frequency of the water body approaches the tidal forcing frequency with increasing water depth and changing boundaries.

Mann (1987) theoretically simulated the response of inlet/bay systems of assumed geometries to a total sea level rise of 1.3 m, corresponding to a 0.3 m rise over the past century and a 1.0 m projected rise. The bay was assumed to be relatively small and deep, with a surface area of $5 \times 10^6 m^2$. The inlet channel was 1,800 m long and 150 m wide. It is illustrative to consider here the case of an initially 1.5 m deep channel. For this shallow system, the ratio of the (semi-diurnal) tidal frequency to the natural frequency is 0.16, which is $<< 1$, thus signifying a friction-dominated (as opposed to resonance-dominated) system.

In Fig. 4.3, the resulting changes in the mean bay level and bay tidal range are shown. A 1.3 m rise in sea level decreased bay superelevation (head above mean sea level), from 0.27 m to 0.11 m. On the other hand, reduced friction resulted in an increased tidal range. Initially, the high water (HW) and low water (LW) amplitudes of tide relative to mean bay water level were 0.28 m and 0.25 m, respectively. The tidal range was thus 0.53 m. After a 1.3 m sea level rise, the amplitudes became 0.66 m and 0.56 m, i.e., range 1.22 m.

These data on the effect of sea level rise enable the determination of the high water level within the bay initially, and following sea level rise. Let S = sea level rise, a_{HW} = HW tidal amplitude in the bay relative to mean bay level and B = bay superelevation. Let Δa_{HW} and ΔB represent changes in a_{HW} and B, respectively. Then, initially, the HW level with respect to the initial mean sea level will be $a_{HW} + B$. After sea level rise, it will be $S + a_{HW} + \Delta a_{HW} + B + \Delta B$. Note that in the example considered, ΔB is a negative quantity. Relevant quantities in the present case are: $S = 1.3$ m, $a_{HW} = 0.28$ m, $\Delta a_{HW} = 0.38$ m, $B = 0.27$ m and $\Delta B = -0.16$ m. Thus the initial HW level relative to initial sea level was 0.55 m, which rose to 2.07 m subsequent to sea level rise.

The significance of the above result is self-evident; sea level rise could, in addition, increase the tidal range so that, in spite of a decrease in bay superelevation, high water level rise within the bay would become greater than that corresponding to sea level rise alone.