We are also developing a model version that will allow for the assessment of cumulative risk (probability of exceeding PNEC) for multiple pharmaceuticals with similar modes of action. With this Bayesian network, we hope to provide a case study in how Bayesian networks can be adapted to complex, real-world scenarios as a tool for prediction, communication, and explanation of environmental risks.

4.03.P-We174 Evaluating the Ecological Consequences of Altered Water Quality in South Africa Using Bayesian Networks

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Multiple water quality stressors derives from land use changes and formal anthropogenic sources including urban areas, agriculture, industries and mines have a legacy of impacting on receiving water resources. It is often very difficult to measure and predict the ecological consequences of these stressors on our socio-ecologically important rivers, lakes, wetlands and estuaries. It is also difficult to manage these stressors and as a result manage the sources from which they derive to achieve sustainable development. The management of water quality stressors and their sources are difficult because of the dynamism of the source-stressor-response relationships and multiple factors including lack of data, complex impact pathways and risks and uncertainties that are difficult to parameterise. Good scientific approaches that produce reliable impact projections of multiple water quality stressors are rarely applied to evaluate the ecological wellbeing of water resources, but Decision Analysis techniques commonly used in other fields have the potential to improve development decisions. This paper presents a Decision Analysis approach using a Bayesian Network (BN), risk based probability modelling approach to support decision makers manage multiple water quality stressors on multiple spatial scales. The BN probability modelling approach is widely applied in a range of disciplines, including medical sciences, genetics, environmental sciences and legal reasoning. It allows for the formal representation of causal models, such as risk probability modelling of multiple sources, stressors and receptors in the context of multiple ecological endpoints. This paper illustrates the use of BNs as a risk-based probability modelling approach to evaluate the probable ecological effects of altered water quality associated with multiple sources using the Vaal, Olifants, Inkomati, Thukela and uMvoti catchments in South Africa as examples. Available water quality, land use activity and ecotoxicology data were used to describe conceptual risk pathways, parameterise the BNs and model the probable consequences of multiple water quality stressors to water resources. Our models, based on available data, effectively represent the ecosystems considered in the case studies and using a scenario-based approach, predict the ecological consequences of altered water quality. This approach further identifies important, determining water quality constituents and associations to their sources so that the sources and their stressors can be managed to attain sustainable resource development.

4.03.P-We175 Bayesian Belief Networks As a Toolbox for the Creation of a Decision Support Framework for Plastic Clean-Up Technology Selection in Rivers and Estuaries

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With plastic debris accumulating in the marine environment at high rates, the need for sustainable mitigation strategies is imperative. Currently, one of the most used end-of-pipe solutions to block the transport of litter to the coast and ocean is the deployment of clean-up technologies in rivers and estuaries. These crucial technologies prevent plastic litter from reaching the marine environment, where it would rapidly spread and become more difficult to extract. However, to date, there is a lack of published empirical data on the potential impact of these devices on riverine and estuarine biota. Therefore, in this study, we propose to evaluate observation-based trade-off data for plastic clean-up devices to weigh bycatch versus plastic removal by using Bayesian Belief Networks (BBNs). Thus, creating a tool to support stakeholders in the decision-making process. We have identified four clusters of parameters that may play a substantial role in the bycatch of clean-up technologies, and that will be used to feed a BBN model as a starting point of a decision support framework. A first factor that will be considered in the BBN is the initial environmental status of the river or estuary in which the device will be deployed. In fact, transport of litter, including plastic debris, is highly influenced by the river's hydrological conditions. A typical example of this factor is the river flow velocity. A second factor to integrate into the probabilistic model is related to the traits of the biota present in the system and with which the device might interact. Size, buoyancy, and adhesiveness are all characteristics that might influence the chances of biota being unintentionally caught. A third important parameter is the characteristics of plastics present in the river or estuary such as size and buoyancy. Lastly, the removal operation mechanism of the clean-up devices is considered. To maintain the efficient collection of plastic debris while mitigating unintentional bycatch, we advocate that this BBNs model will support policymakers in the decision-making process, prior to the selection and deployment of plastic clean-up devices in rivers or estuaries. Policymakers will be able to find an optimal trade-off between plastic removal and possible negative environmental effects due to unintentional organic bycatch.

4.03 Bayesian Networks: Applications for Environmental Risk Assessment and Management (Poster Corner)

4.03.PC-We01 A Spatial Bayesian Belief Network for Assessing Field-Level Pesticide Pollution Risk in a Small Drinking Water Catchment

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Pesticides continue to present a significant risk to the quality of raw water for drinking water supplies worldwide. While catchment management is considered a cost-effective alternative to costly drinking water treatment, the effectiveness of pollution