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The Development of a Water Quality Forecasting System for Recreational Coastal Bathing Waters in Ireland

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The European Bathing Water Directive (BWD; 76/160/EEC 2006) requires the implementation of early warning systems for bathing waters which are subject to short-term pollution events. To this end, the EU SWIM project is developing coastal water quality prediction models and alert systems at nine beach sites in the Republic of Ireland and Northern Ireland, which represent a range of baseline water quality and site conditions.

At each site, statistical / machine-learning predictive models are being developed based on their site-specific relationships between fecal indicator bacteria and multiple environmental variables. A unique aspect of the approach being developed is the use of a historical back-cast climate data (Met Éireann's MÉRA dataset) as the foundation of model development, and the use of a related climate forecast dataset (Met Éireann's Harmonie dataset) for forecasts. By integrating these datasets into a predictive system, environmental variables can be utilized at spatial and temporal resolutions exceeding what is typically available from alternative data sources (e.g. weather station gauges). This approach enables the production of a continuous stream of short-term water quality forecasts, which can then be validated against data collected by routine compliance sampling, as well as targeted supplementary water quality sampling.

This presentation provides an overview of the end-to-end prediction system, a summary of the underlying models, and a discussion of the challenges and opportunities presented by this forecasting framework.