenets of what the Beacon of Hope Resource Center (BOH) would come to represent, were put in place. Officially, Ms. Thornton started the BOH on February 14th, 2006 based out of her home in Lakewood. Ms. Thornton spent her days at the house answering questions and giving advice. By providing a forum for residents to swap stories and share advice pertaining to prices, contractors, and lessons learned, returning residents would be able to help each other through this difficult process.

From the outset, the BOH Model was based upon a community-led framework that was founded and spearheaded by a strong-willed individual. Ms. Thornton's initial goal was to show residents and city government that the Lakewood neighborhood was a viable, recovering part of the city. By providing the information and resources that residents needed to return, this would spur further redevelopment and reinvestment. The organization was based on the simple notion that a well organized and informed population would respond more quickly and positively to the neighborhoods redevelopment.

The Lakewood neighborhood had many advantages that have led to its rapid recovery. First, the neighborhood is very small, with roughly 400 parcels. Secondly, and most importantly, prior to the storm, this was one of the most sought after neighborhoods in the city. The median household income for the Lakewood neighborhood in 1999 was $109,861, 400% greater than the average for Orleans Parish, at $27,133 (Bureau 2000). Thirdly, the neighborhood is physically separated from the rest of Orleans Parish by the U.S. Interstate. Lastly, Lakewood had a well organized neighborhood organization that was ready and able to respond rapidly after the storm. Many of these neighbors were also property owners with the ability to repair their homes, unlike the high percentage of rental properties found throughout other parts of the city. None of this is to discount the hard work and rapid mobilization of volunteers by the Beacon of Hope, but it bears reminder that all of New Orleans neighborhoods did not start out on equal footing in the aftermath of the storm.

One of the central roles of the BOH's early work in the Lakewood neighborhood was mapping properties that were being rehabilitated and also tracking blighted properties. The mapping component of the BOH's work started on May 20th, 2006. The reason behind the initial mapping was for an open house that Denise had organized to showcase the recovery of Lakewood. With the help of the New Orleans City Planning Department, Denise received a map of Lakewood that she then imported into *Microsoft PowerPoint* to start her first map database. On the map, she symbolized 8 houses that were rebuilding as green, the houses that were for sale were marked yellow, and the non-gutted houses, red. On the day of the open house, neighbors were given wristbands and maps to conduct walking tours of the houses that were under renovation so they could see for themselves what was going on. The total turnout for the open house was more than 350 people. With this simple mapping tool, BOH built a database that would be used to highlight the neighborhoods recovery. These maps provided a quick and accurate assessment of the neighborhoods vitality.

While the maps were used to highlight the progress of properties in Lakewood, they were also used to call attention to blighted and un-gutted properties. One year after her initial neighborhood meeting, Denise sent out a letter to residents who had yet to gut their homes. This was the founding of the Lakewood Blight Committee, an organization of residents that would track Lakewood's blighted structures and mail or e-mail their owners to try and pressure them into action. After the initial blight letters went out, there was a noticeable response in the neighborhood as work on blighted properties increased (Thornton 2009).

Data collected by BOH tracks the recovery of the Lakewood neighborhood from early 2006 to the present. Out of 400 total properties, 275 were occupied in September 2009. Of the remaining 125, 60 were undergoing renovations. Nearly 4 years after the storm, the occupancy rate for a neighborhood that completely flooded is still under 75% occupancy. Without the development of a resource center, the use of mapping tools, and by marketing the recovery of the Lakewood neighborhood, rates of reinvestment and return would most likely not have been as strong.

The BOH began in the Lakewood neighborhood of New Orleans and soon spread to nearby Lakeview. By expanding to nearby Lakeview, the BOH added staff and started to refine its model for community recovery. The goal of the BOH is to provide support services and training to residents that are active and engaged in their communities. The Beacon M.O.D.E.L. (Mapping Outreach Development Empowerment Leadership) for sustainable neighborhood revitalization and community empowerment is implemented in each of the twelve Beacon neighborhood sites city-wide. The BOH Model of community recovery involves the creation of local neighborhood 'Beacons'. If residents or a neighborhood organization express a desire to implement the BOH Model, staff meet with residents or the neighborhood organization to gauge the level of interest. For no fee, neighborhoods have access to the organization and the experience of a full time staff that develop a residentially guided framework that includes programs to meet neighborhood recovery goals. The model is structured to help organize, educate, and empower residents to become the engines for their neighborhoods recovery. More recently, the BOH has started work in the Gentilly neighborhood, an area of the city that is still struggling to reach occupation rates near 50% of pre-storm levels.

While the BOH offers all of the training and resources, neighborhoods must supply a modest amount of engaged residents willing to attend meetings and join specific teams to meet the neighborhoods recovery goals. As neighborhoods reach a certain recovery threshold, they are weaned off of the Beacon structure and graduate from the Beacon Model. The advantage of the Beacon Model in terms of PPGIS and data collection is the role of residents as data managers and survey takers. To conduct the residential neighborhood surveys, Block Captains are designated by the Beacon Model who have the responsibility to survey between 50-100 parcels. The residents know each neighborhood better than any college students or part-time volunteer staff and they are also more invested in seeing the results of each survey. Secondly, residents guide the creation of survey questions and map products according to their own needs. In many neighborhoods, residents are concerned about the growth of weeds on blighted and non-conforming lots, so this information is collected. With the goal of collecting survey data every 3 months, neighborhood residents are best able to meet the significant time demands that are required to survey every parcel in the neighborhood, input the data into a spreadsheet, and update the data.

