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# The Vici project “Turning the tide”: dynamics of channels and shoals in estuaries with sands and mud

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Tidal systems such as the Ems and Scheldt estuaries and the Wadden Sea have perpetually changing channels and shoals of sand and mud, sculpted by ebb and flood currents. Shoals that dry and flood daily due to the tides are ecologically valuable habitats, whilst main tidal channels have a multi-billion Euro impact as shipping fairways that provide access to harbours and urban areas. Unfortunately, our present current models fail to adequately predict natural dynamics and the effects of human interference, making optimisation of management for the combined functions precarious.

In the coming five years I will conduct my Vici project (NWO-STW) to generate understanding of natural dynamics and response to human interference of channels and shoals in estuaries, and subsequently produce improved forecasting tools. The working hypotheses are that the natural dynamics are caused by 1) sudden collapses of steep shoal and channel margins and 2) sand transport processes on gentler slopes. These shoal break-down processes are balanced by shoal build-up with 3) a layer-cake of sand and mud. Together processes 1-3 govern the response to human interference.

I will build a large, worldwide unique, tidal facility to systematically create dynamic estuaries and apply dredging scenarios. The novel principle, periodic tilting of the entire flume, successfully reproduced dynamic channel-shoal systems (for pilots see Kleinhans et al., this conference). Numerical models presently ignore channel-shoal margin collapses and inadequately predict gentle slope processes and mud settling, for which novel submodels will be developed and implemented in collaboration with Deltares. The effects on large-scale dynamics of channels and shoals will be explored. Dredging and dumping scenarios will be run that optimise cost and benefit habitat surface area and quality. Tidal bar dimensions and stratification will be analysed to benefit the petroleum industry.

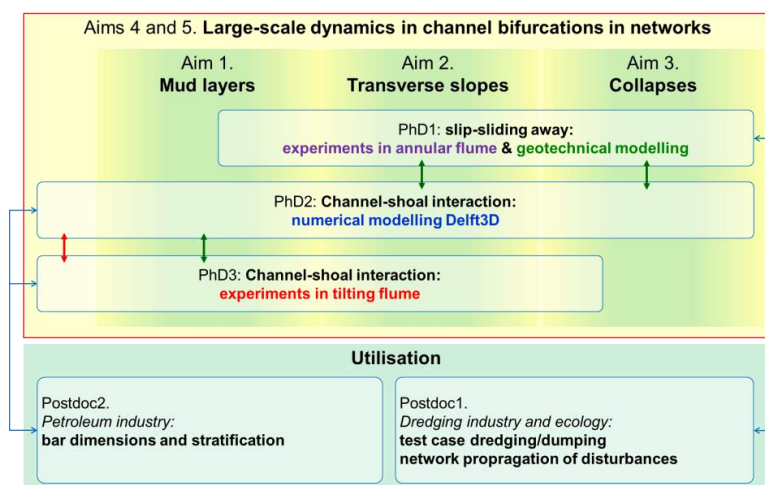


Figure. Project setup.