Working Together

Creating Partnerships for Mitigation

In the aftermath of a disaster there is a political and social opportunity for making mitigation a fundamental aspect of the disaster recovery process. Media and public attention are focused on the effects of the disaster, and, generally, there is considerable discussion of the types of strategies that should be implemented to prevent or reduce future disaster loss and damage in a specific area. However, the opportunity for mitigation is frequently lost as state and local governments are overwhelmed with the immediate needs and problems of helping communities recover from a disaster. By the time clean-up and recovery are finished, public attention moves elsewhere, and the focus on mitigation dissipates.

Case Studies

MIAMI-DADE COUNTY, FLORIDA

Miami-Dade County, Florida

In 1995, the Federal Emergency Management Agency (FEMA) developed and adopted a National Mitigation Strategy that is intended to "engender a fundamental change in the general public's perception about hazard risk and mitigation of that risk and to demonstrate that mitigation is often the most cost-effective and environmentally sound approach to reducing losses[1]."

FEMA's strategy recognizes that the key to accomplishing hazard mitigation rests firmly in the partnerships established with the State and local governments, private sector constituents, and most especially the general public.

In Florida, over $118,000,000 in Hazard Mitigation Grant Program (HMGP) funds have been made available for state and local mitigation projects since 1992. Of this amount, over $78,000,000 has been requested and obligated to the states. Most of these funds have been allocated incrementally on a case by case basis. What has been needed is a regional approach that would allow for more comprehensive and coordinated planning. At a regional level, the primary obstacle to coordinated planning is the difficulty of prioritizing projects among competing counties, municipalities, and communities. Miami-Dade County, however, has implemented a regional mitigation program with a unique approach to conflict-resolution and project prioritization.

After Hurricane Opal in 1996, which caused massive coastal erosion, and the El Niño flooding events in 1997, many mitigation proponents were galvanized into action. The State of Florida realized that hazard mitigation projects could be more effectively moved into the implementation stage if local communities supported the measures and if local governments were empowered with planning and decision-making authority. In 1997, the Florida Department of Community Affairs launched a $14,229,361 project to

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promote Local Mitigation Strategies (LMS). FEMA provided $5,285,704 in HMGP funds allocated under seven disaster declarations. The State of Florida contributed the other $8,943,656. The State prompted counties and local communities into a Local Mitigation Strategy process that has evolved into a successful program of cooperative local mitigation planning and implementation. The project provided funding for cities and counties to work together to prepare a single, unified LMS that serves as a bridge between local government's comprehensive and emergency management plans, land development regulations, building codes, and other ordinances. The effectiveness of the program became immediately apparent in the aftermath of severe flooding in Miami-Dade County in early October 2000.

On October 3, 2000, a tropical low pressure center moved over South Florida, dumping over 15 inches of rainfall on the Miami International Airport in less than 15 hours. Miami-Dade County was the most severely flooded with an estimated 94,350 homes and 500 businesses affected, and 15 schools closed. Standing water became contaminated with sewage and fuel, creating a serious public health threat in many parts of the city. Damages to the infrastructure have been estimated at $100,000,000, and agricultural losses will exceed $219,000,000.

Recent experiences with large-scale disasters have created a strong motivation for local officials to begin mitigation efforts. Miami-Dade County rests within a 12-mile wide stretch of land between the Everglades to the west, and the Atlantic Ocean to the east, that is particularly vulnerable to hurricanes and tropical storm systems, highlighted by the impact of Hurricane Andrew in 1992, Hurricane Irene in 1999, and the October floods of 2000. Its geographic vulnerability is magnified by a complex local government system that makes communication and coordination difficult.

Miami-Dade County consists of a network of local governments made up of 30 municipalities, and the unincorporated municipal services area. Each of the 30 municipalities has signed on to participate in the LMS

Southeast Florida was carved almost entirely out of the Everglades. Large-scale man-made changes have allowed expansive development and have resulted in the use of regional flood control canal systems that are no longer adequate for the task.

program. The goal of the LMS program is to pre-identify and prioritize county and community projects that could reduce that area's vulnerability to future disaster losses. After Hurricane Irene, the Miami-Dade County Flood Management Task Force was created in 1999 to make region-wide recommendations. Immediately following the October floods, the state governor formed the Governor's South Florida Flood Management Working Group. This group represents an expanded effort to include more state and federal agencies, as well as local public and private sector interests to push forward the implementation of mitigation projects identified by the county and municipalities. The LMS program has become an important part of the strategies pursued by these groups, and a basis of local planning initiatives and projects.