4.4 The Beacon of Hope/University of New Orleans Community Recovery Project (BUCRP)

4.4.1 *Introduction*

The *Beacon of Hope/University of New Orleans Community Recovery Project (BUCRP)* started in the fall of 2008. The BUCRP was the work of Tina Marquardt, then general manager of the BOH, Brian Baldwin, a graduate assistant at The University of New Orleans, and Dr. Michelle Thompson, an assistant professor in the school of Urban and Regional Planning at The University of New Orleans. As stated in the initial project proposal, "The *Beacon of Hope-University of New Orleans Community Recovery Project* (BUCRP) was borne to organize, support, and document the creation of a *Beacon GIS* that allows flexibility in data collection, maintenance, mapping, and analysis across multiple platforms using a variety of public and private data sources." Through a year of intense work, many missteps, and countless lessons learned, the partnership between The University of New Orleans and The Beacon of Hope created a viable PPGIS. Without the dedication of staff, a strong vision, and the support of that vision by the Beacon of Hope's Board of Directors, the true value of a PPGIS would have gone unrealized. With all of these factors, and the credibility provided by receiving a grant, the program was able to continue beyond a pilot project phase.

4.4.2 *Refining the Mapping and Surveying*

With the expansion of the BOH into the Lakeview neighborhood, the use of *Microsoft PowerPoint* as a mapping and survey tool was no longer feasible because of the significant number of parcels. There was also a need to integrate the survey information more accurately into a mapping system. BOH began contacting Task Force LLC because they were the company that was awarded a contract to manage the state owned properties purchased through the Road Home program. This is when the first contact was made between Dr. Michelle Thompson and BOH staff member Tina Marquardt. BOH wanted to understand what Task Force's capabilities and goals were for managing the blighted properties. In the course of these discussions, BOH noticed that Task Force was using *MapPoint* software to map their properties. In the summer of 2007, the BOH received a donated copy of *MapPoint* from Task Force LLC. By tracking their neighborhoods properties in a spreadsheet, they were able to easily import this database into *MapPoint*. Yet, the software did not allow for easy customization of symbology. *MapPoint* placed red dots on each parcel, but the placement was not very accurate. While the software had its drawbacks, it allowed for fast visualization and saved a great deal of time rather than manually changing the color of each parcel, as was done previously with *PowerPoint*.

On November 3rd, 2007, the Broadmoor Improvement Association (BIA) in partnership with the Kennedy School at Harvard University hosted a series of workshops on neighborhood recovery best practices. This was part of the Neighborhood Leadership Forum Series. As part of this workshop, a BOH staff member saw an example of the success that Broadmoor was having in creating a survey database and mapping (Marquardt 2009). The workshop examined how to collect data, manage it, and also map it. This was the first time members of the BOH staff were exposed to an ESRI product. This meeting also introduced BOH to the use of *Salesforce*, a product suite that is designed for sales and marketing, but is easily adaptable to the needs of a small non-profit. One of the positives to the *Salesforce* software was the ease of creating reports. The introductory software suite is also free. Broadmoor continues to use *Salesforce* software for case management because the software is easy to use and meets their needs (Ahlers 2010).

Over the next 18 months, BOH began looking for a way to create better maps, but the retail price of the ESRI software precluded the organization from purchasing it. It was during this time that the organization was awarded some free programming time through a grant, and a local programmer offered to help BOH integrate its use of *Saleforce* with *Arrowpointe Maps*, a mapping application that integrates easily with *Salesforce*. The BOH was using *Salesforce* to generate reports and track their residential surveys. With the donated time of a local programmer, BOH was able to have customized reports produced that showed summarized neighborhood conditions and simple maps of the conditions. The summaries were available for residents, businesses, as well as local government and they served an important role in the rebuilding of neighborhoods. Yet, like *MapPoint*, the *Arrowpointe* software was not easily customizable or adaptable. It was at this time that BOH began importing the property condition surveys for the Lakeview neighborhood in order to map them. While the software worked, the resulting maps were still not as accurate or useful as BOH wanted.

During the summer of 2008, a graduate student from the University of Washington worked as an intern at BOH and introduced the non-profit to GIS software. BOH was able to receive a copy of *ArcMap* through a Tech Soup, a company that delivers reduced cost software packages to non-profits. With the *ArcMap* software and help from an intern, BOH started creating customizable neighborhood condition maps based on their surveys. To aid residents in collecting survey data, BOH started using GIS to produce walking maps that residents could follow when they surveyed. By providing more than just summaries and reports, the maps were something that residents could quickly understand. The maps provided a dramatic tool that the BOH had only produced prior by hand. With *ArcMap* software, the BOH was able to import their survey data and quickly map it. The BOH intern began working in the Gentilly neighborhood of New Orleans, a neighborhood that had already seen one survey process come through and was also recovering at a much slower rate than Lakeview or Lakewood.

