



Integrating citizen science, open and big data into water and environmental decision support systems

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Water and environmental monitoring, observation and decision support systems (DSS) are being transformed by a wealth of open and big data that are increasingly available, accurate and timely. Consolidated technologies of earth observation, remote sensing, geospatial modelling and visualization systems are stimulating earth, hydrological and environmental sciences that are reacting not only with increasing scientific production, but with novel solutions-oriented methods, tools and algorithms. Procedures, methods and tools are more and more available for analysis, interpretation and mapping of river and basin coastal landscape features and hydro-environmental dynamics. Citizen science are further empowering the capabilities of DSS by gathering and sharing data on the human behaviour component to better understand the nature-human-urban interplay. Citizens, empowered by mobile devices, act as data and information producers, receivers and transmitters supporting the assessment of the effects of human-derived observations, feedbacks and actions sensing. Emerging hardware and software technologies (e.g. machine learning, artificial intelligence, IoT, etc.) are creating amazing opportunities for these DSS linked to the development of the human-machine interface and its use for promoting practical environmental and social actions to manage and mitigate natural hazard and climatic risks. The National System for Environmental Protection (SNPA) by the Italian Institute for Environmental Protection and Research (ISPRA) is supporting and implementing a wide and diverse range of research, applied research, learning and communication activities, both at the national and international level, in collaborating with leading academic, professional and international organizations, for integrating citizen science, open data and big data into next generation water and environmental decision support systems. This contribution, while depicting the overall SINA framework (Italian Environmental Information System) and ongoing and planned activities by ISPRA SNPA and SINA, presents recent outcomes of research initiatives developed within the Water JPI, UNEP INFORAC, National Plan for Climate Adaptation (PNACC), Marine pollution, Biodiversity, the Water, Food and Energy Nexus among others. Insights from joint research efforts and working groups are presented and shared while pursuing further synergies and stimulate the discussion on this crucial topic for national and international agencies, like ISPRA, that seek to transfer research data, models and tools into institutional and operational activities.

