2011

Florida Division of Emergency Management's Bureau of Mitigation

Economic Impact Analysis

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This report presents the results of an internal DEM study to assess latent economic benefits that hazard mitigation activities provided the State of Florida from 2004-2011. Study results reveal that, in addition to future loss reduction, hazard mitigation activities provide a positive economic benefit to Floridians in terms of employment.

I. Introduction

The Florida Division of Emergency Management's Bureau of Mitigation (the Bureau or DEM) works to reduce or eliminate long-term risk to human life and property from natural hazard events and disasters by facilitating the implementation and measurement of myriad mitigation activities.[1] Assistance for hazard mitigation activities is provided through both state and federal programs administered by the Bureau.[2] While the Federal Emergency Management Agency (FEMA) is the most prominent source of funding for the projects the Bureau manages, the State of Florida also provides funding for mitigation projects through the Residential Construction Mitigation Program (RCMP) .[3] In addition, local governments and other eligible recipients provide funds for the required non-Federal cost-share, typically 25%. Since August 2004, the Bureau, in partnership with FEMA, has administered approximately $811 million to implement mitigation activities.

In addition to the benefits of reduced future disaster losses, the Bureau is interested in measuring employment activity stimulated by investments in mitigation activities. To this end,

[1] Natural hazard mitigation (mitigation) is any effort to reduce loss of life and property that can result from the impact of disasters.

[2] Hazard mitigation grant programs administered in the State of Florida include the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), Repetitive Flood Claims (RFC), Severe Repetitive Loss (SRL), Pre-Disaster Mitigation Grant Program (PDM), and the Residential Construction Mitigation Program (RCMP).

[3] RCMP receives legislatively appropriated funds each fiscal year from the Hurricane Loss Prevention Program (Chapter 215.559, Florida Statues).

staff members undertook an analytical assessment to estimate the employment-related benefits that Bureau-administered mitigation activities provide to the State of Florida. This study is the first of its kind undertaken by the Bureau. The methodology will be used as part of a series of performance measures in the future.

Study results reveal that hazard mitigation activities provide a positive economic benefit to Floridians in terms of employment as well as economic stabilization following a disaster. **Between August 2004 and February 2011, 12,206 Full-Time Equivalent (FTE) jobs were created as a result of mitigation activities implemented in the State of Florida. This equates to 1,525 jobs per year or 4 FTE jobs per day.**

It is a sound investment to spend resources pre- and post-disaster to reduce the risk of natural and man-made hazards in Florida. In addition to previous findings which reveal that mitigation is effective in reducing losses, the results of this study have confirmed the Bureau's long held belief that mitigation contributes significant additional economic benefit to the State's economy.

The following sections review the methodologies and assumptions used in this study and provide greater detail of the employment related economic benefits. Then, following a refresher of mitigation's traditionally considered benefits, several further, but less quantifiable, benefits are also presented.

II. Methodology

The analysis examined employment related economic impacts of mitigation activities managed by the Bureau from August 2004 to February 2011. The objective of this study is to measure economic activity, in the form of employment, labor income, value added, and output (see Table 2) stimulated through the hazard mitigation programs administered in the State.

Assumptions

Significant assumptions used in this analysis included:

- *Project Data Source*: This analysis used the best available data from FloridaMitigation.org, the Bureau's project data portal. All data provided were assumed accurate and complete.
- *Project Status:* A project classified as "closed" in Floridamitigation.org is assumed to have been fully completed in that all requirements of the scope have been met, all funds expended, and all associated contracts closed.
- *Open Projects*: This analysis assumes that projects which were not yet closed or completed at the time of this analysis would fully expend all awarded funds in accordance with the approved scopes of work.

- *Project Cost* Share: Where the specific breakdown of the Federal and non-Federal shares of a project's cost was unavailable, a 75% Federal and 25% Non-Federal ratio was assumed.
- *Scope:* This analysis is based on the assumption that all projects of the same project type have equivalent scopes of work.
- *Management Costs:* The analysis assumes that 70% of management costs are attributed to personnel salary and benefits and 30% for indirect costs and expenses as outlined in the State of Florida HMGP Administrative Plan.
- *Project Cost Ratios:* For each project type, allocation of total project costs between labor and materials was based on FEMA guidance and consultation with DEM mitigation engineering staff.

