

# Current Developments and New Directions in Operational Biogeochemical Modeling: The "Blue" City Project as an Example

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We critically review the strategies and modeling tools currently available for multi-disciplinary environmental impact assessments. Leading reactive-transport models, currently developed for operational purposes, allow, on a routine basis, for the coupling and nesting of dynamic surface-flow models of various dimensions, and may also be integrated with GIS modules and models of engineering structures (hydraulic controls, treatment plants, sewer networks etc.). In addition, the levels of complexity selected for the description of biological and geochemical processes - including the feedback loops as seen by these various disciplines - are very often sufficient for sound environmental impact assessments.

The lack of high-resolution data, in particular biogeochemical variables, is the greatest impediment to progress at present. In this framework, the project "Blue City of the Future and its Region" will develop and integrate computer

models and measurement systems for all the natural and man-made waters of the Lee Catchment (Ireland), and its urban areas, with particular emphasis on eutrophication and flooding.

In the Blue City project, state-of-the-art software will be integrated with telemetered, high-frequency, *in-situ*, water quality measurements, to provide the first comprehensive dynamic model of the surface waters of a complete catchment, containing both the natural water courses and all significant water extraction and treatment facilities and processes, water distribution networks, sewer systems, storm overflows, waste water treatment facilities and processes, and hydraulic structures. 'Blue City' will yield a valuable tool, not only for environmental science and engineering, but also for demonstrating compliance with EU Directives, and for the development of comprehensive water management plans. Work in progress will be presented.