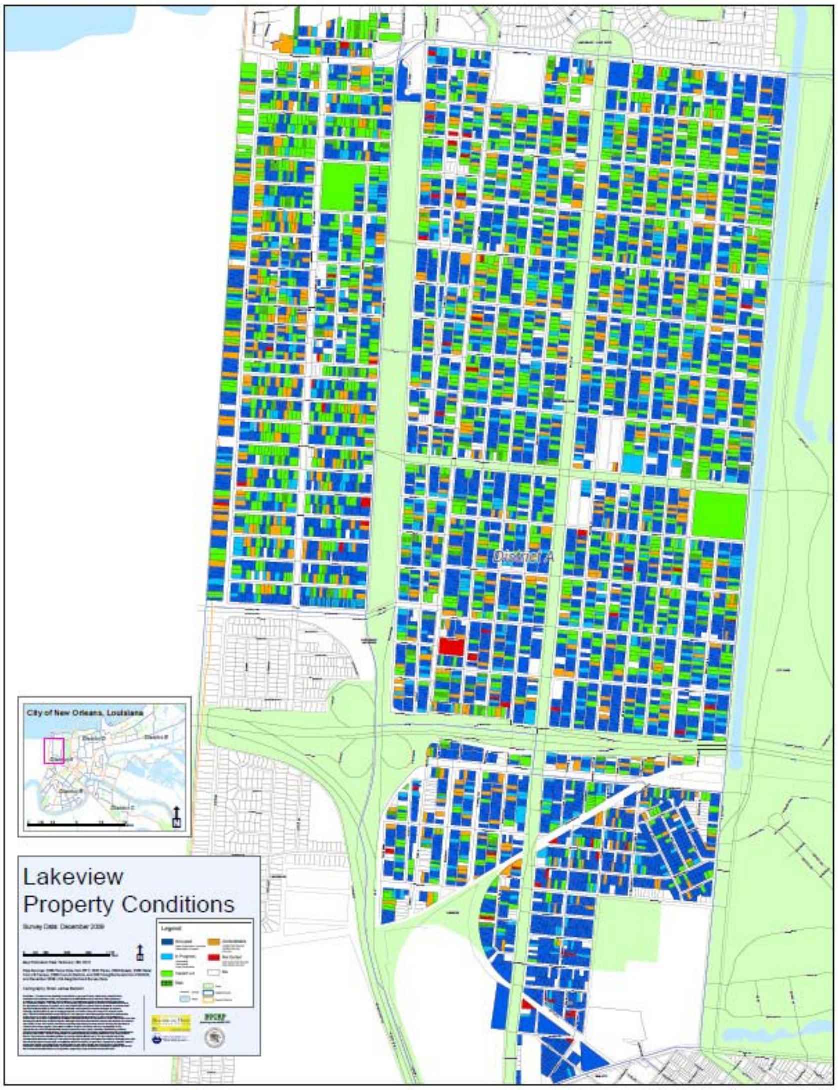
As BOH was just starting to build a GIS, they received a copy of the City of New Orleans parcel layer. With this data, BOH was able to link survey addresses to the physical parcel using *ArcMap*. Without this data, it would be nearly impossible to create maps of individual parcel conditions, unless it was constructed manually. One of the problems for many non-profits has been the resistance from the City of New Orleans GIS Department (CNOGIS) to publically release this dataset. While, this data is officially proprietary and not available for public use or distribution, the file has been disseminated among various non-profit organizations. These restrictions on data access have been one of the biggest problems for many non-profits looking to enter into the world of GIS. While CNOGIS disseminates data layers on its website, the lack of this valuable dataset has hampered the work of many local non-profit organizations.

The GIS that the BOH was operating was still in its infancy when the BOH's summer intern departed in the fall of 2008. Lacking staff with the training or skills to operate a GIS and also lacking the funding to hire a new staff member, the BOH found their GIS coming to an abrupt end. An unfortunate casualty of the ceased operation would be the time spent forging relationships and building trust among residents, as well as the expectations for surveying and mapping that had developed within Gentilly. Yet, there was simply no funding to provide for a full-time staff person that could manage and operate the GIS, create the surveys, attend resident meetings, and train residents. BOH understood what a GIS could add to their operations and outreach, but there was no way to continue. As the summer intern left New Orleans at the end of the summer in 2008, there was still no clear decision as to what would happen to the Beacon GIS.

4.4.3 *The University/Non-Profit Collaboration*

The *Beacon of Hope/University of New Orleans Community Recovery Project (BUCRP)* began in the fall of September 2008. Dr. Michelle Thompson, a new faculty member at The University of New Orleans discovered that the BOH was struggling to continue its mapping and surveying project and offered a solution. There was room for helping this organization by providing graduate assistant staff time and management expertise from The University of New Orleans that would help organize and strengthen the current *Beacon GIS*. This partnership started as a university/non-profit collaboration, one in which the non-profit stood to benefit from the time and resources of a large, state institution. The goal behind a partnership would be to ensure that the BOH would be independent of the University after receiving training, data restructuring, metadata, and documentation, to ensure that when future staff turnover occurred, anyone would be able to pick up where the last person left off. With a lack of staff and time to develop an in-house PPGIS, BOH could rely on the University of New Orleans, specifically the Department of Planning and Urban Studies, for time and expertise. Even though the University of New Orleans was going to be providing staff time and training at no cost, there would still be a required commitment from the BOH. With the university aiding in the tasks of conducting trainings, holding meetings, developing the GIS, creating maps, and creating surveys, there would still be a significant time and resources required from BOH in helping the fledgling *Beacon GIS* get off the ground. The need for a GIS was an issue of contention among the BOH Board members. It was not clearly understood what the intentions of the university were, or what the need for a GIS was. Defining the need for the GIS became one of the primary goals of the partnership in the early stages. For a small non-profit organization to spend any time or resources on the development of a project, they must believe in it and understand its goals, and this was not the case from the outset. Yet, with the production of some of the first maps from the BUCRP Lakeview neighborhood pilot project, and the lines that residents formed to examine the condition of their neighborhood, interest in the partnership grew. Map 4.4 shows one of the maps developed by the BUCRP for the Lakeview neighborhood.

Map 4.4 December 2009 Lakeview Property Survey



Source: Author

The early stages in the development of the *Beacon GIS* involved organizing the existing data and most importantly, documenting the processes for creating and managing all of the data. All of the *Beacon GIS* data needed to be cleaned and organized to ensure that any new staff person could easily walk into the role of GIS manager and take over with minimal problems. Another issue that was involved in setting up the community/university partnership was the development of a data sharing agreement. Who would have access to data and who would own the data upon its creation? The creation of a data sharing agreement and contract worked towards ensuring that the terms of the relationship were understood by all parties. One of the mandates of the BUCRP partnership was that all maps and data would be publically available. Without this requirement and others being clearly expressed in the contract, there would have been a great deal of room for misunderstanding. One of the largest goals at the outset of the BUCRP partnership was ensuring that BOH would not be reliant on the university at the end of the project. The main goal was to create a sustainable PPGIS that would be managed and run by BOH.