Process

This analysis calculated total economic impacts of mitigation activities statewide. This analysis uses Bureau project data from Floridamitigation.org in conjunction with the IMPLAN economic impact assessment software system.[4]

Floridamitigation.org is a proprietary database containing unpublished project file data used by the Bureau to track and process payments, obligate budgets to each project, as well as track and report on project progress. The data included in the Floridamitigation.org database are entered and maintained by Bureau project managers responsible for individual projects.

Project specific information from Floridamitigation.org (project title, sub-grantee name, project close date, and Federal and non-Federal obligated funding totals) was extracted and consolidated for input into the IMPLAN system. Analysts investigated existing gaps and duplication in the data and took appropriate steps to improve data quality.

IMPLAN software is produced by the Minnesota IMPLAN Group of MIG, Inc. and licensed to users for the purpose of measuring the effect of a change or activity that takes place in a particular local or regional economy. MIG, Inc. licensed IMPLAN Version 3.0 economic impact assessment software system to the Bureau. Analysts used this system to develop a statewide input-output economic model of Florida's economy, customized specifically to the Bureau's mitigation activities.

The software uses an input-output methodology of analysis, in combination with social accounting matrices and economic multipliers, to estimate the result of changes or activities in the economic study area. IMPLAN data sets can create a complete set of balanced social accounting matrices (SAMs) for every zip, county, and state. The SAMs illustrate a complete

[4] www.implan.com

picture of the economy, and are used to generate predictive input-output multipliers for estimating economic impacts. IMPLAN incorporates data from many sources, including the U.S. Bureau of Economic Analysis (BEA), the U.S. Bureau of Labor Statistics (BLS), and the U.S. Census Bureau. As this analysis was conducted on a statewide basis, the *Florida State Totals* IMPLAN dataset was used.

There are a total of 440 IMPLAN sectors, which are derived from the North American Industry Classification System (NAICS). The IMPLAN sectors incorporate industry specific economic data for the study area. The following ten IMPLAN industry sectors were used to analyze mitigation efforts in Florida:

- 36: Construction of other new non-residential structures
- 39: Maintenance and repair construction of nonresidential maintenance and repair
- 40: Maintenance and repair construction of residential structures
- 267: Motor and Generator Manufacturing
- 437: Employment and payroll for state government non-education
- 371: Custom computer programming services
- 374: Management, scientific, and technical consulting services
- 376: Scientific research and development services
- 381: Management of companies and enterprises
- 384: Office administrative services

Outputs

For this analysis, the output value of each major project type is expressed as an "impact event" with the appropriate IMPLAN industry sector (*Table 1*). Analysts applied total project funding to the most appropriate IMPLAN Sector and entered this figure into the IMPLAN system as either an "industry change" [5] or "institutional spending pattern".[6]

Projects included in this analysis were obligated funding between August 2004 and February 2011. To account for the span of the study period, analysts made adjustments to the standard IMPLAN Gross Domestic Product (GDP) deflators, using an average deflator in order to normalize to 2011 dollars. A deflator is a statistical factor designed to normalize dollars in order to present results consistently.

[5] Used to model changes in industries in the Study Area (Version 3.0 User's Guide (V3 Reference Manual) (http://implan.com/V4/index.php?option=com_docman&task=cat_view&gid=144&Itemid=7)

[6] Examine impacts of spending by households or governments. (http://implan.com/V4/index.php?option=com_docman&task=cat_view&gid=144&Itemid=7)

Table 1. IMPLAN Input Data

Project Type (Impact Event)	Total Number of Projects	IMPLAN Sector	Total Project Funding
Generators	20	267; 39	$76,388,587
Acquisition/Demolition	78	36; 374	$4,098,117
Drainage	217	39	$139,522,036
Elevation	91	39; 40	$24,567,666
Flood Proofing	9	40	$2,913,086
Management Costs	47	371; 437; 384	$26,790,945
Planning	52	376	$58,495,843
Public Awareness	52	381	$20,702,474
Studies	27	376	$8,629,717
Warning Systems	10	36; 39	$2,548,632
Wind Retrofit	675	39; 40	$445,964,830
TOTALS	1354		$810,621,933

III. Findings and Conclusions

The study results indicate that hazard mitigation activities funded by hazard mitigation grant programs in the State of Florida between 2004 and 2011 resulted in:

- 6,807 jobs created within industries directly related to mitigation activities
- 2,501 jobs created in supporting industries
- 3,893 jobs created through employee spending
- 13,202 jobs created in total -- which equates to 12,206 FTE jobs created between 2004 and 2011, or 1,525 jobs per year, or 4 FTE jobs per day[7]

Results generated by IMPLAN demonstrate benefits experienced throughout Florida's economy from the mitigation activities included in this analysis.

