

Case study – Dr Mike Dearnaley

Director at engineering and environmental hydraulics company HR Wallingford Ltd



Coasts and estuaries, with their shifting shorelines, sandbanks and mudflats, are complex physical environments facing many competing demands. We need to balance the need to expand and maintain our ports, harbours and other infrastructure with the provision of coastal and flood defences, the potential for tidal power and the preservation of unique wildlife habitats.

This challenge requires highly skilled environmental engineers and scientists who can assess the impacts of proposed development schemes. Mike Dearnaley's PhD in Oceanography, funded by NERC, gave him the skills in applied physics and independent thinking that he now uses to provide expert impartial advice to developers, regulators and other stakeholders such as fishermen.

For his PhD, Mike developed a simplified mathematical model of ocean circulation to investigate how water is exchanged between the Pacific and Indian Oceans. This region is one of the critical links in today's huge global climate models. Keen to apply his modelling skills in the "real world", he moved to independent research and consultancy HR Wallingford, where he is now a director with responsibility for projects related to coasts, estuaries, dredging and the environment.

"A PhD is very good training for independent thinking and provision of consultancy advice" says Mike. He found his PhD taught him to take a scientific approach to problem-solving. "Interaction with supervisors and the final discipline of writing and delivering the thesis gives you very good, focussed training that you would not get through lectures or workshops."

Mike now applies those skills to a variety of high profile environmental engineering projects, including:

- **Tidal power.** With a tidal range of 14m - the second biggest the world - the Severn estuary could provide up to 6% of the UK's electricity. Mike and his team used numerical models of water and sediment movement to assess the physical effects of a tidal barrage, including the impacts on the mudflats and sandbanks in the estuary which are vital habitats for wading birds.
- **Thames Estuary flood defence.** Flood risk in London is increasing due to climate change, with tidal surges potentially meeting higher river flows due to extreme rainfall. Mike and his colleagues evaluated the impacts of different flood defence options in the Thames Estuary over the next 100 years.



Severn estuary



Thames barrier

- **Felixstowe container terminal.** Mike aided the design process for expanding the largest container terminal in Europe, helping the operators achieve planning consent. This has included development of innovative methods for managing the dredged material and regular monitoring of the estuaries.
- **New habitat creation.** Mike provides expert advice on the potential for managed realignment (the breaching of flood defences to create new wetland) and the use of dredged material.
- **Dredging.** Some 40-50 million tonnes of material is dredged each year to keep navigation channels open. Mike provides impartial expert advice on applications for dredging or sand and gravel extraction, and advises on options for disposing of dredged material in the least damaging way.

Career timeline

1983-86 BSc Geophysical Sciences, University of Southampton

1986-89 PhD, Physical Oceanography, University of Southampton (awarded 1990)

1989-present HR Wallingford



Dredging