Modeling Storm Surge for Emergency Management

Study Area:

Guam is the southern-most island of the Mariana Archipelago and is located at 13° 28' N, 144° 47' E. •It has a total area of 541.3 sq. km. and the highest point is Mount Lamlam at 406 m.

•Estimated population of 173,456 in 2007.

•In 1950 under the Guam Organic Act, the island became an organized, unincorporated territory of the United States under the jurisdiction of the Office of Insular Affairs, Dept. of the Interior (DOI).



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Emergency Management & GIS

Background

Emergency is a course of events that endangers or adversely affects people, property or the environment.

• Types of Emergencies:

- Natural Disasters
- Internal Disturbances
- · Energy and Material shortages
- Attack

Emergency Management Phases

- <u>*Planning*</u> activities necessary to analyze and document possibility of emergency or disaster
- <u>Mitigation</u> activities that eliminate or reduce probability of a disaster
- <u>Preparedness</u> activities necessary to the extent that mitigation activities have not or cannot prevent a disaster
- •<u>Response</u> activities following an emergency
- •<u>*Recovery*</u> begin when emergency is over, two phases short and long term

Emergency Management & GIS

Objective/ Scope

- Model Storm Surge for natural disasters (typhoon or tropical cyclones)
- o Assess model against real data from super typhoon Pongsona
- Build Predictive model with Maps static and interactive to assess areas where access to Emergency facilities will be encumbered

GIS Analysis

Data: DEM – 10m resolution, Shapefiles, Ikonos Imagery, DRG, GoogleMaps, Bathymetry depth and Bathymetry slope

Methods: Convert DEM to TIN with 10m z-tolerance

Derive Contours from TIN at 5m intervals

Convert TIN to raster to get cell values <=5m (storm surge level) Roads layer to extract routes affected by storm surge Bathymetric Zonal analysis used to assess model to real data



Tide with Storm Surge

Meteorological Parameters

- Intensity of storm
- Atmospheric pressure
- •Tract of storm
- Forward speed
- Radius of maximum winds

Physical characteristics of the basin

- Slope of coast
- Roughness of coast
- Coastline
- Natural or man made barriers













Modeling Predictability

Typhoon Pongsona 2002 Inundation Levels



Heights in feet of inundation above mean sea level (AMSL) at locations from Cabras Island to upper Tumon Bay

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Modeling Predictability



Emergency Management - Applying the Model

•Develop EM GIS Standards

•Resource allocation

- •Software, Hardware, Data Types, Internet
- •Training

•Detailed Maps of areas affected

- •Use of GIS spatial Analysis
- •Dissemination of Maps GeoPDFs
- •Web Technologies –Googlemaps/Earth

•Implement throughout EM Phases

- •Risk Analysis and assessment
- •Enhanced decision making

Applying the Model

Evacuation routes or street closing to nearest Hospitals









