Panta Rhei – Everything Flows
Change in Hydrology and Society
IAHS Scientific Decade 2013-2022
www.iahs.info/pantarhei

Details of the Proposal

Title of the Working Group

Large Dams, Society, and Environment

Abstract of the proposed research activity

Large dams have and continue to play a vital role in our socio-economic development. There are about 50,000 large dams around the world, with an aggregate reservoir storage capacity of about 6,000 km^3. They provide immense benefits to our societies, supplying water for domestic, agricultural, industrial, hydropower, and other uses. However, they also cause serious damages to our ecosystems and displace millions of people from their homes. The benefit-cost analysis of large dams is a tremendously challenging endeavor, due to numerous factors, including absence of accurate models, lack of data, and socio-cultural sensitivities. This Working Group aims to significantly improve studies on dams through: (1) reviewing existing data and collecting new ones on all relevant hydrologic, ecologic, and socio-economic factors; (2) developing new approaches for analysis of water, ecologic, and socio-economic data in combination; and (3) formulating scientifically sound, practically feasible, and socially acceptable guidelines for dam construction and management.

Panta Rhei Research Themes, Targets and Science Questions addressed by the Working Group

Research Theme:

Large-scale Water Projects and Society

Targets:

Target 1 - Understanding

Target 2 – Estimation and prediction

Target 3 – Science in practice

Science Questions:

Science question 2: How do changes in hydrological systems interact with and feedback on natural and social systems driven by hydrological processes?

Science question 3: What are the boundaries of coupled hydrological and societal systems? What are the external drivers and internal system properties of change? How can boundary conditions be defined for the future?

Science question 4: How can we use improved knowledge of coupled hydrological-social systems to improve model predictions, including estimation of prediction uncertainty and assessment of predictability?

Science question 6: How can we support societies to adapt to changing conditions by considering the uncertainties and feedbacks between natural and human-induced hydrologic changes?

Societal impact of the Working Group activity

Should we continue to build large dams? This question has been among the highly controversial issues faced by our societies in recent years. While developed nations are no exception, developing and least-developed countries are the ones that are particularly vulnerable to this controversy, because that is where significant growth in population and water demands continue to occur on one hand and where there is immense potential for additional exploitation of water resources on the other. This Working Group will conduct extensive studies on the benefits and costs of large dams in a far more rigorous and balanced manner than has been done so far (including by the World Commission on Dams) and provide important guidelines for managing existing dams and constructing new ones. These guidelines will significantly advance policy and decisions by governments and funding agencies, in collaboration with the other stakeholders in the water, environment, and socio-economic sectors.

List of Participants (Members in alphabetical order)

Name of Participant	Affiliation (full address and email)	Role in Working Group (Chair or Member)	Main expertise
1. Bellie Sivakumar	School of Civil and Environmental Engineering, The University of New South Wales, Sydney, NSW 2052, **AUSTRALIA** E-mail: s.bellie@unsw.edu.au & Department of Land, Air and Water Resources, University of California, Davis, CA 95616, **USA** E-mail: sbellie@ucdavis.edu	Chair	Hydrologic modeling; Water planning and management; Climate change; Transboundary waters; Water crisis and conflicts; Complex systems; Scale issues
2. Ronny Berndtsson	Department of Water Resources Engineering & Centre for Middle Eastern Studies, Lund University, S-22100 Lund, **SWEDEN** E-mail: Ronny.Berndtsson@tvrl.lth.se	Member	Climate variability; Rainfall and runoff; Urban hydrology; Water resources management; Hydrosolidarity; Water in the Middle East; Solute transport; Nonlinear dynamics
3. Asit Biswas	Third World Centre for Water Management, Atizapan, Estado de Mexico, **MEXICO** E-mail: akbiswas@cablevision.net.mx & Lee Kuan Yew Institute of Public Policy, National University of Singapore, **SINGAPORE**	Member	Long-distance water transfers; Transboundary waters; Hydropolitics; Water planning and management; Regional development
4. Ji Chen	Department of Civil Engineering, The University of Hong Kong, Pokfulam, **Hong Kong, CHINA** E-mail: jichen@hku.hk	Member	Multi-scale terrestrial hydrologic processes; Land-atmosphere interactions; Water resources management; Water-related natural hazards; Climate change
5. Demetris Koutsoyiannis	Department of Water Resources and Environmental Engineering, Faculty of Engineering, National Technical University of Athens, Heroon Polytechneiou 5, Zographou, **GREECE** E-mail: dk@itia.ntua.gr	Member	Hydrologic modeling; hydrological stochastics; hydroclimatology; analysis of hydrosystems; water resources engineering

			and management; ancient water technology and management
6. M. Dinesh Kumar	Institute of Resource Analysis and Policy, 202 Riviera Apartment, Dwarkapuri Colony, Panjagutta, Hyderabad, **INDIA** E-mail: dinesh@irapindia.org	Member	Social and economic benefits from large water resource systems; groundwater management; agricultural water productivity mapping; water-energy-food security nexus; climate variability and water security
7. Upmanu Lall	Columbia Water Center & Department of Earth and Environmental Engineering, Columbia University, New York, NY 10027, **USA** E-mail: ula2@columbia.edu	Member	Hydroclimatology; Nonlinear dynamics; Applied statistics; Natural hazards; Water systems; Risk management; Water technologies for developing countries
8. Xi Xi Li	Department of Geography National University of Singapore **SINGAPORE** 119260 E-mail: geoluxx@nus.edu.sg	Member	Riverine sediment; Sediment trapping; Reservoirs/Lakes; Large Asian rivers
9. Ashok K. Mishra	Glenn Department of Civil Engineering, Clemson University, Clemson, SC 29634, **USA** E-mail: ashokm@clemson.edu	Member	Droughts; Water security; Hydroclimatology; Climate change impacts on water resources; Hydrometric network design; Stochastic hydrology
10. D. Nagesh Kumar	Department of Civil Engineering, Indian Institute of Science, Bangalore 560012, **INDIA** E-mail: nagesh@civil.iisc.ernet.in	Member	Climate hydrology; Large-scale reservoir system operation; Climate change impacts on water; Evolutionary algorithms; Remote sensing and GIS applications; Inter-basin transfer and river-linking
11. R. Maria Saleth	Madras Institute of Development Studies, 79 Second Main Road, Gandhinagar, Adayar, Chennai – 600020, Tamil Nadu, **INDIA**	Member	Environmental economics; Water policy; Water institutional reforms;

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12. Vijay P. Singh	Department of Biological and Agricultural Engineering & Zachry Department of Civil Engineering, Texas A & M University, College Station, TX 77843, **USA** E-mail: vsingh@tamu.edu	Member	Hydrologic modeling; Water-energy-environment-food nexus; Irrigation scheduling and water management; Social hydrology; Stochastic and mathematical modeling
13. Cecilia Tortajada	Third World Centre for Water Management, Atizapan, Estado de Mexico, **MEXICO** E-mail: ctortajada@thirdworldcentre.org & Lee Kuan Yew Institute of Public Policy, National University of Singapore, **SINGAPORE**	Member	Impacts of large dams; Hydropolitics; Water governance; Policies and institutions; Water quality
14. Dawen Yang	Department of Hydraulic Engineering, Tsinghua University, Beijing 100084, **CHINA** E-mail: yangdw@tsinghua.edu.cn	Member	Large-scale hydrologic modeling; Water resources assessment under changing environment; Eco-hydrological observation and modeling