Preface

'There, twice in every twenty-four hours, the oceans's vast tide sweeps in a flood over a large stretch of land and hides Nature's everlasting controversy about whether this region belongs to the land or to the sea. There these wretched peoples occupy high ground, or manmade platforms constructed above the level of the highest tide they experience; they live in huts built on the site so chosen and are like sailors in ships when the waters cover the surrounding land, but when the tide has receded they are like shipwrecked victims.'

So wrote the Roman historian Pliny the Elder (23–79) after his visit to the northern Netherlands.

Last year I spoke with a French TV-producer who was shooting a documentary on flood-prevention policy in The Netherlands. He was a bit disappointed: 'The sea does not seem to worry the Dutch; everywhere they have hidden it behind dikes; the sea is out of sight and out of mind'. This documentary perpetuates the myth that is expressed in the popular saying: 'God created the earth but the Dutch created Holland'.

One may also look from a different perspective. When the sea filled the Southern Bight of the North Sea 8000 years ago, central Holland was on average 15 metres below the present mean sea level. Most of Holland was drowned by the sea. In the Roman era, 6000 years later, tidal basins had been filled up with (mainly marine) sediment, and the greater part of Holland had grown close to the mean sea level. From that time on, human activities have caused soil subsidence of several metres and large tidal basins have formed in the southwestern and northern parts of the country. Maybe we should say: 'God created the earth but the sea created Holland'.

Is it possible that the sea creates land? Most often the sea is viewed as a destructive, land-swallowing force. It is the way the Dutch looked at the sea for a long time. And they had good reasons for that.

When I was five years old The Netherlands was hit by a devastating storm surge, which destroyed many sea defences. My father worked at Rijkswaterstaat, the governmental public works department responsible for safety against flooding. He developed new tidal computation techniques for the Delta project [115], designed after the disaster of 1953 to raise coastal defences to resist almost any storm surge. He died before the completion of the Delta project. I entered Rijkswaterstaat a few years later.

The Delta project gave a major impetus to coastal research in The Netherlands. The scale of the interventions in the Rhine–Meuse–Scheldt delta required the broadening of the coastal engineering perspective to long-term and large-scale aspects of coastal morphodynamics. Geologists and physical geographers joined the research teams and this interdisciplinary cooperation gave birth to the Netherlands Centre for Coastal Research. This organisation has contributed since its establishment in 1992 to the foundations of sustainable coastal management through interdisciplinary education and research programmes.

Great progress in understanding the basic nature of sea-land interaction has been achieved worldwide in the past decades. Insight in the nonlinear feedback processes inherent to this interaction has been a major breakthrough. It has modified the old perception of the sea as a destructive and dispersive force, by revealing its creative and structuring power. Progress in this area has greatly benefitted from the Marine Science and Technology Programme of the European Commission and the international conferences of the American Society of Civil Engineers [329] and the International Association of Hydraulic Research.

Our conception of the role of the sea has fundamentally changed. This is expressed in the present coastal defence strategy of the Netherlands. This strategy is based on working with the sea, instead of working against it, by stimulating the capacity of the sea to create and maintain new land [291].

Can we understand the creative and structuring power of the sea? That is what this book is about. It is an extended version of a course on the Physics of Coastal Systems, which I have given during the past ten years at the universities of Utrecht and Delft.