

INVESTIGATING THE RESILIENCE OF SALT MARSHES TO EXTERNAL DISTURBANCE

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Salt marshes are valuable ecosystems that provide numerous services and act as natural coastal defences by buffering storm waves and stabilising sediments. However, it is not clear whether they will be able to retain their resilience with accelerating rate in sea-level rise, possible increases in storm intensity and increasing land reclamation. The current paradigm is that a positive sediment budget supports the survival and accretion of salt marshes while a negative sediment budget causes marsh degradation. Here we present the results of a series of studies that used an integration of modelling and paleoenvironmental analysis and a sediment budget approach to investigate the resilience of estuaries and salt marshes to projected rise in sea-level, possible increases in storm activity and existing anthropogenic disturbance. The studies were conducted using the Ribble Estuary - North-West England - as a test case, the hydrodynamic model Delft3D to simulate the estuary morpho-dynamics under selected scenarios, and optically stimulated luminescence (OSL), geochemistry and particle size distribution analysis to reconstruct the past evolution and adaptation of the estuary morphology. Results showed that sea-level rise threatens estuary and marsh stability by promoting ebb dominance and triggering a net export of sediment. Conversely, storm surges aid the resilience of the system by promoting flood dominance and triggering a net import of sediment and have the potential to counteract the negative impact of sea-level rise by masking its effects on the sediment budget. The addition of embankments, on the other hand, can further promote ebb dominance in the system and intensify sediment export, further threatening marsh stability.

References

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