Table 2 Impact Summary shows the Direct Effect,[8] Indirect Effect,[9] and Induced Effects[10] of the total project investment of $810,621,933 that has been contributed to mitigation projects throughout the State between August 2004 and February 2011.

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[7] Jobs converted into full time equivalents using IMPLAN's methodology provided at http://implan.com/V4/index.php?option=com_content&view=article&id=628:628&catid=253:KB33.

[8] http://implan.com/V4/index.php?option=com_glossary&task=list&glossid=13&letter=D&Itemid=12 "The set of expenditures applied to the predictive model (i.e., I/O multipliers) for impact analysis. It is a series (or single) of production changes or expenditures made by producers/consumers as a result of an activity or policy. These initial changes are determined by an analyst to be a result of this activity or policy. Applying these initial changes to the multipliers in an IMPLAN model will then display how the region will respond, economically to these initial changes."

[9] http://implan.com/V4/index.php?option=com_glossary&Itemid=12 The impact of local industries buying goods and services from other local industries. The cycle of spending works its way backward through the supply chain until all money leaks from the local

Table 2. Economic Impact Summary

Impact Type	Employment[11]	Labor Income[12]	Total Value Added[13]	Output[14]
Direct Effect	6,807	$333,402,103	$401,051,362	$802,672,372
Indirect Effect	2,501	$121,492,215	$192,703,119	$338,499,357
Induced Effect	3,893	$161,676,671	$294,264,079	$482,988,728
Total Effect	13,202	$616,570,991	$888,018,561	$1,624,160,459

A created job as reported in this analysis is a full-time annual position. Employment as reported in IMPLAN's data is equivalent to the annual average of employment for the respective sector, which can be considered part-time, full-time, or seasonal jobs. To present the estimated number of full-time equivalent jobs created, the employment figures were converted using conversion tables for calculating FTE positions. These jobs are distributed throughout many sectors of Florida's economy.

The top ten IMPLAN sectors that experienced the most jobs added as a result of the mitigation activities are presented in *Table 3* below. When combined, maintenance and repair construction of nonresidential (39) and residential (40) structures accounted for 44% of the jobs created by the Bureau's mitigation activities.

economy, either through imports or by payments to value added. The impacts are calculated by applying Direct Effects to the Type I Multipliers.

[10] http://implan.com/V4/index.php?option=com_glossary&Itemid=12 The response by an economy to an initial change (direct effect) that occurs through re-spending of income received by a component of value added. IMPLAN's default multiplier recognizes that labor income (employee compensation and proprietor income components of value added) is not a leakage to the regional economy. This money is recalculated through the household spending patterns causing further local economic activity.

[11] Number of jobs created.

[12] All forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income.

[13] (http://implan.com/v4/index.php?option=com_glossary&task=list&glossid=13&letter=V&Itemid=12) The difference between an industry's or an establishments total output and the cost of its intermediate inputs. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Value added consists of compensation of employees, taxes on production and imports less subsidies (formerly indirect business taxes and nontax payments), and gross operating surplus (formerly "other value added"). (BEA); Gross value added is the value of output less the value of intermediate consumption; it is a measure of the contribution to GDP made by an individual producer, industry or sector; gross value added is the source from which the primary incomes of the SNA are generated and is therefore carried forward into the primary distribution of income account.

[14] (http://implan.com/v4/index.php?option=com_glossary&id=176) Output represents the value of industry production. In IMPLAN these are annual production estimates for the year of the data set and are in producer prices. For manufacturers this would be sales plus/minus change in inventory. For service sectors production = sales. For Retail and wholesale trade, output = gross margin and not gross sales.

Table 3. Top Ten Sectors for Employment

Sector	Description	Total Employment	Total Labor Income	Total Value Added	Total Output
39	Maintenance and repair construction of nonresidential structures	4,061	$184,714,972	$218,243,740	$433,860,015
40	Maintenance and repair construction of residential structures	1,796	$79,671,758	$99,154,756	$201,535,990
376	Scientific research and development services	456	$34,511,152	$34,299,646	$68,481,332
413	Food services and drinking places	437	$10,995,183	$15,476,390	$28,546,590
360	Real estate establishments	354	$5,264,506	$39,394,033	$53,704,957
369	Architectural, engineering, and related services	287	$18,086,962	$19,099,152	$33,870,297
319	Wholesale trade businesses	270	$19,963,935	$34,519,832	$48,947,097
437	Employment and payroll only (state & local govt., non-education)	232	$15,886,234	$18,046,990	$18,548,983
394	Offices of physicians, dentists, and other health practitioners	209	$15,198,937	$16,207,580	$26,999,044
329	Retail Stores - General merchandise	209	$6,141,956	$9,990,323	$11,488,948

