



A Bayesian Network Analysis of Trade-Offs Between Ecosystem Services in the Dutch Wadden Sea

Sonja Wanke (1), Alex Ziemba (1,2), Ghada El Serafy (1,2)

(1) Deltares, Environmental Hydrodynamics and Forecasting, The Netherlands (sonja.wanke@deltares.nl), (2) Technical University of Delft, Delft, The Netherlands

Ecosystems provide numerous benefits to humans, from clean water and air, food and flood protection to cultural heritage. Many of these benefits, which are also known as ecosystem services, are threatened by man-made pressures. In order for decision and policy makers to take the right management choices, they need clear information on how biodiversity supports these services, the demand for them, the capacity of ecosystems to provide these services, and the pressure they are facing to make relevant decisions. One concept that seems to bridge the gap between the many qualitative and quantitative evaluation methods are Bayesian Networks. They are statistical models functioning on the basis of causal dependencies between system elements of interest. The aim of this study is to extend the understanding of ecosystem services through causal relationships and trade-offs by developing a Bayesian Network. The Bayesian Network developed combines a blend of remote sensing and in-situ data with expert knowledge to value the causal relationships between prioritized ecosystem services of the Dutch Wadden Sea. It was shown that combining different data sources with expert knowledge aids in developing a well-functioning model. The developed network was able to also account for both, tangible and intangible ecosystem services. All in all, Bayesian Networks seem to be a useful tool in ecosystem service valuation as they are able to bridge the gap between qualitative and quantitative approaches. Furthermore, they are suitable for complex systems and are scalable. Results were very much dependent on the availability of complete datasets and/or expert opinions. Those limitations can be tackled by finding more valid data sources and therefore improving the reliability of the whole network.

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