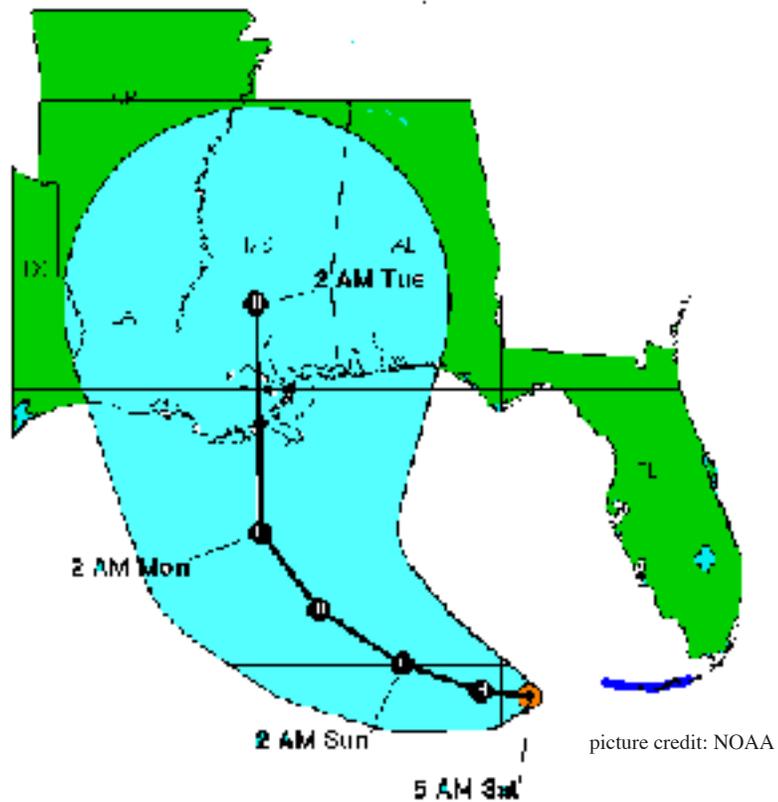# GIS Applications and Disaster Response and Recovery

picture credit: NOAA

New Orleans Use of GIS in Post Hurricane Katrina

Damage Assesment

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The goal of this paper is to address the increased importance of GIS applications in disaster rescue and recovery issues. To do this we will be highlighting a current GIS application that is being used to aid in the damage assessment of homes and structures throughout New Orleans. The paper will discuss an overview of the GIS application, as well as the societal and information dissemination benefits the application offers. It is our hope that this paper can be viewed as a resource to better understand, through the example of a current GIS use, the impact and advantages GIS software can have on local, regional, and national efforts to coupe with the massive amounts of data and information needed to run a successful post disaster plan.

GIS Tool Intoduction

In the fall of 2003, the city of New Orleans finalized negotiations to implement a new Web-based software program to provide a centralized database and access to information regarding rebuilding permits and applications. This new software provides a storehouse for permitting and land management, as well as planning, licensing, and enforcement activities.[1] When combined with GIS, parcel information and other land-based information can be linked to this database allowing real-time updates.

The City of New Orleans contracted with Accela Inc. to create customized software to accommodate the city's data needs. Accela is one of the nation's leading providers of government enterprise management software. Accela's software was created for the City's Department of Safety and Permits and New Orleans' Planning Department. In August 2004, Accela Automation was launched allowing decision-makers, businesses, and the public to visualize changes in the community from their computer. The new software also provided city employees with flexible and efficient access to data necessary for their jobs.[2]
An additional application of Accela's GIS software is in emergency response. Accela's software can be used to produce real-time maps containing land use, zoning, and parcel information that can be made available on-line for public use.[3]   This software application became particularly relevant immediately following the Hurricane Katrina disaster in New Orleans. With the parcel,

land use, and zoning information already loaded into Accela's GIS software, and stored remotely in California prior to Katrina, the City of New Orleans had a great opportunity to quickly and accurately address disaster zones in a GIS format that could be made available for the public on-line.

GIS Tool Application

Following the hurricane, over 100,000 homes were damaged in the City of New Orleans. The Department of Safety and Permits who was responsible for home inspections only had 17 of the normal 43 inspectors available following the disaster.[4] In addition, all damage reports needed to be completed according to FEMA's forms. In order to efficiently and accurately record this information Accela Inc. was contacted to assist in this process.

Accela Wireless

The City of New Orleans utilized the Accela Wireless software that extends inspection management capabilities to the field for inspections, code enforcement, work orders, and service requests.[5] Remaining inspectors, and volunteers were trained by Accela to utilize laptops equipped with GIS software, GPS receivers, and wireless internet cards to record inspection locations, status, and other relevant data. The City worked with FEMA to adapt a FEMA-approved guide sheet for flood damage assessment that was then utilized by the trained inspectors on their laptops.[6]

While in the field, building inspectors would simply examine a building and the Accela Wireless software would provide a series of prompts in which the user would answer questions relating to the building's condition, damage, or historic nature.[7] In addition, the Army Corps of Engineers provided inspectors with a sample score sheet that allowed inspectors to estimate the cost of damage to each home. Table 1 describes the score sheet inspectors utilized and Table 2 defines the consequences on home repairs based on damage cost estimates.