One of the pitfalls that the BUCRP experienced at the beginning of the partnership was the tendency to take on new projects and tasks that were not part of the initial scope of work. In the most flagrant example, before the BUCRP had yet to organize and create a data dictionary of all of the existing data that BOH had, the BUCRP began a training program in a partnership with a local non-profit focused on youth job skills training. The non-profit, Limitless Vistas, was looking to partner with area organizations that could offer skills development to roughly 15 youth for multiple weeks. The BUCRP offered the Limitless Vistas an opportunity to learn about GIS, conduct field surveys, learn about basic computer operation, and other skills. This seemed like a great opportunity on the surface because it would allow for BUCRP to conduct a quick baseline survey of the entire Lakeview neighborhood that consisted of over 7,000 parcels. While the surveying and mapping was typically handled by residents organized in their block captain teams, this would expedite the process. The possibility to survey the entire neighborhood in a relatively quick span of time was tempting. Rather than start the BUCRP slowly and work to refine the survey tools and clean up the existing data, much of the early work went into creating surveys and training sessions for the Limitless Vista group. While the Limitless Vistas were able to survey the Lakeview neighborhood in a short span of time, which helped to create an important baseline survey, the project took away from the ultimate goals of the BUCRP; creating a viable, independent Beacon GIS.

While BOH was able to gain access to datasets through partnerships with other non-profits and organizations, the partnership with UNO opened up broader access to data and regional networks. Early in the BUCRP process, an agreement was made between the Regional Planning Commission (RPC) and BUCRP that printing of large scale maps would be provided gratis. Without this help, the BUCRP would have been unable to produce the many large scale maps that were used in meetings and distributed to community groups. The purchase of a large scale plotter is well outside the budget of BOH, and printing large maps could add a price tag of hundreds of dollars a month. Not only was the RPC partnership beneficial in terms of printing, but also in terms of data. The RPC provided recent aerial imagery for neighborhoods that the BUCRP was working in. The RPC also provided a myriad of other important data files that aided the BUCRP in the production and analysis of their maps.

The standards and organization that the university was able to bring to the partnership were one of the biggest steps forward for the *Beacon GIS*. Prior to the partnership, the cartography and layout of maps was secondary to their production. The partnership showed BOH that the production of high quality maps with recognized standards would only aid in the readability of maps and also in the credibility of the organization. With the maps being distributed and viewed across the city, it was imperative that quality work be created and that these maps, data, and reports maintain a high standard.

Moving forward, one of the ways that the BUCRP is looking to improve the *Beacon GIS* is through the creation of reports. Non-profits rely on grants to continue and the production of well designed and targeted reports that analyze the recovery of New Orleans is one of the ways that the partnership has aided BOH.

One of the shortcomings of the BUCRP partnership is that university staff work schedules ebb and flow with the academic calendar. While the operations of the BOH continue, university staff and students go on extended winter and summer breaks. Attempting to prepare for these breaks caused a rush of work during the academic year. When the university partners were unavailable, the BOH still needed maps and work to get done, so they looked for volunteers in the community. While the BOH was able to get help during the summer months, it was a volunteer that was not trained in the BUCRP system, or aware of the new mapping standards. Without the help of the university staff, the work of developing the *Beacon GIS* moved backward. The BOH is glad to receive help from graduate assistants, but it also has a need for a full-time person who could dedicate more than 20 hours a week. Also, when the graduate assistant graduates or changes roles at the university, a new person will be required to be trained and this learning curve is simply not available when the position is already capped at 20 hours a week.

One of the ways that citizen participation has been improved through the BUCRP process is through citizen input and cooperation at resident meetings. The City of New Orleans parcel layer is not 100% accurate, but it is the best base layer for creating the condition maps of each neighborhood. After the first condition maps were created, some residents noted that houses and addresses were missing from the maps. To correct this issue and improve the overall accuracy of the surveys, residents edited their field maps and submitted these corrections to the BUCRP for inclusion in the next field survey. Residents are one of the best sources of information pertaining to their locale, but these corrections may only represent what the residents believe to be the accurate addresses. While these corrections may be more accurate than the City of New Orleans data, diverging from the standardized parcel will create future problems when the BUCRP wants to compare neighborhood conditions with other datasets. Yet, this process and the incorporation of local knowledge has helped create more accurate representations of what exists on the ground.

In the spring of 2009, BOH applied for a grant through the Louisiana Recovery Disaster Foundation (LDRF) to provide support for the BUCRP project. To conduct a pilot surveying and mapping project of five neighborhoods in Gentilly, BOH was awarded $25,000 through the LDRF. While this award did not match the requested funding level, it provided the BUCRP with recognition and the ability to financially support its operation. The grant proved to BOH that the creation of a *Beacon GIS* could play an important role in the organizations funding opportunities.

The BUCRP has continued working to build capacity for BOH and to establish a sustainable *Beacon GIS*. The BUCRP is scheduled to phase out in the spring of 2010. Over the past year, the BUCRP has continued expanding into Gentilly neighborhoods and has developed a close working relationship with the Lakeview Civic Improvement Association (LCIA). The BUCRP has also worked to create ties between the New Orleans Redevelopment Authority (NORA) and other local institutions. To support, and in recognition of the importance of the *Beacon GIS*, BOH hired an in-house staff person in the fall of 2009 who has worked closely with the university partners to ensure that the BUCRP best practices will be maintained at the conclusion of the partnership.

4.5 Conclusion

The Broadmoor Improvement Association/Harvard University partnership, the Gentilly Project, and the BUCRP were not the only PPGIS initiatives that occurred during the New Orleans recovery process, yet they were the most visible community/university PPGIS projects. Each of these PPGIS initiatives approached the questions of access, participation, and who exactly the public was in different ways. The official planning process that occurred in the City of New Orleans encouraged the creation of these processes, but the needs of residents in each neighborhood has sustained them. The next chapter explores the successes and limitations of each of these projects and offers suggestions for creating a successful PPGIS. It evaluates each of these community/university PPGIS partnerships with the framework that was developed in chapter two and also the needs for closer synergy between emergency management and response GIS.

