Sea – level rise and storm surge erosion have been steadily increasing over time. A large amount of the world’s coasts are eroding and are in danger of disappearing. This has many causes from global warming caused by the greenhouse effect and increase in storm severity to the human impact. The world scientific community has been discussing sea – level rise for many years but only recently have the city and town planners become increasingly aware of this problem. The problem of sea – level rise will have an effect on many communities around the world. It will have a devastating effect on coastal cities and towns. Some cities and towns will cease to exist if the town and city planners do not plan now for the future to prevent further loss of our coastal area due to sea – level rise and storm surges.

Town and city planners are reaching out to the environmental GIS community and asking them to produce data modes showing how sea – level rise will effect their communities. The data that was used by many researchers was remote sensing and local DEM (Digital Elevation Models). In some countries they use DTM (Digital Terrain Model), ecological landscape studies, and LIDAR data. The tools that were used in the study were ArcInfo and ArcView from ESRI. The remote sensing data comes from the Landsat TM, SPOT multispectral satellite.

There were several different models that were used by many different countries. The model that was used for sea – level rise to determine how it would impact the northeast coast of Florida was SLAMM (Sea Level Affecting Marshes Model). The use of this model is for landscape changes from wetland response to sea – level rise. This model used remote sensing and GIS. The SPOT satellite images were used as well as DEM, USFWS, and NHAP data. They were mapping how the sea – level rise and storm surge would effect the diverse coastline of Florida. The model that was used in Sydney was the CRM (Coastal Recession Model), which was developed by Cowell (Cowell et. al 1996). It is a calculation that is used to predict sea – level rise. Other researchers in Australia used three models to show how the sea – level rise would effect the coastal area. They are Hybrid – Brunn, Aggradation and Translation models. These models use different calculations to show the possible changes that sea – level rise and storm surge will play on the coastline. The Aggravation and Translation Models have not been tested and validated with data that was collected in the field. There are a lot of limitations for these models because of the different GIS software packages that are available for use. The different software uses different algorithms for data collection, interpolation, and calculations (van der Knapp, 1992). The researchers who could not use any of the models that were currently available to accurately show the effects of the sea
level rise created new maps by remapping old DEM's to show what the coastline currently looks like. They also created new models using Visual Basic and Oracle database the could be used with ArcView to create models. They had to go out and collect new data and then remap other data for the coastline. They collected data using LIDAR, satellite images, and air photos. The types of maps that the researches used varied from raster to vector depending on how the data was to be presented to the city and town planners. There is not a wide variety of data that is up to date and the models are limited because sea-level rise is a new issue that is affecting our coastlines.

The articles that I found relating to sea-level rise and coastal erosion were very interesting. I found that this is a major problem for the world and that there were not many articles that were written about this topic. I also learned from the articles that there is a limited amount of up to date data on the coastal zone and it was hard to collect data because of the drastic changes in the environment. This is often difficult to do because of the lack of high-resolution data, especially terrain data in many coastal areas (Nichols, 1993). All the articles stated that GIS is perfect for modeling and doing a case study on this topic. The researchers used remote sensing satellite images and air photos as well as local DEM, topographical maps, and DTM.

I found that this is an important issue and that the town and city planners are using this information to change or add new laws governing zoning along the coastline. I conclude that sea-level rise is a reality that has to be dealt with and there is a great need for more data on this topic since it will have a dramatic change on a country.

Other References


Annotated Bibliography


This paper discussed the issue of conservation and sea-level rise on the coastal dunes in the Netherlands. There is a great expanse of coastal dunes that will be threatened by the sea-level rise. A commission was formed to study this problem.
and come up with a plan of action to take steps to limit this issue. The commission chose to use a Geographic Information System (GIS) to help show dune erosion, change, and sea-level rise. They chose to use raster maps. They found out that they did not have enough complete data therefore researches had to go and build up their database to scan and digitize the maps so that they could do their analysis of sea-level rise and coastal flooding.

**Webster, T., Dickie, S., O’Reilly, C., Forbes, D., Parkes, G., Poole, D., Quinn, R., May 2003. Mapping Storm Surge Flood Risk Using A LIDAR-Derived DEM. Geospatial Solutions.**

This article explains how a group of researchers used GIS and Remote Sensing to study the effects of sea-level rise around Prince Edward Island, Nova Scotia, and Canada. To do the study, they hired a helicopter equipped with an airborne system that emits laser pulses beamed towards the ground to acquire accurate topological information. They also used GPS to validate the information that was collected from the aerial photos. Next, they went on to describe how they used the GPS, and aerial photos to develop DEM’s of the island. Following the creation of DEM models, they created flood-plain simulations using triangular irregular network (TIN) for these flood models. The paper concluded with predictions of sea-level rise and flooding models that were given to the planning board so that the board could make new zoning laws.


This paper was written to express the difficulty in predicating sea-level rise and coastal recession for Fingal Bay Beach, Sydney, SE Australia. The article talks about using a raster based modeling technique to map the unpredictable coastline and beaches. The article goes over a couple of random simulations of how the data should be inputted into a GIS ArcInfo system. It also states that it is difficult to acquire data because of the unpredictability of the erosion changing the coastline. The articles also take about different kinds of models or procedures used to create new DEM’s using a differential approach, random simulation, and fuzzy set theory.


This research article states that coastal flooding is a problem England and coastal planners are studying. As researchers started to investigate this problem they found that there was a lack of data on this problem and an insufficient
software package to do the analysis. The researches created a new program that integrated Intergraph GIS and Oracle database software then converted them to ArcInfo format for analysis. They also used Microsoft Excel to do calculations of the flood level. The prototype that was used was Microsoft Datamap and Visual Basic to do the calculation and update the attribute tables and maps that were entered into ArcView. The data that they used for this model was Lansat TM for land – use/land - cover for coastal impact.


The paper discusses sea level rise and the effects on coastal wetlands in Florida. The researchers talk about how they gathered data using remote sensing, USGS, and National Wetland Inventory Maps (USFWS). They chose to use raster and vector maps to run simulations on sea level rise. In their research, they use Sea Level Affecting Marshes Model (SLAMM) with updates and new maps that they digitized from the SPOT satellite images. They found that the GIS and remote sensing helped the planning boards make new zoning decisions.


The article is written about sea-level rise and coastal erosion in Australia. The authors talk about using three models to generate answers to sea – level rise and coastal erosion. They are Hybrid-Bruun, Aggradation, and Translation models. These models use a set of calculations from a model on sea –level rise. The authors talk about the data and state that a GIS system is great to use but there is a lack of high-resolution data on terrain information. However, they did not talk too much about what kind of data they required. They only mentioned that they needed to remap terrain data.

This paper discusses the sea – level rise in the Polish Baltic coastline. The article explains some of the causes of sea – level rise and the increasing amount of storm surges. They also go into the greenhouse effect and how it is effecting the Earth’s climate. The article gives you a feel for the different types of coastline that are along the Polish Baltic coast. The authors use a TIN vector data model and DTM data (Digital Terrain Model) raster map to generate models for their study. They used numerous calculations and models to determine the area that will be affected by sea – level rise. As the authors were working on the data, they found that the DTM was not accurate and they had to acquire more data for the study area.