Table 1: Damage Type	
Case Type	Water Depth
A	0-2 feet
B	2-7 feet
C	7 feet and above

Source: Adapted from Russell, 2005

Table 2: Damage Costs and Required Actions	
Damage Cost ($)	Action
>50% of Building Cost	Built to New Elevation Levels
<50% of Building Cost	Homeowner still eligible for Insurance at current level

All of this data, including GPS locations, were transferred wirelessly to Accela's database in San Jose from wireless hotspots in the City.[8] During inspection, the buildings were tagged red, yellow, or green, depending on the amount of damage. Table 3 below summarizes the color-coding system utilized by the City.

Table 3: Building Inspection Color Codes		
Color Coding	Occupancy Allowed?	Interpretation
Green	Yes	Homeowner can make needed repairs without special approval
Yellow	Yes with restrictions	Home is believed to have structural damage and a permit is required before any work can be done.
Red	No	Home has major structural damage and will need careful review. Without homeowner action, demolition is likely

Accela's Wireless software allowed two-member inspection teams to conduct 90-110 inspections a day for a total of 3,500 per day.[9] In total over 128,000 homes were inspected with between 15 and 100 inspectors on the job each day for 10 weeks.[10] Accela wireless allowed the city to both efficiently and accurately assess home damage throughout the city in a short time frame despite widespread damage sustained by Hurricane Katrina.

Accela GIS

Accela incorporated an additional tool, Accela GIS, in the emergency response effort following Katrina. Accela GIS linked existing GIS base layers such as parcels, roads, and

infrastructure, to the home inspection data that was collected through Accela Wireless. Accela GIS served as a critical planning tool for city decision makers during the collection of home damage reports. The full integration of Accela Wireless and Accela GIS allowed home inspection data to be immediately uploaded into the City's database. City officials were then able to carefully track progress and assess the damage of the city. Following each day of inspections, city officials and project managers convened to examine the spatial distribution of completed inspections and determined which areas to prioritize for the following day of work. Accela GIS was both critical to the efficient collection of data and, empowered city officials to make informed decisions during the aftermath of Katrina.

Following the data collection stage, Accela configured Web-based access to the database as soon as inspections were uploaded. The building damage information could be either downloaded by individuals to view as a damage report of their home or could be viewed on a map in combination with other existing GIS layers such as road and parcels in the city's existing web-based GIS. This web-based access allowed displaced citizens with internet access the ability to learn about the status of their home or neighborhood.

Presentation of Information

The damage assessment information that Accela compiled is of vital importance to the New Orleans city government, and also critically important to the displaced citizenry of the devastated city. The key to the presentation of this information has been the timeliness in which it was provided. The job of damage assessment was among the top priorities following the hurricane, and, as Director of the Departments of Safety and Permits Mike Centenio said, using traditional pen and paper would have taken "100 inspectors three months to do the job."[11] Therefore, Accela's first and most dramatic impact on the presentation of information was the ability to expedite the access to that information.

In addition to dramatically shortening the timeline for damage assessment, Accela was

also able to provide almost real time data to all those in positions of power and influence in the disaster recovery effort. To do this, Accela put together web-based access to the data they were compiling in the field. The information was uploaded and made available to all city officials whenever the assessors were located in a wireless hotspot, or when the assessors returned to the office after being n the field. The information was viewable by date of inspection and house tag color, as well as being presented in GIS maps for visualization and a configurable data set that allowed different users to create customized views of data that were directly relevant to the work they were performing. This website then allowed all of the mayors staff to be briefed with the most up-to-date assessment data in preparation for the daily meetings and decision making processes.[12] Overall, this method of data presentation was an extraordinarily valuable resource to city officials, as attested to by Director Centineo, "Not only are we moving at five times the speed by using these products, we can upload the results daily for immediate totals and reporting. This is tied directly to our property database for future inspections and permitting, and in a GIS database for visual assessment of damage patterns. The benefits of this are obvious."[13] Quotes like those above pepper the articles written about this project. The positive response from officials and decision makers point to wider acceptance and appreciation for GIS in city work.

Dissemination of Information and Social Benefit

Beyond the presentation of critical information to officials and decision makers, Accela's work also provided useful and easy to access information to citizens. After the damage information was collected, Accela was able to translate that data, using GIS, to a parcel data map that displays the green, yellow, or red status of every house inspected. This map was then made available at a public website, www.cityinfo.com, to provide citizens with a timely way to determine their homes damage level. (see Figure 1) Because this information is being made available in an online format, the citizens can take immediate steps to initiate the process of obtaining the appropriate permits to return to their home, this process has become known as the Fasttrack Online Permit System. Besides the obvious advantage this format holds for citizens,

this will also alleviate the work, in both fielding phone calls and filling out paperwork, which the depleted department of safety and permits will have to undertake.