Chapter 5: An Evaluation of New Orleans Community/University PPGIS Initiatives

5.1 Introduction

The community/university PPGIS partnerships that occurred varied greatly in their successes and limitations. Each of these partnerships occurred at different times, in different neighborhoods, with different resources, expectations, and all experienced different outcomes. None of these partnerships started with the same expectations for either member of the partnership. Relying on the framework that was developed in chapter two, this chapter compares each of the PPGIS case studies that were reviewed in the previous chapter. This chapter seeks to address research objective four: Creating a rubric for providing PPGIS to community and neighborhood groups in a post-disaster recovery environment, and five: Developing a framework for the integration of grassroots information and PPGIS with the government's disaster response and recovery effort. The 11Q framework that was developed is applied question by question.

5.2 Community/University PPGIS in Community Recovery

The community/university case studies were evaluated based on the framework that was presented in chapter 2. Figure 5.2 places each of the case studies within this framework to evaluate their overall effectiveness.

Figure 5.1 Evaluation of New Orleans Community/University PPGIS Partnerships

	BIA/Harvard	Gentilly Project	BUCRP
1) Does the project empower?	Yes, surveys used for blight enforcement, collective action	No	Yes, surveys are used for blight enforcement, collective action
2) Who participates?	Broadmoor residents	Gentilly residents	Beacon service areas
3) What are the projects goals?	Prove neighborhoods viability, build BIA's capacity, and empower through multiple, ongoing projects	Enable community recovery by documenting recovery rate	Enable quicker community recovery by engaging citizens and producing valuable data
4) Who has access and how?	Full access for Broadmoor residents through BIA to all data	Originally full access to map through website, limited access to edit data, currently no access	Full public access through website to finished maps, limited access to edit data for residents
5) What is the projects timeline?	Long-term commitment, no timeline	Project terminated, no timeline existed	1 year, extended to 2 years
6) What are the products?	Bi-annual survey conducted by students, developed sustainability plan	Web-based map application, currently inactive	Bi-annual printed condition maps and report
7) What are the partners' roles?	Harvard/Kennedy School conducts surveys, provides training, BIA drives the process	Dartmouth organized residents, designed the surveys, collected data, and built online map application, Gentilly residents helped survey	UNO provides training, cartography, and data management, BOH provides training and organizational structure
8) What is the projects scale?	Broadmoor neighborhood ~ 2,200 parcels	Gentilly ~ 15,000 parcels	Beacon service areas ~ 15,000 parcels
9) Is the project sustainable?	Providing sofware training, resources, and leadership development	No	Providing software training, manuals, data management, organization, and building relationships between local government agencies
10) What local knowledge is supplied?	Partnership is resident driven	No	Residents correct addresses and collect data according to needs
11) Who controls and owns the data?	Harvard collects and inputs data, controls creation and methodology, BIA receives the data	Dartmouth controls all the data and gives samples out to residents who request it	BUCRP creates standard form, residents collect and input data

Source: Author

The development of community/university PPGIS partnerships in response to Hurricanes Katrina and Rita differ substantially from PPGIS case studies in non-disaster environments. Rather than creating PPGIS partnerships between a university and its local community, schools from across the United States arrived in New Orleans to lend their assistance. While many of these universities offered skills and resources that empowered communities and aided residents in the recovery process, many partnerships created unsustainable programs or were not designed as partnerships at all. By applying the 11Q framework in the context of community recovery, the best practices for a community/university PPGIS in a recovery role can be developed.

Arnstein (1969) said that to ensure a PPGIS is actually creating the means for participation, it must be analyzed to see if there is a two way flow of information. In the Broadmoor and BUCRP case studies, this was and is happening. In Gentilly, Dartmouth failed to create an open dialogue with the community and used the results of surveys and mapping for its own agenda. While universities in PPGIS partnerships provide skills and resources to a community, they expects to gain access to the community data. If a university does not provide the analysis, results, and value that it adds to this data, it is doing a disservice to the community and limiting participation. As (Schlossberg and Shuford 2005) explore, participation is supposed to achieve a broader purpose and that purpose was recovery, which Dartmouth stifled through its suppression of participation.

As Craglia and Onsruc (2003) discuss, access is the starting point for a PPGIS. Access to the GIS, in terms of both control, the ability to manipulate the data, and the ability to view and use maps, all play an important part in the creation of a successful GIS project. The access of the New Orleans case studies differs extensively in terms of who has access to what. To have a successful PPGIS, there should be access to comprehensive information (Barndt 1998). In

Gentilly there was very little access to any data, whereas in Broadmoor, residents had full access to raw data. The BUCRP provided access to finished maps to the public, but limited access of raw data to the whole community. As Tulloch and Shapiro (2003) discussed, there is a strong correlation between access and successful PPGIS projects.

