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Commission for
Water Sustainability



IGU Commission for Water Sustainability

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1. A word from the chair

2010 has been an extremely busy year despite the lack of a formal meeting for the first time since the creation of the Commission in 2002, or indeed of its predecessor the Study Group on Climate Change and Extreme Hydrological Events back in 1998. The reason has been bringing two more major publications to fruition. *Water Sustainability: a global perspective* brings together the research undertaken over the last decade, which began in earnest with assured funding from the International Council for Science (ICSU) and the International Geographical Union (IGU) in 2004. This allowed the appointment of Dr Keren Smith as a research assistant and a beginning to be made on establishing links with the managers of the major international data archives and on downloading and analysing the data. The book now contains the first world maps of data derived from many of these databases, notably annual and seasonal maps of precipitation, evaporation and riverflows, together with maps of extremes, both high and low. It also takes the first steps in analysing the distribution of factors that make water management difficult – extreme seasonal contrasts, low annual precipitation and high interannual variability. The world maps also cover water quality and water-related diseases.

The book highlights the nature of the challenges currently facing water provision around the world and attempts to predict the trends over the coming century. In this, it covers not only the problems posed by the burgeoning global population and climate change, but also the changing political and economic environments – the prospect of ‘water wars’ and weaknesses in the global financial system that led to the greatest world recession since the 1930s in 2009. The way forward must involve progress on a wide variety of fronts, not just more efficient use of water and recycling, important though these are, but also new technologies using seawater, solar power and simple, low cost solutions for the developing world – like wave-powered desalination or play pumps for children.

Improvements in law and governance also have clear roles to play in creating sustainable solutions, as too do improvements in monitoring and modelling systems, and in supporting the role of charities and charitable funding from private companies. Giving also needs to be better focused and monitored. The UN, the World Bank and other major funders of projects to improve water supply and sanitation around the world have begun to demand more information and more accountability, and to focus more on the social and environmental impacts of water resource developments, and there is a clear need to proceed further down this path to ensure that solutions match social and environmental requirements, that funds are not wasted through incompetence or corruption, and serve the poor as well as the rich.

The second book draws to a close the Commission's work in support of the UN International Year of Planet Earth (IYPE). I was appointed to chair the IYPE Science Implementation Team for Groundwater and Commission member **João Paulo Lobo-Ferreira**, head of the Groundwater Division of the Portuguese Laboratory for Civil Engineering, served as my deputy. *Sustaining Groundwater Resources* is intended to give an overview of the current challenges, developing trends like climate change, and the role of new technologies for monitoring, modelling and managing groundwater resources in the future. It is one of eight volumes being published by Springer in their Legacy Series to commemorate the IYPE, which itself was instigated to mark 50 years since the 1957-8 International Geophysical Year that kickstarted international scientific collaboration in the geosciences. Perhaps the most notable aspect of the IYPE is the recognition that geoscience is now about far more than pure physical science which was the focus in the 1950s, that it now has a social and environmental conscience, which is upfront and vital - as the IYPE logo states: "Earth sciences for society".

Finally, I must add a more personal note. Having served as chair of this Commission and of the preceding Study Group for the last 12 years, I have decided that it will be time for me to relinquish control in 2011 and to pass the chairmanship over to my successor, Professor Claudio Cassardo. Claudio has served our IGU group faithfully since 1998 as its webmaster. He also organised our last – and very memorable – conference in Turin. He is the unanimous choice of the Steering Committee. Our colleague Professor Kazuki Mori has kindly expressed his willingness to continue as vice-chair for the foreseeable future, and I will continue as an ordinary member of the Steering Committee.

My thanks to all who have supported the work of the Commission and best wishes for the future.

Tony Jones

2. Annual Report 2009

2.1. Meetings

The Commission held its annual conference in Turin University from 26th July to the 1st August 2009. The meeting was officially designated as a contribution to the UN International Year of Planet Earth Conference at University of Turin. Professor Claudio Cassardo of the Department of General Physics at Turin University organised a thoroughly professional and engaging meeting that included participation from international scientific bodies, including the World Water Assessment Programme, engineers and environmental and charitable agencies, like HydroAid, as well as academics from a wide range of disciplines, including law.

The conference was sponsored by the Piedmont Region Environmental Protection Agency, the River Po Regional Water Company, and a number of regional councils from the Province to the City of Turin. The Rectors of the University of Turin and the Technical University of Turin spoke at the opening ceremony. Over 60 delegates attended the meeting from around the world, including Japan, USA, Argentina, China, Armenia, South Africa, Tunisia, Italy and Belgium. Two field trips were organised with the assistance of the International Research Centre at the Società Metropolitana Acque Torino (SMAT). The SMAT Research Centre is producing purified water for space travel. In order to minimize processing costs, SMAT selected well water and spring water from sources near Turin that most closely meet the chemical, bacteriological and physical standards specified by Russia and America prior to treatment, and eschewed taking water from the River Po, which is normally used for the normal public water supply. The process is complicated by having to meet different water standards for the Russian cosmonauts and American astronauts. The water was launched with the ATV module Jules Verne to supply the International Space Station in March 2008. The second fieldtrip visited the Pont Ventoux-Susa hydropower scheme. This is an interesting hybrid scheme which generates electricity using a mix of natural gravity feed and pump storage. At nighttime, when electricity is cheaper and demand is lower, water is pumped from the Dora River below the turbines back up to the Val Clarea reservoir, whence it is released in daytime when demand returns. On average about a third of the flow is reused in this way. A fish ladder allows migratory fish to reach the natural river above the system intake.