A second important role Accela played in the dissemination of information, and a second

Figure 1

societal benefit gleaned by this process, is the insurance of some level of transparency of information that will be used in the decision making process. With all of the damage assessment accessible, in a relatively real-time fashion, the public will be able to see how the assessment is progressing, and the damage levels of areas in which redevelopment is being debated. While the above resource is just the beginning, it will go a long way in creating an educated public that will then be able to better participate in the rebuilding process.

Despite the obvious and overwhelming benefits of providing an online database, some questions and concerns arise about the equity of a process like this. Following the disaster hundreds of thousands of people were displaced, and over 75,000 were housed in shelters.[14] One concern that rises out of this is the equity of access to Internet services in which most of this work is being conducted through. Additionally, one must consider the difficulty of making the displaced public aware that a site like this even exists. Although internet access is becoming more universal, it is an issue worth looking into for future damage assessment work and information dissemination. In addition, the New Orleans Web-based GIS site has had poor and unreliable performance during the months of January to March of 2006. Hopefully, the City of New Orleans is aware of the slow web-server and is working to alleviate this situation.

Deployment of Application

Before Accela entered New Orleans, they were well prepared for the type of software and tools necessary to inventory the damaged homes. Accela also had the foresight to create their software in a customizable format which allowed for quick on-site adjustments as necessary. Andrew D'Ottavio, Accela project manager, explained that upon arriving in New Orleans two weeks after the hurricane, they realized that the City's address database could not be accessed wirelessly across the city. To adjust for this, D'Ottavio and his associates loaded the address database onto the inspectors' laptop computers to allow work to continue efficiently.[15] D'Ottavio was very pleased with the integrated performance of Accela Wireless and Accela GIS in New Orleans. In particular, the real-time accessibility of inspection data proved to be a great tool for disaster recovery.

Conclusion

The above example of the use of GIS in disaster recovery management highlights some important issues. First, it is clear that New Orleans had the substantial logistical advantage of already contracting with a company that was capable of providing immediate, expert manpower when the city needed it. Secondly, one may infer from the New Orleans example, that if municipalities are not already prepared with the technology and skills needed to carry out work of this nature they should begin, provided the necessary resources are available, the process to either secure those skills and technologies or consider contracting with a company that can provide them. Lastly, as the city of New Orleans rebuilds, it should consider programs to provide Internet access and computer usage for lower income citizens so that this technology is fully accessible to all New Orleans citizens.

Notes

1. Accela. (2003). Integrating Your GIS Data Using Accela. Accela Fall Newsletter.
    Retrieved February 20, 2006, from http://www.accela.com/news/newsletter/fa03.pdf

2. Accela. (2004). New Orleans, Louisiana Launches Accela Automation as it New Enterprise
    E-Government Solution. Retrieved February 10, 2006, from
    http://www.accela.com/news/pr_080904.asp

3. Accela. (2003). Integrating Your GIS Data Using Accela. Accela Fall Newsletter.
    Retrieved February 20, 2006, from http://www.accela.com/news/newsletter/fa03.pdf

4. Babcock, C. (2005, December 12). New Orleans Residents Want Homes, but Data is a Start
    – Since Katrina, city inspectors have scrambled to get information posted online.
    Information Week.

5. Accela. (2005). New Orleans Leverages Web-based and Mobile Technology to aid in
    Response and Recovery. Accela Case Study. Retrieved February 20, 2006, from
    http://www.accela.com/products/includes/assets/casestudy_NOLA.pdf

6. Harris, B. (2003, October). Accela Takes On Vital Rola in New Orleans Recovery. Retrieved
    February 20, 2006, from www.govtech.net/digitalcommunities/story.php?id=96895

7. Russell, G. (2005, November 5). 2000 Homes face possible razing. The Times-Picayune.

8. Harris, B. (2003, October). Accela Takes On Vital Rola in New Orleans Recovery. Retrieved
    February 20, 2006, from www.govtech.net/digitalcommunities/story.php?id=96895

9. Russell, G. (2005, November 5). 2000 Homes face possible razing. The Times-Picayune.

10. D'Ottavio, Andrew. personal communication. Accela Inc. February 24, 2006

11. Babcock, C. (2005, December 12). New Orleans Residents Want Homes, but Data is a Start
    – Since Katrina, city inspectors have scrambled to get information posted online.
    Information Week.

12. Harris, B. (2003, October). Accela Takes On Vital Rola in New Orleans Recovery.
    Retrieved February 20, 2006, from www.govtech.net/digitalcommunities/story.
    php?id=96895

13. Accela. (2005). New Orleans Leverages Web-based and Mobile Technology to aid in
    Response and Recovery. Accela Case Study. Retrieved February 20 from
    http://www.accela.com/products/includes/assets/casestudy_NOLA.pdf

14. Nola.com T-P Orleans Parish Breaking News Web-Log. After the Storm: Louisiana Death
    Toll. Retrieved February 23, 2006, from
    http://www.nola.com/newslogs/tporleans/index.ssf?/mtlogs/nola_tporleans/ar
    chives/2005_09.html

15. D'Ottavio, Andrew. personal communication. Accela Inc. February 24, 2006