Operationalizing environmental indicators for real-time multi-purpose decision making and action support

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# Abstract

Within the last decades tremendous progress has been made in analysing, characterising and understanding the processes, functions, and structures of the environment. Numerous indicators have been proposed and operationalised using computing techniques. However, many of the approaches are based on specific case study areas and the transfer of approaches is hampered due to incompatible data formats, data availability limitations, and/or unavailable modelling routines. Information on modelling routines, existing result datasets, and updates of previously derived analyses are missing. Considering the recent technological and methodological developments, environmental modelling providing indicators for decision support is likely to change in the next decade. This research provides a heuristic conceptual basis for driving the next generation of real-time multi-purpose data assembling, evaluating, modelling, and visualisation towards the operationalisation of decisions. Turning field observations into useful (near) real-time decision support information is demonstrated based on a hydrological example of future Integrated Water Resources Management. This research describes new ways of near real-time indicator processing using Wireless Sensor Networks and standardised web services. Publicly available and standardised environmental information as Open Geospatial Consortium compliant Sensor Observation Services with its data formats Observations & Measurements and Water Markup Language 2.0 automatically feed into Web Processing Services for timely information delivery, discovery and access of the spatially explicit environmental conditions as pull and push based web services accompanied with notification for immediate actions in crisis times.

# Keywords

WebGIS, Sensors, SDI, Early warning system, Water resources management, OGC