Why do we love the sea?
Because it makes us think of things we like to think[1]

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The Belgian coastal zone offers quite a number of scientific and engineering challenges.

The actual level of safety is at several places considerably less than the 'once in 1000 years' standard. Patches of beaches and dunes are threatened. The expected sea level rise, due to the imminent climate change will increase the challenge. This has prompted the Flemish government recently to approve an integrated safety plan for the coast; some urgent measures are already taken.

The accessibility of the harbours of Ostend and Zeebrugge requires frequent dredging and important infrastructure works. The Scheldt Estuary needs continuous maintenance dredging, which entails the problem of where to dispose the dredged material, in particular mud, which may be contaminated. Clever solutions can turn a problem into an opportunity, avoiding morphological deterioration of the estuary and fostering biodiversity by re-creating mud flats or extending existing ones.

Natural reserves are threatened (e.g. the Zwin), others are newly appearing (Heist) or are being recreated (e.g. mouth of the IJzer).

To be prepared for all these challenges, research had been done: both fundamental work to understand the physics better (e.g. mud behavior, nautical depth, sediment transport) and applied research by testing different designs or management plans. However, more research is still needed to fill knowledge gaps (e.g. the effects of waves breaking against a dike and of dike overtopping), or to address new problems (e.g. off shore wind farms or even artificial islands!).

Although physical models are still used to support and underpin the design of infrastructure works or coastal protection plans, numerical models are now used routinely. However, no model includes all relevant physical processes in sufficient detail and/or all their interactions. A numerical model is a 'model' indeed and thus represents the reality only partially. Often, also the available data are not sufficient to calibrate and validate the models properly. The use of new technologies (e.g. using satellite images or airborne sensors, producing spatially distributed data) may improve on that. Anyhow, model results must be interpreted with care and expert knowledge.

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[1] After Robert Henri (1865-1929).