A selection of papers will be published in a new international online scientific journal, *Water*, edited by Professor Claudio Cassardo, Department of General Physics at Turin University, and the Commission chairman.

2.2 Scientific collaborations

2.2.1 The UN International Year of Planet Earth

Work continues with the compilation of the Groundwater volume for the Springer Legacy Series commemorating the IYPE (now see section 3.2). The Commission's conference in Turin was also designated as a contribution, as too is our forthcoming book on Water Sustainability (now see section 3.1).

2.2.2 NATO

The results of our NATO Advanced Research Workshop on Natural Disasters and Water Security, held in Armenia, were edited and published in the book *Threats to Global Water Security* (see section 2.3). This concludes our work with the NATO Science for Peace and Security Programme.

One interesting but also one of the more controversial recommendations of the Working Group on the Threat from Armed Conflict and Terrorism (S. Arlosoroff and J.A.A. Jones), published in the book, is that the armed forces should be formally involved in restoring safe water and sanitation at the very early stages when it is too dangerous for aid workers to enter the field of combat. The idea was taken up by the future UK Prime Minister, David Cameron, in March 2010 prior to the General Election. His remarks elicited immediate condemnation from the charities. Save the Children maintained that the military should not do humanitarian work because it blurs the distinction between the combatants and civilians and so puts civilian aid workers at risk. However, the Department for International Development (DfID) supported the idea, saying that military and civil organizations need to be combined as security is a huge problem for aid organizations.

The Working Group proposed the creation of special sections of the military or under military control that are more specialized in water and sanitation provision and restoration than the current military engineers, and noted that NGOs have a multitude of other aims and interests and are funded on a non-professional and potentially less reliable basis, mainly by donations. The hope was also expressed that in the long-term the UN might develop a formal and specific set of international rules concerning responsibilities for the protection and restoration of water supplies and sanitation during armed conflicts.

2.3 Publications

2.3.1 Books

The main event of the year was the publication of *Threats to Global Water Security* in the NATO Science for Peace and Security Series – C, Environmental Security, comprising 400 pages, in hard back, paperback and as an eBook. The Contents of the book and further details can be found in the Publications section of the Commission website, <http://water-sustainability.ph.unito.it>.

Water resources are under threat in many parts of the world. Climate change and natural disasters like earthquakes are aggravating already critical situations. But a significant number of threats are posed directly by human interference and failings. A major theme in the book is the need for preparedness. Poor risk assessment, lack of emergency planning and poor institutional response are key factors in making natural disasters or human-induced problems worse. The problems are ones of water quality as well as quantity. A large section is devoted to the threats from climate change and extreme hydrological events. As global warming progresses most regions can expect an increase in the frequency of floods and droughts. But the rising cost of these events is also directly due to human mismanagement, lack of preparation and poor emergency response. Similar issues surround the threats from terrorism and armed

conflicts, which are analysed by a special Working Group. A final section is devoted to analyses of the water resources problems surrounding the Aral Sea - perhaps the worst man-made disaster in history - in which experts from the region discuss the solutions being developed, the urgent need for international collaboration and the problems caused by the huge cost of rehabilitation.

Reference

Jones, J.A.A., T.G. Vardanian and C. Hakopian (eds) 2009: *Threats to global water security*. NATO Science for Peace and Security – C: Environmental Security, Springer, Dordrecht, 402pp. ISBN 978-90-481-2343-8 (soft cover), ISBN 978-90-481-2336-0 (hardback), ISBN 978-90-481-2344-5 (ebook); Library of Congress Control Number 2009927446. Price £81.00.

2.3.2 International journals

Editing is also well advanced with a Special Issue of the new online international journal *Water*, based on a selection of the best papers presented at the Turin conference. This will be online in 2010.

Cassardo, C. and J.A.A. Jones (eds), 2010: *Managing Water in a Changing World: Selected Papers from the 7th Conference of the Commission on Water Sustainability*. *Water*, ISSN 2073-4441, online at www.mdpi.com/journal/water.

3. Publications and activities 2010

Publication of papers based on the Turin conference in the online open access journal *Water* began in 2010 and is continuing into 2011. The book *Water Sustainability: a global perspective* was published in December 2010 and the final manuscript for the IYPE book *Sustaining Groundwater Resources* has now been submitted to Springer.

