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TITLE: Increasing flood risk and wetland losses due to global sea-level rise: regional and global analyses

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ABSTRACT:

To develop improved estimates of (1) flooding due to storm surges, and (2) wetland losses due to accelerated sea-level rise, the work of Hoozemans et al. (1993) is extended to a dynamic analysis. It considers the effects of several simultaneously changing factors, including: (1) global sea-level rise and subsidence; (2) increasing coastal population; and (3) improving standards of flood defence (using GNP/capita as an ?ability-to-pay? parameter). The global sea-level rise scenarios are derived from two General Circulation Model (GCM) experiments of the Hadley Centre: (1) the HadCM2 greenhouse gas only ensemble experiment and (2) the more recent HadCM3 greenhouse gas only experiment. In all cases there is a global rise in sea level of about 38 cm from 1990 to the 2080s. No other climate change is considered. Relative to an evolving reference scenario without sea-level rise, this analysis suggests that the number of people flooded by storm surge in a typical year will be more than five times higher due to sea-level rise by the 2080s. Many of these people will experience annual or more frequent flooding, suggesting that the increase in flood frequency will be more than nuisance level and some response (increased protection, migration, etc.) will be required. In absolute terms, the areas most vulnerable to flooding are the southern Mediterranean, Africa, and most particularly, South and South-east Asia where there is a concentration of low-lying populated deltas. However, the Caribbean, the Indian Ocean islands and the Pacific Ocean small islands may experience the largest relative increase in flood risk. By the 2080s, sea-level rise could cause the loss of up to 22% of the world's coastal wetlands. When combined with other losses due to direct human action, up to 70% of the world's coastal wetlands could be lost by the 2080s, although there is considerable uncertainty. Therefore, sea-level rise would reinforce other adverse trends of wetland loss. The largest losses due to sea-level rise will be around the Mediterranean and Baltic and to a lesser extent on the Atlantic coast of Central and North America and the smaller islands of the Caribbean. Collectively, these results show that a relatively small global rise in sea level could have significant adverse impacts if there is no adaptive response. Given the ?commitment to sea-level rise? irrespective of any realistic future emissions policy, there is a need to start strategic planning of appropriate responses now. Given that coastal flooding and wetland loss are already important problems, such planning could have immediate benefits.

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