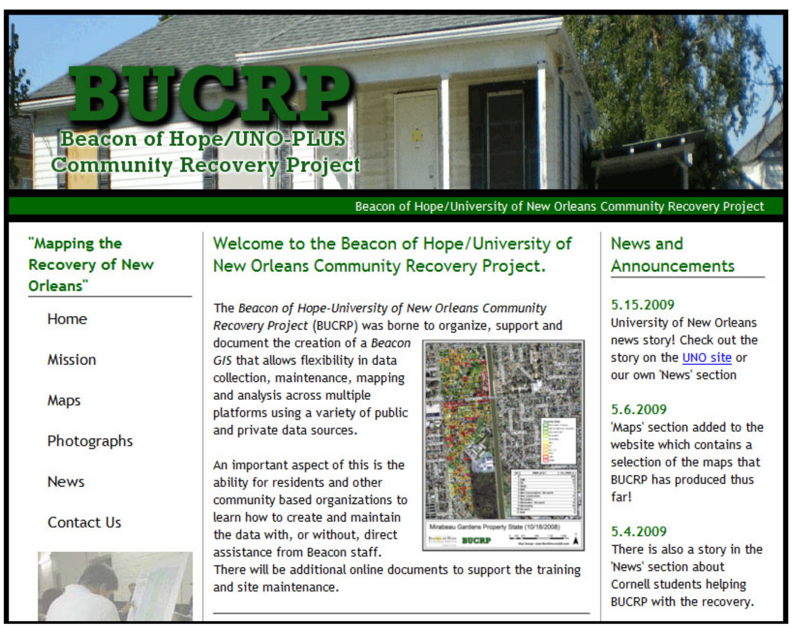
Harvard's success in Broadmoor stems largely from the geographic size of the neighborhood. With roughly 2,200 parcels, Harvard and Bard students were able to help BIA develop unique ID's and ground truth each parcel, to create a database that accounts for nearly every address. Dartmouth College surveyed all of Gentilly before contacts were established with residents in each of the local neighborhoods. While it could have been possible to work at such a large scale and then build the local capacity to maintain the project, the will and funding to do this ran out before the project was sustainable. It requires money to run and build a PPGIS. The Dartmouth project was started with good intentions, but at a scale so grand that it was not possible to maintain. Unlike Dartmouth, the BUCRP started working with the local neighborhood organizations to train and build capacity overtime. As neighborhood groups see the benefits of surveying, the BUCRP trains them, empowering the residents to take on the mapping and surveying rather than trying to start a possibly unsustainable project. More successful PPGIS will grow gradually by working with the local residents.

Hoyt, Khosla et al. (2005) discuss the role of incorporating local knowledge into the PPGIS. The BUCRP partnership stressed the use of local residents to conduct the surveys because residents understand their own neighborhoods better than anyone else (Laituri 2003). This process ensures that local knowledge is collected and built into the system (Barndt 2002). Harvard uses students to collect surveys and produce maps, because a standardized methodology is more important to their needs. While this approach puts less of a burden on the residents, the survey is also being conducted by different students on every trip, who are not familiar with the neighborhood or its needs. As Sieber (2006) also discussed, many residents and community groups are proud of their data collection efforts and methodologies. PPGIS in community recovery should build on this local knowledge to increase participation and pride among residents.

When residents are investing their time and energy into a mapping initiative, they must be able to see that they are getting something in return. The development of tangible products is an important component of the community/university PPGIS model The Gentilly Project initially provided a galvanizing possibility for residents and had many people excited to participate and see the results of their work. It was only when the map was not updated and poorly designed that residents started to become frustrated. In the case of Broadmoor, Harvard worked collaboratively with the neighborhood and always ensured that the residents and BIA were in control of the data. Harvard also worked to correct all of Broadmoor's parcels to create a database that was nearly perfect. While students collected data and created reports and maps, this was handed directly over to the neighborhood. The BUCRP has also worked closely with residents to ensure that problems are fixed in a timely manner. With every new survey, neighborhood groups receive a large printed map that shows the results of the survey. If the PPGIS partnership were to disband, the community would have something tangible to show as a result of their commitment and work.

Within PPGIS there is a need for the use of new and creative technologies (Weiner and Harris 2003). In each of the New Orleans case studies, online message boards were used by residents to start organizing. In the aftermath of Katrina and the New Orleans diaspora, this may have been the only possible way for residents to share information and organize, but its importance cannot be overlooked. These informal online message boards also became conduits for other neighborhoods to learn from. From the message boards, the use of technology for mapping, maintaining databases, and presenting this information on the web became important for access and participation. All of these PPGIS case studies used technology to their advantage, but the Dartmouth example shows the limitations of web based data. One of the main products that was part of the BUCRP was the development of a project website that hosted all of the neighborhood condition maps.[10] A screenshot from the BUCRP project website is included as Figure 5.1. The goal of this website was to provide data access to the public, residents, and also to serve as a promotional role.

Figure 5.1 The BUCRP Project Website



Source: Author

[10] http://planning.uno.edu/BUCRP/

The long time commitment to the Broadmoor neighborhood established by the Kennedy School at Harvard has helped the partnership define goals and build trust. In the Dartmouth case study, there was no clear commitment of time, so the residents and university had no clear goals or timeframe for reaching those goals. The partnership should have a contract that establishes a time frame as well as clear goals (Stewart, Jacobson et al. 2008). In the BUCRP case study, an initial one year scope of work was extended for two years, to allow for the *Beacon GIS* to more fully develop. These longer time frames let the university provide training and education that will build capacity and sustainability. It is paramount that the community understands what GIS can and cannot do and that it is able to carry on the work itself (Al-Kodmany 2000). This sustainability can also be built by promoting relationships with other community groups, organizations, and universities to create a network of support. One example of this from the case studies is the way that Harvard has been working in a partnership with the BUCRP and Neighborhood Housing Services of New Orleans (NHS) to develop a standardized mapping and survey form.

The issues of data control and ownership must be addressed in the service contract for each PPGIS partnership. In the BUCRP, both partners spent a significant amount of time discussing data sharing and ownership. A contract was drawn up that would allow public access of all finished map data, but protect the raw data. In Broadmoor, Harvard controls the production and creation of the data and then turns it over to the community. In Gentilly, questions about data control and ownership were never asked by residents until after the data had been created by Dartmouth. For a successful community recovery PPGIS, the community should have ownership and control of the data.