IV. Other Mitigation Benefits

Each type of natural hazard produces a unique set of potential losses which are characterized by the details of the impact of each disaster or event. The State of Florida faces many natural and man-made hazards as outlined in the 2010 Enhanced State Hazard Mitigation Plan (SHMP) [15]. This plan is developed and maintained by the Bureau with the engagement of representatives from various State and Federal agencies, as well as non-governmental and non-profit organizations. Hazards that may affect Florida include:

- Flood
- Hurricanes/Coastal Storms
- Severe Storms and Tornadoes
- Wildfire
- Drought and Extreme Heat

[15] The State of Florida developed and adopted a State Hazard Mitigation Plan in 2004 to comply with the Disaster Mitigation Act of 2000 (DMA2K). As required by 44 C.F.R. §201.4(d) the Plan was reviewed and updated in 2007 and again in 2010. The SHMP can be viewed at http://www.floridadisaster.org/Mitigation/State/Index.htm .

- Winter Storms and Freezes
- Erosion
- Sinkholes, Landslides, and Seismic Events
- Tsunami

There are mitigation activities specific to each type of impact from these hazards that effectively reduce the risk of loss. The Bureau has successfully provided funding, management, and support to implement mitigation activities in Florida communities. In addition to benefits explored in this economic impact analysis, mitigation activities provide a litany of benefits to the citizens of Florida, some beyond the scope of the measurement. The principal benefit is the avoidance or minimization of post-disaster losses that likely would have occurred if the mitigation activity had not been implemented. Such quantifiable losses avoided include the following:

- Property damage;
- Direct business interruption;
- Indirect business interruption;
- Environmental damage and natural resource loss;
- Cultural property damage (historic sites); and
- Societal losses (death, injuries, homelessness).[16]

Each of these avoided losses affects individuals, neighborhoods, and communities in unique ways and by extension affects the entire population of the State of Florida. From a qualitative standpoint, the most basic benefits of hazard mitigation activities are that they promote safer communities, save lives, and reduce loss from natural hazard events. Each of the quantifiable avoided losses listed above contains residual qualitative effects that can be reduced through mitigation. For instance:

Community Disruption from Property Damage and Business Interruption

Damage to residential, non-residential, and personal belongings can have a dramatic, and sometimes, life-changing effect on families and businesses.[17] Small businesses can be particularly vulnerable to disaster impacts on their capital investments, their customer base, and their supply chain. Natural hazard events have been shown to result in reduced hours to

[16] Environmental damage, cultural property damage, and societal losses can be quantified through willingness to pay (WIP) indexes. Please see http://www.csc.noaa.gov/coastal/economics/envvaluation.htm for more information.

[17] Fullerton, CS et al (1995). Psychiatric dimensions of disaster: patient care, community consultation, and preventive medicine. *Harv Rev Psychiatry*. *1995 Nov-Dec;3(4)*:196-209.

employees of small businesses, as well as slowed hiring. [18] If owners are unprepared to cope with the effects of disasters, businesses can close. Other than disruption of a daily routine, such impacts can result in relocation of families and business entities, thereby reshaping the dynamics of the communities and the economies of impacted areas.

Implementing mitigation activities can mean the difference between a home either remaining intact or sustaining catastrophic damage requiring demolition which displaces residents. Creating a stronger community through mitigation activities before disaster strikes will result in less business interruption post-impact. Mitigation helps support community resiliency in post-disaster situations by strengthening property.

Community and Industry Disruption from Environmental and Cultural Property Damage

Hazard impacts can cause catastrophic and irreversible damage to valuable environmental features and natural resources. Environmental assets provide a multitude of benefits, which range from recreational opportunities to clean drinking water. Tourists from around the world flock to Florida to enjoy the environmental amenities the state has to offer, producing economic stimulus. Some mitigation activities help protect environmental features by hardening infrastructure for parks and natural resources.

Florida has a diverse history which is evidenced by historic and cultural sites and structures located throughout the state. These places add value through increased tourism and provide for educational and cultural opportunities and activities. Such features help create a sense of place and many Floridians take pride in associating themselves with these resources. Protecting historic and cultural resources from the effects of natural hazards strengthens communities and cultures. Mitigation supports the retrofitting of historical and culturally significant structures, as well as helps fund infrastructure improvements to further protect these sites.

