7. SHORELINE RESPONSE MODELING

7.1 INTRODUCTION

A potential dominant effect of relative sea level rise is shoreline erosion. An erosional trend on a developed coastline always requires a decision to: 1) retreat, 2) stabilize through coastal structures, or 3) stabilize through nourishment. Each of the above can be costly; accepting that under a given scenario of relative shoreline stability, sea level rise, etc. there is an "optimal" choice, it follows that an inappropriate choice could be inordinantly expensive. Given that eustatic sea level rise affects shorelines on a global basis, that the human rate of shoreline development is increasing and that some projections of future sea level rise are much greater than in the past, it becomes important to attempt to predict the shoreline response to such a rise.

Shoreline response to sea level change depends not only on the rate of change, but also on antecedent conditions and the degree and type of disequilibrium of the shoreface. The dominant engineering approach to predicting shoreline response is the so-called "Bruun Rule" which considers only cross-shore conditions and an offshore "closure depth" seaward of which there is no sediment exchange. The Bruun Rule yields a simple relationship resulting in horizontal shoreline retreat of approximately 50-100 times the rise of sea level. This chapter presents a more complete consideration of the sediment budget on the shoreface and attempts to remove some of the limitations of the Bruun Rule. Specific cross-shore components not included by Bruun but which could be of significance are: 1) shoreward transport of sediment across the shoreface, 2) deposition of suspended sediment, and 3) biogenetic production of sediment. An important factor relating to shoreward sediment transport is the history of sea level change over the past ~ 20,000 years, with the last 6,000 years or so representing a relative still stand.

7.2 LITERATURE REVIEW

Prior to discussing the models for shoreline response, it is instructive to review estimates of sea level rise over the last 20,000 years or so, shown in Fig. 7.1. Sea level rose rapidly (about 0.8 m/century) from 20,000 years before present (BP) to about 6,000 years BP. Over the last 6,000 years, sea