

Impact of beach nourishment on coastal ecosystems with recommendations for coastal policy in Belgium

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Sandy shores or beaches line 70% of the world's oceans, including the entire Belgian coastline. They have a multitude of ecosystem functions, constitute an important habitat for a variety of fauna and flora and hold important economic, social and cultural value as prime recreational assets. Predictions on sea level rise, intensified storms, accelerated erosion and flood risk for the North Sea have led to the drafting of the Belgian Integrated Coastal Safety Plan. In order to protect the Belgian coastline on a short and long term basis (up to 2050), the Belgian sandy beaches face a multitude of beach nourishment activities over the next years. This soft coastal defence measure safeguards the natural dynamics of the coast and has little impact on the beach ecology and tourism compared to other options. However, together with the multitude of human beach functions, beach nourishment potentially threatens the natural balance of the beach and coastal ecosystem.

In this PhD thesis, 16 Belgian beaches, sampled over 14 years, were analysed in order to understand the natural variability of this sandy beach ecosystem. By means of monitoring the ecological beach nourishment on the Belgian beach of Lombardsijde, possible impact effects were unraveled. The combination of mesocosm experiments and both modeling and biological valuation techniques gave valuable insights into more ecologically adjusted beach nourishments. As management of the coastal zone is clearly a multi-faceted and complex endeavour, where the interests of several stakeholders need to be combined, coastal management desperately needs ecological dimensions. The gathered scientific knowledge from monitoring data, experiments, biological valuation maps and model predictions is used to provide guidelines for ecologically good practice of beach nourishment, monitoring protocols and decision support tools for managing the Belgian beach ecosystem in a sustainable way.

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