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COASTAL FLOODING MITIGATION BY IMPLEMENTING HYBRID FLOOD DEFENSES CONSISTING OF EMBANKMENT AND VEGETATION FIELDS

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Coastal schemes are essential in mitigating the risk of flooding, which will increase due to inevitable sea level rise, and which affects coastal communities globally. The design of these schemes is complex and needs the careful balancing of competing interests and perceptions. Coastal practitioners currently champion “green” nature-based solutions in place of traditional hard defenses. Large, vegetated areas are needed to sufficiently attenuate long-period waves, but coastal squeeze and urbanization do not always allow for wetlands restoration on large enough scales. The consequence is that the effectiveness of nature-based solutions to sufficiently attenuate long period waves such as tides and surges is uncertain. In this study, the use of hybrid solutions informed via engagement with the local community is tested as an alternative. A 2D numerical model is built in Delft3D-FM to simulate flooding in the inner Forth Estuary (UK). The hybrid defense consists of an embankment and vegetation patches of various sizes added in front, on top and behind the embankment. The simulations reproduce the December 2013 storm conditions. The results indicate that vegetation can considerably increase the energy dissipation currently provided by the embankment and decrease water depths and flood extents. In the presence of hard defenses, loss of agricultural land can be limited by increasing along-shore distances of the vegetation patches causing the same effect. For an effective attenuation, the vegetation patches need to interfere with the main flow path and circulation. This study provides an insight on the use and benefits of hybrid flood defenses.