Societal Loss

The impacts of hazards have components that threaten lives, livelihoods, and can cause unimaginable disruption to the way of life for many citizens. These effects can be far-reaching and may endure for generations. Death, injury, homelessness, and unemployment are a few examples of the societal effects of hazards on families and communities. Activities funded and managed through the Bureau reduce the loss of life and property throughout the state. Projects such as the elevation of structures, hurricane evacuation studies, wind-retrofitting of hospitals and other critical facilities, and the residential wind-retrofitting of structures increase the safety and well being of citizens and protect property.

[18] Kulikowski, L. (2011, June 2). Large-Scale Disasters Impact Small Businesses (Natural Disasters Stifle Small-Business Hiring). *NuWire Investor (with permission from The Street)*. Retrieved from http://www.nuwireinvestor.com/articles/large-scale-disasters-impact-small-businesses-57349.aspx.

Sound mitigation activities maximize the protection of vulnerable populations and minimize damage to buildings, critical facilities, and infrastructure. This, in turn, ensures that essential services and critical facilities are available and functional during and after natural hazard events. This allows the efficient allocation of resources to respond to disasters and protect all Floridians. Furthermore, mitigation activities foster a quicker recovery for communities following a disaster impact.

Measuring Other Mitigation Benefits in Florida

A 2005 study prepared for FEMA estimated that **society receives $4 in future benefits for every $1 spent on mitigation.**[19] A 2007 Congressional Budget Office report found that mitigation projects likely lower the need for post-disaster assistance from the government, "**so that mitigation investment…would actually save taxpayer funds.**" [20] Mitigation is expected to save hundreds of lives across the United States each year.[21] These conclusions show that communities that implement a coordinated, comprehensive mitigation strategy, inclusive of all stakeholders, are much more resilient to the impacts of natural and man-made hazards

At the state level, in 2010 the Bureau conducted post-disaster assessments. These assessments reviewed completed mitigation projects in the damage swaths of Tropical Storm Fay and the North Florida Flood Event of 2009 to determine whether mitigation projects had successfully reduced damage. All projects assessed were found to be successful.[22]

The Bureau is developing methodologies to expand the information captured in post-disaster assessments to include direct financial losses avoided.[23] These losses include property damage, displacement costs, and direct business interruption and will be captured through loss avoidance assessments to be completed following the next significant flood or wind hazard event. The data gathered and presented in loss avoidance reports will provide the foundation for future performance measurement of mitigation benefits of this kind in Florida.

V. Conclusion

Although the benefits of mitigation have historically been attributed to losses avoided post-disaster, investments in the activities and administration of the Bureau have paid for themselves

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[19] National Institute of Building Sciences, Multihazard Mitigation Council. 2005. *Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities*

[20] U.S. Congress. House. *Predisaster Hazard Mitigation Act of 2010*. H.R. 1746. 111th Cong., 2nd sess. (January 5, 2010). http://www.gpo.gov/fdsys/pkg/BILLS-111hr1746enr/pdf/BILLS-111hr1746enr.pdf (accessed May 15, 2011).

[21] Ibid.

[22] These reports can be viewed at http://www.floridadisaster.org/Mitigation/State/documents/2010stateplan/appendix/FINAL%20Appendix%20E-b_TS%20Fay%20Cost%20Avoidance%20Report.pdf and http://www.floridadisaster.org/Mitigation/State/documents/2010stateplan/appendix/FINAL%20Appendix%20E-a_1831%20Cost%20Avoidance%20Report.pdf , respectively.

[23] This commitment is reflected in the SHMP, Section 4.0.

in terms of job growth alone. This is a previously unexplored benefit. The value of output, over $1.6 billion, added to Florida's economy over the past seven years more than doubles the investment. Activities facilitated by the Bureau since 2004 have yielded the equivalent of over 12,000 yearly full time positions at an average labor income of over $50,000. These investments have helped to support the industries that have suffered heavily as a result of the downturn in the economy: construction, real estate, research and development, and food service industries, to name a few.

The results of this new economic impact analysis reveal that continued investment in mitigation and the Bureau, which administers, tracks, and measures such activities, is sound when viewed in terms of job-growth value added alone. When such results are coupled with the fact that mitigation strengthens Florida's communities and residents, adding resiliency to the State as a whole, it is evident that continued investment in mitigation and the Bureau yields a boon to our economic health.