

ASSIGNMENT 2. CLIMATE CHANGE IN PORTS

Define a sloping structure with the typical features of a port located on the Catalan Coast. The following values must be assigned: θ (structure slope at the seaward side), h (water depth at the structure toe) and F (freeboard or distance from sea level and the top of the breakwater).

To carry out the computations, present wave features must also be defined: H_s (significant wave height at deep water corresponding to a return period of 50 years) and T (wave period associated to H_s). Assume that the wave incidence is perpendicular to the structure and bottom contours are straight and parallel to the structure.

Make two plausible hypotheses of sea level rise and two of wave height increase (at deep water) due to climate change. For the four possible combinations, compute the variation (in %) of the scouring at the structure toe, the variation (in %) of the overtopping discharge and the variation (in %) of the weight of breakwater armour layer blocks (in this case use the expressions of Hudson or van der Meer).

To compute the scouring S , use the following expression:

$$\frac{S}{H} = \frac{f(\theta)}{\left[\sinh\left(\frac{2\pi h}{L}\right) \right]^{1.35}}$$

where:

$$f(\theta) = 0.3 - 1.77 \exp\left(-\frac{\theta}{15}\right)$$

H and L are respectively the significant wave height and the wave length at the structure toe.

To compute the overtopping q use the expression:

$$\frac{q}{\sqrt{gH^3}} = 0.2 \exp\left(-4.18 \frac{F}{H}\right)$$