Controlling Floods that Rise From Below

During the early stages of development in Miami-Dade County, the land was frequently inundated for long periods of time due to the flat topography, low land elevations, and the high groundwater table in the Biscayne Aquifer. To remedy this situation and to make the land suitable for habitation, government and private entities constructed a canal system. However, the excavation of the canal system exposed the Biscayne Aquifer, the county's primary source of drinking water, to saltwater intrusion. In order to stem the flow of salt water into the Biscayne Aquifer, salinity control gates were constructed at the mouths of both secondary and primary canals throughout Miami-Dade County[2].

State and local leaders meeting to develop comprehensive mitigation solutions to South Florida drainage/flooding concerns.

Today, the canal system in Miami-Dade County is a network of about 620 miles laid out in an approximate one to two mile-wide grid. The gravity-driven canal system is divided into 360 miles of primary canals and 260 miles of smaller secondary canals. The South Florida Water Management District operates the primary system, including most of the salinity control gates. The secondary system is primarily the responsibility of Miami-Dade County. In general, the secondary canal system connects into the primary system, which discharges into Biscayne Bay. The ability to move water in the secondary system is dependent on the available capacity in the primary system, which, in turn, is dependent on the proper operation of the salinity control gates.

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The people of Miami-Dade County are dependent on gravity-driven spillway structures for the primary flood control. Since land elevations are so low, the tidal cycles influence how much flow can be removed in the critical hours after a heavy rain. The county has little or no flood control capacity during incoming tides. Furthermore, because of the proximity of the canal system to Everglades National Park and Florida Bay, water control operations have the potential to create a significant negative environmental effect. Single focus flood control operational policies, such as extreme drawdowns, could produce negative impacts to the water supply and to sensitive ecosystems in the region, and would not be allowed under state and federal environmental protection laws.

Prioritization and the Creation of Local Mitigation Strategies

An interconnected system of canals attempts to control the water table level under the communities. This gravity flow system depends on a small landscape gradient and the tidal cycle to perform its drainage function and needs supplemental pumping to increase its capacity.

The counties, in conjunction with their municipalities, were asked by the State to establish Mitigation Strategy Working Groups that would be responsible for developing the single, unified LMS. The working groups brought in other agencies and non-governmental organizations as active partners in the process. The state published an LMS Guidebook[3] that established a consistent set of standards and procedures for each of the working groups, and the participants agreed to attend LMS workshops and technical training sessions. Funds were allocated according to population and to each community's vulnerability in terms of repetitive loss, risk, and mutual aid participation.

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Local mitigation strategies are intended to not only identify a community's risks and vulnerabilities, but also to determine the types of projects needed to reduce those vulnerabilities. The goal is to allow local governments, the most critical participant of any meaningful mitigation effort, to develop LMS that will lead to pre-identified, prioritized, HMGP projects that become part of the overall State Mitigation Strategy. For the first time, LMS create real incentives for local governments to participate in hazard mitigation, and it provides a vehicle for all federal and state agencies to coordinate their resources and time. In South Florida, the LMS program has created an unprecedented degree of cooperation among local, state, and federal agencies, as well as educational institutions, private relief organizations, business, and community organizations. This has been demonstrated in the coordinated local response to the October, 2000, floods, and also by the region-wide commitment to a set of comprehensive flood control initiatives and projects.

Gates are used in the canal system to manage water level and prevent saltwater intrusion into the aquifer that is used as a primary source of the public's drinking water.

Using FEMA program funds, State Emergency Management Preparedness Assistance Trust Funds, and Department of Energy oil overcharge funds; counties and municipalities were assisted with plan development. The assistance was not solely financial. Technical assistance was provided, including hazard vulnerability data from The Arbiter of Storms (TAOS) and Sea, Lake, and Overland Surges from Hurricanes (SLOSH) models. The current SLOSH model can create

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a more accurate depiction of expected storm surge inundation patterns. Communities will use information generated by these models to develop locally appropriate mitigation measures as a part of their LMS.

In the past, the largest obstacle to implementing mitigation projects has been local disagreement over project prioritization[4]. One of the most interesting institutional measures developed by the project has been a quantitative prioritization tool. The municipalities created a systematic and unbiased methodology to allow participants to analyze the suitability, costs, and risk reduction potential of their proposed hazard mitigation measures, and allow the measures to be compared, ranked, and prioritized within each community. The algorithm and methodology was developed around two important requirements:

- That the measures must be based on the needs identified and qualified by local personnel who best understand the situation.
- That the methodology must be based on a solid foundation that reflects the key parameters agreed to by participating municipalities and their consensus view of the relationships among the parameters, determined by assigned weighting factors.

Participants found that the process was successful in quantifying the overall need, benefits, and costs of alternative measures, as well as reducing conflict over decision-making. Hundreds of potential projects have been analyzed and prioritized, and are now ready for implementation. These include initiatives at the county, regional, and municipal level. The projects range from large modifications of the Miami-Dade canal system to tree-trimming and educational programs.