5.3 The Integration of PPGIS with Disaster Response and Recovery

The rate of recovery for communities and neighborhoods is based in part on the conditions and organization of them pre-disaster (Mills 2008). By developing networks and relationships between the PPGIS community as well as the emergency and disaster response community before a disaster event, a quicker recovery could occur. This is also closely related to the importance of the local political context (Ghose and Elwood 2003). If there is strong leadership and relationships are forged between these two areas of GIS, they could both work more effectively because of shared networks, shared data, and increased capacity.

One of the biggest problems to face both the emergency response GIS community and the PPGIS community was the lack of access to the New Orleans parcel data. The emergency response and recovery efforts of the city were held up because of data sharing concerns that prevented this important dataset from being shared with anyone. It was only through the work of concerned individuals who shared this dataset without permission, that it has been used by community groups and the official emergency response effort. The City of New Orleans needs to release this data publically. As suggested by William Craig, legislation needs to be passed in order to mandate changes to the current culture of data protectionism (Craig 1995).

Part of this stronger network of GIS would require that neighborhood organizations build more data into their PPGIS, like contact numbers and e-mail for residents, to create a system that could be more closely linked with the emergency management system. Secondly, there is also a need for neighborhood organizations to establish web message boards that are recognized as the official boards for the community. Further research should be conducted to explore if a centralized system operated by city or regional government would be the best way to do this, or if personnel from the city should simply maintain an updated list of the location of these community web pages and message boards. There is still a need for neighborhood groups and organizations to share what they are doing and the data that they are using. The amount of insulation that is still occurring is hampering the recovery of the city and almost five years after the storm, neighborhood groups are just starting to work together to see how they are using data and technology. Community groups and the community/university partnerships are starting to look for ways to use this data collectively and at a larger scale.

Another goal of the BUCRP was to build partnerships between Broadmoor Improvement Association (BIA) and Neighborhood Housing Services of New Orleans (NHS), another organization conducting neighborhood condition surveys in New Orleans. By standardizing the survey and data collection process of these disparate surveys and creating a GIS server, a city-wide PPGIS model could be developed. A partnership was formed between the University of New Orleans and the GISCorps, who volunteered programmer hours to design the ArcGIS server application. While the development of the application has begun, there have been countless holdups to implementing the project. It has taken a significant amount of time to bring each of these organizations together to discuss the need for a standard survey form. Yet, the creation of this GIS is still in the working stages. While this would be the end goal of the program, creating this system has involved a great deal of time and effort. This system would be a great asset for both the PPGIS community and the emergency response GIS community.

5.4 Conclusion

This chapter evaluated three community/university PPGIS partnerships that formed in response to the Hurricane Katrina and Rita disaster. The need for community/university partnerships that offer tangible products and also work to empower the participants is vital in a community recovery environment. A clear contract that clearly presents each partners goals, roles, and the timeline, should be created to ensure that the community and university both understand each other's expectations. The university should ensure that it builds local knowledge into the PPGIS and that the community has access and ownership of the data.

This chapter also explored the ways that the PPGIS community could form stronger ties with the emergency and disaster response GIS community. Through the creation of a centralized data sharing and message board system, PPGIS could serve as a mitigation tool in the emergency response effort. There are datasets and information that both sides could share, which would build the capacity of both.

The following chapter presents the conclusion of this work and explores the ways that it met the research objectives. The next chapter will also look at the limitations of this work and future research questions that need to be examined.

Chapter 6: Conclusion/Further Research

This chapter revisits the original research goals to see what questions have been answered and what future research questions have been raised. Through this broad study of PPGIS, GIS in emergency response and recovery, and the development of community/university PPGIS partnerships for community recovery post-Hurricanes Katrina and Rita, a wealth of information has been presented and evaluated. This research introduced the 11Q framework, a tool for evaluating if the criteria exist for developing a successful community/university PPGIS partnership. It also discussed ways for developing broader ties between PPGIS and the emergency and disaster GIS community. This chapter will also examine the limitations of this study and areas for future research.

6.1 Research Objectives

This work examined five separate research questions. The research objectives and accomplishments are outlined below:

- An evaluation of the community-university model for the provision of PPGIS
  - Reviewed the PPGIS literature and presented 3 case studies to develop best practices for PPGIS partnerships
- Documenting the use of GIS in city, state, and federal agencies during the response and recovery efforts of Hurricanes Katrina and Rita
  - Presented an explanation of the development of the GIS-Store and other partnerships from the disaster response community.
  - Discussed the role of PPGIS during the Hurricane Katrina disaster response
- Documenting the creation of PPGIS initiatives in New Orleans

    - Reviewed the development of 3 New Orleans community/university PPGIS partnerships
- Creating a rubric for providing PPGIS to community and neighborhood groups in a post-disaster recovery environment
    - Provided the 11Q framework for evaluating PPGIS in community recovery
- Developing a framework for the integration of grassroots information and PPGIS with the governments disaster response and recovery effort
    - Discussed ways for developing broader ties between the PPGIS and emergency and disaster response community

6.2 Evaluation of the Research Objectives

The community/university model of PPGIS provision is an effective way for a community to be educated about GIS and what can or cannot be provided. With the resources and staff of a university, the PPGIS model provides significant assistance to a community or non-profit group. In post-Katrina New Orleans, this model was well-suited for use in the recovery effort. Universities from across the United States, as well as, those based locally lent their resources and skills to communities who willingly formed partnerships. This study explored the ways that both the universities and communities should consider the costs, benefits, and goals of a partnership. A post-disaster community should exercise caution and ensure that the PPGIS is helping it meet its goals. The community/university model was evaluated based upon the literature and case studies presented in chapter two and a framework was presented that examined the best practices for creating a partnership.

