



Water research to support society: past, present and future

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Scientists are nowadays claiming that we are leaving the geological era of Holocene and have entered the Anthropocene (the Age of Man), a man-made world, in which humans are not observers of nature but central to its workings and commanding the planet's features, fluxes and material cycles. Both the hydrological and the biogeochemical cycles are radically changed compared to pristine conditions and the biodiversity is radically declining as the human population is growing. The co-evolution between society and environment is complex and not always reversible and we therefore need more research on effects of change to raise awareness and prepare for consequences.

Many problems caused by humans are also well recognized and can be remediated. As the society develops also the environmental concerns normally becomes more important leading to remedial measures and pollution control. The change in water quality for many rivers world-wide shows similar flux over time related to level of economic development, going from deterioration to recovery as an effect of improved water management.

Water management is of major importance for sustainable development, both for efficient water use and ecosystem protection. Water management should be based on (i) best available site information and (ii) best practices from understanding cause-effect relationships; yet, large areas still remains un-monitored and the relations between processes are complex and often not well understood. These knowledge gaps hamper the societal development and are thus two key challenges to address in the hydrological sciences initiative Panta Rhei. This presentation will address some of these challenges for water research in the past, present and future.

Hydrology is by tradition an applied research, in which scientific questions co-evolve with societal needs. This will be exemplified this by giving a brief overview of the shift in research questions at one national institute, SMHI, during the last 100 years. Historical changes in focus areas clearly reflect the shifts in societal needs, going from industrialization to the information society and globalization.

Present research needs will be illustrated in the on-going practical work to support water managers and decision makers with hydrological forecasts, climate change impact assessments, improved water status for biodiversity and statistics for dimensioning safe infrastructure. Different approaches to applied research and ways to implement new knowledge in society will be discussed.

Future research is suggested to embrace the complexity of the water systems by linking scales, monitoring systems, processes, disciplines and various users. Some ingredients to achieve a coordinated effort in the scientific community will be suggested, based on new technology, multi-data, transparency and the principles of sharing. To handle the problems of the Antropocene, improved knowledge accumulation to advance science and interactions with other disciplines is absolutely necessary. These should be the basic elements of Panta Rhei.