Understanding Freshwater Quality Problems in a Changing World
Proceedings of H04, IAHS-IAPSO-IASPEI Assembly, Gothenburg, Sweden, July 2013 (IAHS Publ. 361, 2013)17-30.

Challenges for water-quality research in the new IAHS decade on: *Hydrology Under Societal and Environmental Change*

MATTHEW R. HIPSEY[1] **& BERIT ARHEIMER**[2]

1 School of Earth and Environment (M004) & Centre for Ecohydrology, The University of Western Australia, 35 Stirling Hwy, Nedlands WA 6009, Australia
matt.hipsey@uwa.edu.au

2 Swedish Meteorological and Hydrological Institute, Folkborgsvägen 1, 601 76 Norrköping, Sweden

Abstract Emerging water quality research challenges of the next decade are related to understanding how the function of complex catchment sub-systems interact and co-evolve in response to an unprecedented level of environmental change. Several high-level challenges are identified in this paper that relate to those of the new IAHS thematic decade ("*Panta Rhei*": 2013–2022), but explored within the specific context of water quality science. We review current research trends and outline the need for new approaches able to deal with complexity, non-stationarity and uncertainty in future scenarios. We then identify opportunities that exist for the community-driven integration of the diversity of models of hydrology, biogeochemistry and society, with environmental sensing approaches and cyber-infrastructure as a way to integrate process-driven and data-driven approaches for exploring river basin health and water quality dynamics. By embedding our collective efforts in development of a global network of catchment observatories, we believe we can support further knowledge discovery through facilitating comparative analyses and synthesis activities.

Key words water quality; river health; aquatic systems; new IAHS decade; network science; open source