Estimating the Impact of Catastrophic Sea Level Rise in Maine
Randa Capponi ('06), Gregory LaShot (’07J), Sharon McMonagle ('06), and Christopher Russoniello (’06)
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Introduction
Global climate change is increasingly recognized as a certainty (IPCC 2001). Associated with increasing
temperatures, sea levels are expected to rise as a result of thermal expansion and the melting of polar ice caps. Mean high tide is predicted to rise one meter by the end of the century (IPCC 2001). Long-term models indicate the possibility of sea level rise up to six meters (Hamilton cited in Richardson 2000). If these predictions are realized, the loss of land and the associated economic impacts will change the face of the Maine coastline. Long term financial and spatial planning will help to alleviate the impact of climate change. This study is a spatial analysis of the areas most likely to be affected by rising sea levels in Maine.

Methods
Digital Orthophoto Quadrants (DOQs) were downloaded from the Maine Office of GIS (MEOGIS) to visualize existing infrastructure in 15 Maine towns. In addition to the eight towns shown, data for Bar Harbor, Biddeford, Boothbay Harbor, S nostris, Brunswick, South West Harbor, Waldoboro, and York were included in our analysis. Data layers containing information on fire and police stations, schools, hospitals, libraries and roads were obtained from MEOGIS. Maine township data were used to determine the borders of each town. We used the mask function to identify the infrastructure located in our study sites. Digital Elevation Model (DEM) data of the towns were then translated, clipped, and reclassified into five elevation classes: 0-1 meter, 1-6 meters, 6-20 meters, 20-40 meters, and greater than 40 meters. The study looked at 1-meter and 6-meter sea level rise scenarios. We then determined the total amount of infrastructure located within each class. The road miles analysis was only calculated for the eight towns shown. A similar analysis was conducted for the whole coastline, however DOQs were not included.

Discussion
Maine will experience the economic impacts of sea level rise within the century. The cost of replacing coastal infrastructure as well as private property will be high. Overall, in the 1-meter scenario 3 municipal buildings and in the 6-meter 35 buildings were submerged in the 15 towns analyzed, no municipal buildings included in our study were affected. In the 6-meter scenarios 2 schools and libraries, 3 fire and police stations, and 1 hospital were submerged. Few roads were affected by the 1-meter scenario, with less than 4 kilometers of road damaged in each town. Within the 15 towns, the largest land loss in a 1-meter scenario was in Kennebunk, where 2.94% of the town would be inundated. The six meter rise scenarios had the largest land impact on Old Orchard Beach, where 29.40% of the land and 31.36 kilometers of road were submerged. The Maine Municipal Association performed a study estimating a cost of $20,000 to $60,000 per mile to replace coastal roads (2001). With a 1-meter rise the cost to the state, counties and municipalities would be $1 to 7 million. A 6-meter rise would cost between $15 and 45 million. A similar analysis for the whole state would increase these figures considerably. By planning ahead and building in low risk areas the state of Maine can help to lessen the economic impact of future changes in sea level.