Residential flooding caused by rising water table, reflected in height of water in canal. Recharging of the aquifer immediately below the surface has exceeded the canal systems discharge capacity to move the excess water to the ocean and to the Everglades. Pumping and dredging will improve the canal conveyance capacity.

Some of the proposed infrastructure improvement projects include:[5]

- The development and implementation of a forward pumping system that will supplement the slow gravity flow of the canal water is the key to the overall strategy, providing continuous stormwater drainage through the canals at high and low tides. By constructing and installing pumps at key locations in the canal system, sufficient water level can be attained at discharge points into the bays east of the affected areas to overcome rising tides. Coupled with removal of the accumulation of storm-generated silt, conveyance function of canals will be increased sufficiently to mitigate flooding except in the worst cases.
- Use of these pumps to accelerate the canal flow prior to forecast flood producing storms will increase the floodwater carrying capacity and reduce the flooding effects. Continued operation of the pumps during and after a flood event will quickly move water out of the low lying areas and allow residents and businesses to resume a normal existence reducing the devastating effects of long term inundation and the likelihood of contaminated water.
- Creation of a countywide Stormwater Management Master Plan that details: the retrofitting of undersized culverts, canal dredging, bank stabilization, interconnection of storage basins, and the creation of berms on *some* canals.
- Municipal specific projects for drainage improvement, including the installation of pumping systems, floodproofing government buildings, and floodproofing sewage, power, and communication infrastructure.

Hurricane Andrew in the Gulf of Mexico as it approaches Florida. Satellite photo courtesy of NASA.

- Mitigating storm water pumping stations in areas affected by storm surge against wind and wave action damage and providing redundant power sources for uninterrupted operation during flood events.
- A comprehensive tree trimming project based on experiences with wind damage during Hurricane Andrew. Tree trimming was given a high priority by the county as a whole, and by the separate municipalities. This initiative is to develop measures that reduce debris and protect the infrastructure from damaged sidewalks, curbs, water and sewer lines, power and phone lines (underground and overhead), and clogged storm drains. Also, the initiative identifies the best trees to plant; those that can stand wind, flood, or drought, and the proper pruning techniques to increase their survivability.

The ability to mitigate and respond to the effects of any hazard is largely determined by the social structures and processes in place when a community is impacted.

Equally important as its physical infrastructure is the strength of its institutions and organizations, including the viability of local government, businesses, churches, schools, social organizations, and families, as well as the social processes in place to promote coordination, cooperation and effective decision-making. Keeping these organizations informed is the key to any successful mitigation effort.

In a multi-lingual and culturally diverse metropolitan area, such as Miami-Dade, community outreach and public information campaigns are necessarily multifaceted. Information has to be distributed through multiple media channels and materials must be available in languages other than English. Two of the communities that have been hit hardest by recent floods, North Miami, with a large, Haitian, Creole-speaking population, and Sweetwater, with a predominantly Hispanic population, placed public information and community outreach among their top priorities. The municipalities proposed to develop Spanish and Creole videos, brochures, and newsletters to promote awareness of emergencies, and to educate residents on possible mitigation measures that they can take in their homes and neighborhoods. Both of these communities have a long history of repetitive loss, and both are primary targets of proposed mitigation efforts. Community outreach provides the means for getting the local communities behind these efforts.

Creating a Better Future

The benefits of the LMS process became apparent in the October floods. The local response to the floods was strong, well organized, and coordinated. That coordination was created in the process of linking all of the different emergency response units in the context of the LMS. The prioritization tool reduced

conflicts, and allowed communities to communicate their needs and interests. Increased communication meant a more coordinated response when the floods occurred. With the prepared response in place, mitigation proponents were able to use the floods as an opportunity to push for the immediate implementation of mitigation initiatives and projects. The Governor announced that flood mitigation in Miami-Dade County was moving to the top of the state's agenda, and local agencies began to prepare to move their projects into the implementation stage. The Mayor of Sweetwater, one of the hardest hit municipalities in recent floods, highlighted the importance of the work on LMS. Speaking to the Governor's Working Group he said, "You are our solution and our salvation. Sweetwater from one point to the other was flooded. This is no longer acceptable. We need to solve this problem now. Is the next 100-year storm six months off?"

The long-term benefits of the Miami-Dade LMS are just beginning to materialize, and the city will certainly face another potentially disastrous flooding situation in the near future. The tropical storms and hurricanes will continue to visit the city. The rains will come and the canals will rise. Next time, however, the local communities may avoid the familiar scenes of flooded homes, streets, and schools. When that happens, the city can thank the hard-working and farsighted group of people that decided that they could bring their diverse communities together to solve a shared problem. They have taken on political, cultural, and economic obstacles that others have chosen to accept, and Miami may well be a much better place to live because of this.

References

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