Evaluating the role that GIS played in the emergency and disaster response to Hurricane Katrina and Rita suggests the need for more data sharing and collaboration between PPGIS and

GIS for disaster response. Yet, Ch. 2 also documents the efforts of key individuals and organizations in the successful creation of a GIS clearinghouse model. With the strong relationships between individuals in the Louisiana GIS community, partnerships and data sharing occurred that saved time and lives. This resulted in the creation of a GIS-Store that streamlined the process and serves as a model for disaster response GIS. The response to this disaster also demonstrated the growing importance of *Google Earth* to answer basic spatial queries, as well as the role that the public can play in developing PPGIS.

In New Orleans, city government responded to the disaster by planning for recovery before many people had even returned to the city. The lack of public input in these early planning processes, as well as the plans that resulted from them, encouraged community groups and residents to develop PPGIS. In partnerships with universities, communities formed PPGIS that surveyed and mapped properties to prove the viability of their neighborhoods. These efforts helped residents to focus their energies and create tangible measures of the recovery process. These tools empowered residents by providing them with a voice, connecting them with larger networks of neighborhoods, government, and non-profits, and were used to redirect the local planning process. In Broadmoor, Gentilly, and Lakeview, three different case studies in Ch. 5 presented the way that these partnerships were successful and how they were not. By evaluating these case studies with the 11Q evaluation tool, a framework for the development of community recovery PPGIS community/university partnerships was presented.

Using the best practices of the disaster response GIS community, along with those of the PPGIS effort, suggestions for improvements to the presently bifurcated system are offered. There needs to be a closer working relationship between both the PPGIS and emergency and disaster response community, and this could come through the development of a centralized

PPGIS. By sharing the data and resources of both public and private groups, the capacity of each would be strengthened.

6.3 Study Limitations

An overall limitation of this study was the scope of the research objectives. The exploration into the emergency and disaster response GIS community could have been expanded further. The integration of PPGIS into the disaster and emergency response GIS community, the successes, limitations, and the case studies, could be the subject of a multi-year research study. Yet, the study still documented the efforts of these organizations and individuals during the response to the disaster.

Another limitation of this study are the inherent problems in measuring and gauging the success of PPGIS. Attempts to develop a rubric did not offer any tangible solutions to the questions at hand. With the broad differences that exist between PPGIS projects, especially the influence of the regional and local political climate, comparing these projects was difficult. Yet, by developing a common set of questions that can be applied to PPGIS partnerships, it is still possible to gauge what the success of a project will be.

This research did not go into enough depth about the actual cost of developing a sustainable PPGIS project. The staff, training, software, hardware, and data to develop and maintain a PPGIS is measurable, and this cost can be prohibitive. An exploration of the funding sources for PPGIS could be the subject of future research.

The community/university model of PPGIS provision was examined because it was the most widely used model during the New Orleans recovery process. A review and comparison of other modes of PPGIS provision in a community recovery environment could uncover a better model. While this research presented a framework for evaluating community/university partnerships, it failed to evaluate other modes of provision.

6.4 Further Research Questions

Over the course of the research, several questions were raised that could not be addressed within the scope of the present work. The questions presented below could be the basis for future research.

- How should neighborhood partnerships be built and maintained in order to standardize and share resources for PPGIS?
- What other community recovery PPGIS projects have been developed?
- Looking at projects that have occurred internationally, what lessons can be learned or applied to the New Orleans case studies?
- What is the potential for developing stronger university-university/community PPGIS collaborations?
- When universities want to lend resources, skills, and staff to the development of a PPGIS, but they are based locally, how can they partner with a local university to more sustainably build local capacity?
- What are the costs associated with the development and maintenance of a PPGIS?
- What other modes of PPGIS provision are well suited, or better suited to community recovery than the community/university partnership model?
- Evaluate the hindrances to more open data sharing between local government and the public

This chapter revisited the original research goals to see what questions have been answered and what future research questions have been raised. Through this broad study of PPGIS, GIS in emergency response and recovery, and the development of community/university

PPGIS partnerships for community recovery post-Hurricanes Katrina and Rita, the 11Q framework for evaluating community/university PPGIS partnerships was presented. This framework was used to evaluate three community/university PPGIS partnerships that formed in New Orleans in response to Hurricanes Katrina and Rita. This research also presented solutions for developing ties between the PPGIS and disaster and emergency response GIS community.

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Appendices

Appendix A: IRB Approval Form

University Committee for the Protection

of Human Subjects in Research

University of New Orleans

Campus Correspondence

Principal Investigator: Michelle Thompson
Co-Investigator: Brian Baldwin
Date: November 12, 2009
Protocol Title: "The Role of Geographic Information Systems in Post-Disaster Neighborhood Recovery: Lessons from Hurricane Katrina"
IRB#: 17Dec09

The IRB has deemed that the research and procedures described in this protocol application are exempt from federal regulations under 45 CFR 46.101category 2B, due to the fact that any disclosure of the human subjects' responses outside the research would not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Exempt protocols do not have an expiration date; however, if there are any changes made to this protocol that may cause it to be no longer exempt from CFR 46, the IRB requires another standard application from the investigator(s) which should provide the same information that is in this application with changes that may have changed the exempt status.

If an adverse, unforeseen event occurs (e.g., physical, social, or emotional harm), you are required to inform the IRB as soon as possible after the event.

Best wishes on your project.

Sincerely,

Robert D. Laird, Ph.D., Chair

UNO Committee for the Protection of Human Subjects in Research

Vita

Brian James Baldwin was born in Rockville Center, NY on September 23rd, 1982. He graduated from Chittenango High School in Chittenango, NY with a New York State Regents High School diploma. Upon high school graduation, Brian was enrolled in the State University of New York at Geneseo in Geneseo, NY where he graduated cum laude in May 2005 with dual Bachelor of Arts degrees in History and Geography. Brian joined the United States Peace Corps in 2005 and served for two years in Panzhihua, China. In the fall of 2008, Brian enrolled at The University of New Orleans to pursue studies in Urban and Regional Planning.