3.1 *Water Sustainability: a global perspective*

The book is presented as a contribution from the Commission and also as part of the Commission's contribution to the IYPE. Using the latest mapping techniques, the book examines water availability, the impact of climate change and the problems created for water management worldwide, as well as possible solutions. It is one of the first textbooks to meld the physical and human aspects affecting the world's water resources.

- In **Part One**, the author outlines the challenges and investigates the human factors: population growth; urbanisation and pollution; the commercialisation of water, including globalisation and privatisation; and the impacts of war, terrorism and the credit crunch.
- In **Part Two**, he examines the restless water cycle, the impact of past and future climate change and the problems change and unreliability create for water management.

- In **Part Three**, current and future solutions are discussed, including improved efficiency and water treatment systems, desalination, weather modification and rainwater harvesting, and improved legal and administrative frameworks.

Tony Jones concludes by asking how far technical and financial innovations can overcome the limitations of climatic resources and examines the human and environmental costs involved in such developments.

The book is written in an approachable style and is ideal for anyone concerned with the sustainability of water resources in the coming decades, whether approaching the subject from the point of view of international relations, geography, water engineering or environmental management.

Table of Contents and further details can be found on the Commission website at <http://water-sustainability.ph.unito.it>. The Hodder website provides additional resources to accompany the book, available to purchasers of the book or ebook, at <http://www.hodderplus.com/geography>.

Reference

Jones, J.A.A. 2010: *Water Sustainability: a global perspective*. London, Hodder Education, 464 pages. £39.99. ISBN 978 1 444 10488 2 (paperback), (ebook available from March 2011).

3.2 Sustaining Groundwater Resources

The book contains 13 chapters: 1. Groundwater in peril, *J. Anthony A. Jones*; 2. Groundwater and health: meeting unmet needs in sub-Saharan Africa, *Segun Adelana, Wilson Fantong, Dessie Nedaw and Anthony Duah*; 3. Karst, uranium, gold and water – lessons from South Africa for reconciling mining activities and sustainable water use in semi-arid karst areas: a case study, *Frank Winde*; 4. Arsenic distribution and geochemistry in groundwater of a recharge wetland in NW Botswana, *Philippa Huntsman-Mapila, Hermogène Nsengimana, Nelson Torto and Sorcha Diskin*; 5. Sustainability of groundwater resources in the North China Plain, *Jie Liu, Cuoliang Cao and Chunmiao Zheng*; 6. Groundwater management in a land subsidence area, *Kazuki Mori*; 7. Climate change and groundwater, *Cath E. Hughes, D.I. Cendón, M.P. Johansen, and K.T. Meredith*; 8. Linking runoff to groundwater in permafrost terrain, *Ming-ko Woo*; 9. Geography of the World's groundwater: a hierarchical approach to scale-dependent zoning, *Jac van der Gun, Slavek Vasak and Josef Reckman*; 10. WHYMAP and the Groundwater Resources Map of the World 1:25 000 000, *Andrea Richts, Wilhelm F. Struckmeier and Markus Zaepke*; 11. Overview of a multifaceted research program in Bénin, West Africa: an International Year of Planet Earth Groundwater Project, *Stephen E. Silliman, Moussa Boukari, Landry Loughbegnon and Felix Azonsi*; 12. Groundwater artificial recharge solutions for integrated management of watersheds and aquifer systems under extreme drought scenarios, *J.P. Lobo Ferreira, Luís Oliveira and Catarina Diamantino*; 13. Groundwater in the 21st century – meeting the challenges, *Kevin M. Hiscock*.

Chapter 11 is a report from the winning project that the Science Implementation Team for Groundwater selected in the IYPE research competition.

Reference

The IYPE book *Sustaining Groundwater Resources: A Critical Element in the Global Water Crisis* is due to be published by Springer Verlag, Dordrecht, in the Legacy Series in the spring of 2011. Price £87.00.

4. Conference – Chile 2011

The IGU is holding a Regional Conference in Santiago, Chile, in November 2011 and the Commission is planning to participate. The meeting will be held between the 14th and 18th of November. General details of the conference can be viewed at the new IGU website: www.igu-net.org/. Professor Cassardo is the coordinator of the Commission's sessions and he will be circulating details of these to members shortly and calling for papers.

5. Book sale

We have a few copies of our book in the IGU-Home of Geography Publication Series still available: *Managing Water Resources in a Changing Physical and Social Environment* (Rome, 2007), 177pp., edited by Peter Robinson, Tony Jones and Ming-ko Woo. The book contains 16 chapters, including 4 chapters on the changing physical environment, 6 chapters on social effects, and 4 on planning for the future. Full details can be viewed on the Commission website – <http://water-sustainability.ph.unito.it/publications>.

The book is now available at the discounted price of £5, post free (plus £1 each for any additional copies requested), to clear. If you are interested, please fill in the accompanying form with your address and credit card details and return it to jaj@aber.ac.uk or post it to Tony Jones, Institute of Geography and Earth Sciences, Aberystwyth University, Aberystwyth, SY23 3DB, UK.