



Science & Technology

FORESIGHT

from society to research

Background Document

“The Future of Water:
Availability, Distribution and Provisioning”

11-13 April, 2016 - Pisa

WG WATER



Foresight Exploratory Workshop

The FUTURE of WATER: AVAILABILITY, DISTRIBUTION AND PROVISIONING

**Domus Comeliana, Via Cardinale Maffi 48, Pisa (Italy)
11-13 April 2016**

**scientific committee: Antonello Provenzale (CNR-IGG),
Enrico Brugnoli (CNR-DTA), Giorgio Einaudi (CNR Foresight Group)**

Natural resources on Earth are finite, and some of them - such as water - control the fate of societies and human life. If water is scarce, droughts and famine can appear, and conflicts between different users and/or communities can become severe. This is especially critical in the case of transnational water resources, such as some large surface reservoirs and rivers, and many groundwater resources. Water quality, then, is a crucial element for human health and wellbeing: Organic, chemical or radioactive pollution can make entire water reservoirs unfit for drinking and/or agricultural purposes.

For all these reasons, there is widespread consensus that water is one of the essential resources of future decades, whose distribution and availability are exposed to the vagaries of global and climate change. In addition, the increasing human population, the increase in urbanisation and in per capita consumption will put larger pressures on natural water resources, including shallow and deep aquifers. New and more efficient management and distribution systems are then required, together with improved ability to desalinate sea water. As a result, discussions are on-going on public versus private water management, on the best approaches to technology transfer to developing countries, and on the contrast between the needs and views of different interest groups. Central to any foresight exercise, the issue of future water quality, quantity, availability and management is a complex arena where science, technology, policy and ethics meet each other, not without clashes. It is to the scientists to develop indications on the best strategies to address these problems, helping to build the future we want.

To prepare a knowledge-based view of these issues, as a preparation for future research and dissemination actions, we have organized a two-day exploratory workshop on the theme of future water quality, quantity and management on 11-13 April 2016 in Pisa, Italy. Participants are expected to arrive in the late afternoon of April 11 for a get-together dinner, and stay till the late afternoon of April 13.

The aim of the exploratory workshop is to identify the topics that will become the foresight priorities and propose a road map for the following face-to-face workshops. This requires the participants to separate long-term objectives from intermediate steps and milestones along

the way. In order to do that, we invite a group of experts representing different sectors, asking each of them to introduce, in a ten-to-fifteen-minute contribution, their view of future challenges related to water resources. The expert contributions should NOT concern specific research results but rather the identification of relevant social, economic, political and related scientific and technological issues to be tackled in the coming years, as well as the possible strategies to address them. Ample time will be given to discussion so as to analyse the important issues, prioritize them and unravel the interactions between them.

The results of the exploratory workshop will be summarized in a report on future water, prepared before the end of summer 2016, containing the roadmap of the following face-to-face workshops, which should appeal to researchers, policy makers, industry and consumers and encourage the cooperation in the assessment of risks and benefits. Towards the end of 2016, the first face-to-face meeting will be organized and a special volume containing the main results will be prepared afterwards, as well as a green paper that will constitute a first step towards formulating practical proposals to policy makers.

Speakers of this workshop are asked to present a talk of 10-15 minutes on a topic of their interest, related to the main issues related to the future of water. To optimize contributions and facilitate the exchange of information it is recommended to the speakers to prepare their talk by keeping in mind the following main points:

1. Frontier enabling and converging technologies in the next 10 years and new applications that could derive from their use.
2. Relevant themes with specific frontier topics potentially having a strong impact on economy, society and policies.
3. Current cutting-edge technologies with present relevant investments for each theme.
4. Perspectives, needs, risk assessment and public acceptability for each technology and/or management strategy in the next 5-30 years.
5. Top-level researchers in the world, relevant industries and international initiatives active in the topic.
6. Consider case studies of special geographical and/or social and/or geopolitical relevance where actions on water quality, quantity and management are under way or planned.
7. Look at the problem not only from a scientific perspective, but including relevant social, economical, technological and geopolitical perspectives.

Ample time will be devoted to the discussion of the main topics of interest, with the aim of identifying the major issues for further research and analysis.

Background material for the workshop can be found at the link

<https://www.dropbox.com/sh/ms544cipsj2khjl/AAC87XxZ8taJRslRH04Fm3zMa?dl=0>

Invited Speakers:

Radhouane Ben-Hamadou (Qatar University and UNESCO, Qatar)

Martin Beniston (University of Geneva, Switzerland)

Jerome Benveniste (European Space Agency, Italy)

Douglas Cripe (GEO Secretariat, Switzerland)

Ghada El Serafy (DELTARES, The Netherlands)

Klaus Fraedrich (Max Plank Institut für Meteorologie, Germany)

Glenn C. Miller (University of Nevada, USA)

Patrick Monfray (Agence Nationale de la Recherche, JPI Climate, Belmont Forum, France)

Andrea Rinaldo (Ecole Polytechnique Federale de Lousanne, Switzerland)

Rosina Salerno (PAHO-WHO, Washington, USA)

Members of the Foresight project participating in the discussion:

Ezio Andreta, CNR Science and Technology Foresight

Cecilia Bartolucci, CNR-IC

Ruggero Casacchia, CNR

Caterina Cinti, CNR-IFC

Augusta Maria Paci, CNR

Stephen Taylor, Trieste Area Science Park

Luisa Tondelli, CNR-ISOF

Participants in the discussion:

Daniele Biglino, CNR-IC

Elisa Brussolo, SMAT Torino

Marco Doveri, CNR-IGG

Stefano Ferraris, University of Torino and CNR-IGG

Sandro Fuzzi, CNR-ISAC

Silvia Giamberini, CNR-IGG

Veronica Giuliano, CNR-DTA

Licia Guzzella, CNR-IRSA

Marco Lauteri, CNR-IBAF

Giuseppe Mascolo, CNR-IRSA

Lorenza Meucci, SMAT Torino

Barbara Nisi, CNR-IGG

Elisa Palazzi, CNR-ISAC

Maddalena Pennisi, CNR-IGG

Ivan Portoghese, CNR-IRSA

Brunella Raco, CNR-IGG

Francesco Russo, Italian Society of Hydrothermal Techniques

Andrea Scozzari, CNR-ISTI

Workshop programme

Monday 11 April 2016

- 17:00 Guided tour at "Campo dei Miracoli", meeting in front of the Cathedral entrance.
19:30 Registration, welcome and dinner at Fondazione Comel, Pisa

Tuesday 12 April 2016

Presentations: 15 minutes + 5 minutes for specific questions

Moderators: Antonello Provenzale (morning), Giorgio Einaudi (afternoon)

- 9:30 **Martin Beniston**, "Hydrological change under conditions of retreating mountain snow and ice in a warming climate: challenges for lowland water supply"
9:50 **Klaus Fraedrich**, "Changes along the rainfall-runoff chain"
10:10 **Radouane Ben Hamadou**, "Integrated Water Resources Management in arid and semi-arid regions, challenges and opportunities"
10:30 **Glenn C. Miller**, "Water quality impacts from historic and current mining projects"
10:50 **Rosina Salerno**, "Water and Health: Fighting neglected diseases with intersectoral interventions"

11:10 Coffee break

11:30 General discussion: Future scenarios for water quantity and quality

13:00 Lunch break

- 14:30 **Jerome Benveniste**, "The ESA Earth Observation Programmes in Support of Inland Water Monitoring"
14:50 **Ghada El Serafy**, "Making decisions under uncertainties in environmental assessments"
15:10 **Andrea Rinaldo**, "Will large-scale water management plans include biodiversity protection?"
15:30 **Douglas Cripe**, "Water challenges in the vision of the Group on Earth Observations"
15:50 **Patrick Monfray**, "Transdisciplinary challenge in environmental research for sustainability development"

16:10 Coffee break

16:30 General discussion: Managing future water resources - how science can respond to societal needs?

18:15 End of the working day

19:30 Dinner at Restaurant "Ippodromo", San Rossore, <http://www.ristoranti-pisa.com/>

Wednesday 13 April 2016

9:30 - 16:30 (lunch break from 13:00 to 14:30)

General discussion on the main scientific and technological challenges for the future of water, with the goal of identifying the major themes for future research activities (including F2F meetings on specific topics).

Relevant topics to be discussed include, in a non-exhaustive way:

How to reliably assess the quantity and quality of water resources in the next decades: Scenarios on the quantity and quality of future water resources from global and regional climate projections, identification of main geographical areas at risk, interaction between climate change, land-use modifications and population pressures. Major threats, usage-dependent requirements and adaptation strategies. Role of international scientific organizations and of international programs.

The role of aquifers and their use/management/conservation, including legal regulations: Specific role of aquifers and groundwater resources in different areas of the world. Global threats on quantity and quality of groundwater. Fossil water and issues related to the often transnational nature of groundwater resources. Salinization of coastal aquifers. Risks associated with lack of regulations on groundwater usage.

Extreme events and droughts: Impact of extreme events on water quality and quantity in different geographical areas. Adaptation and risk mitigation strategies. Early warning strategies. International initiatives.

Future challenges in water management and distribution: Major issues in water management and proposed transnational/national regulations. Issues on water distribution and development of new distribution strategies/techniques. Desalination methods. Differences and challenges in water management in developed, developing and poor countries. Issues on the private versus public management of water resources. Examples, challenges and possible dangers.

Water stress and resource monitoring/management: Issues related to water stress, reduced quantity and quality of water resources. Challenges in their management are addressed in a set of specific case studies devoted to different geographical regions. The case of mountain water resources (mountains as water towers).

Sources of water pollution: Monitoring and reduction of pollution from old and new materials, including organic pollution, products from industrial and mining activities, pollution from new sources such as nanomaterials. Strategies to reduce water pollution in different areas of the world. Interaction between pollution, land-use change, climate change.

Water and terrestrial ecosystem services: Impact of changes of the water cycle on ecosystems functions and processes, with the associated reduction of ecosystem services such as watershed resilience, slope stability, provision of clean water, carbon storage, biodiversity.

Water and the spread of epidemics: Effects of water pollution on the emergence and spread of epidemic disease. The example of cholera. Effects of new settlements on water quality and quantity.