

XVI WORLD WATER CONGRESS

Final Report

BY THE INTERNATIONAL WATER RESOURCES ASSOCIATION (IWRA)





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We would also like to acknowledge and thank the 19 youth ambassadors who volunteered their time and efforts in writing and editing the 89 session summaries which are compiled in the second half of this report. We would not have the wealth of information recording the key elements of this event without their contributions. These youth contributors include:

Lindsey Aldaco-Manner, Philip Bedford, Heather Bond, Mathylde Caffa, Bassel Daher, Amrita Gautam, Elcin Kentel, Colton Lauer, Tung Pham, Sebastian Riera, Laura Rodriguez, Lindsay Sansom, Hope Shelton, Tatiana Silva, Fanny Souillot, Ágatha Tommasi, Uyen "Amy" Truong, Lola Wilson and Tuğçe Yıldırım.

Finally we would like to thank our sponsors from the XVI World Water Congress; the World Water Council, the 8th World Water Forum, the Inter-American Development Bank (IDB), Texas A&M University School of Law, Agence Française pour la Biodiversité, Taylor and Francis Group and Agence de l'eau Seine Normandie.



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Message from the Chair

GABRIEL ECKSTEIN

CHAIR, INTERNATIONAL SCIENTIFIC COMMITTEE
XVI WORLD WATER CONGRESS

On behalf of the International Scientific Committee, I have the honor to present this Final Report of the International Water Resources Association XVIth World Water Congress. This report provides an overview of the Congress and its various components, activities, and achievements. It also celebrates the International Water Resources Association and the status that this organization has achieved in its 45 years of history as the premier global water policy-focused professional association.

The sixteenth edition of the International Water Resources Association's triennial World Water Congress was held in Cancun, Mexico, from 29 May to 3 June 2017. The Congress was hosted in association with the National Water Commission of Mexico (CONAGUA) and the National Association of Water and Sanitation Utilities (ANEAS).

During the week, more than 1,100 attendees participated in over 100 distinct sessions, all coalescing around the Congress theme of Bridging Science and Policy. Participants came together from 68 countries, from every inhabited continent and every corner of the world to explore, share, and collaborate on how they might achieve that objective. They came to catalyze the linkages between the scientific world, which

investigates and develops critical data and information related to every aspect of water, and the policy world, the tool through which humans manage their communities and relation to the natural environment. By enhancing the science-policy interface, by improving the interactions, communication, and coordination between these two realms, Congress attendees endeavored to facilitate global goals and strategies articulated in the Sustainable Development Goals, the United Nations Framework Convention on Climate Change, thematic priorities of past and upcoming World Water Forums, and other water-related programs.

On behalf of the International Scientific Committee, I wish to thank CONAGUA, ANEAS, and the Mexican people for their incredible efforts and their unmatched hospitality in arranging and accommodating this Congress in Cancun. I also want to thank the members of the ISC Bureau and the International Scientific Committee for selflessly serving with distinction, and for supporting the important work of this Congress with their time, their networks, and their inspiration. And, I must thank the staff of IWRA for their tremendous and determined efforts over the 18 months that it took to organize this global event and ensure its success.




Message from the Chair

GABRIEL ECKSTEIN

CHAIR, INTERNATIONAL SCIENTIFIC COMMITTEE
XVI WORLD WATER CONGRESS

In addition, I want to highlight and recognize the 19 young professionals who served as Congress Ambassadors and spent countless hours during the Congress as session rapporteurs, newsletter writers and editors, and Congress staff assistants. Many of them spent additional time afterwards finalizing the dozens of session summaries and reports that form the core of this report. Their incredible work was invaluable for the success of the Congress.

Lastly, I would be remiss if I did not thank my colleagues and students at Texas A&M University who have provided amazing encouragement and support that has allowed me the honor of serving as Chair of the International Scientific Committee for this Congress.

I look forward to seeing everyone at the XVIIth World Water Congress! 



Gabriel Eckstein
Chair, International Scientific Committee
XVI World Water Congress



CONGRESS STATISTICS

- ▶ Over **1,100 attendees from 68 countries** and all inhabited continents of the world, including North & South America, Africa, Asia, Europe and Australia.
- ▶ More than **400 speakers** and moderators
- ▶ A total of **116 distinct sessions** held over 5 days, namely:
 - 41 Regular Sessions**
 - 49 Special Session**
 - 5 High-Level Panels**
 - 11 Side-Events**

- ▶ A diverse list of **sponsors and supporters**, including:



World Water Council



8th World Water Forum



Inter-American Development Bank (IDB)



Texas A&M University School of Law



Agence Française pour la Biodiversité



Taylor & Francis Group



Agence de l'Eau Seine Normandie (AESN)



Congress Steering and International Scientific Committees

The content and thematic structure of the XVIth World Water Congress was developed and overseen by a fantastic array of water professionals from around the world. Their dedication, time, efforts, and inspiration were invaluable for the success of the Congress.

CONGRESS STEERING COMMITTEE (CSC)

Bureau	
Patrick Lavarde	International Water Resources Association
Roberto Ramirez de la Parra	National Water Commission of Mexico
Gabriel Eckstein	Texas A&M University
Dogan Altinbilek	World Water Council
Roberto Olivares	National Association of Water and Sanitation Utilities of Mexico

INTERNATIONAL SCIENTIFIC COMMITTEE (ISC)

Chair	
Prof. Gabriel Eckstein	Texas A&M University (USA)
Bureau	
Victor Alcocer-Yamanaka	National Water Commission of Mexico (Mexico)
Victor Bourguett	National Water Commission of Mexico (Mexico)
Torkil Jøneh Clausen	DHI Group (Denmark)
Pierre-Alain Roche	Ministry of Ecology, Sustainable Development and Energy of France (France)
Members	
Aziza Akhmouch	Organisation for Economic Co-operation and Development (International)
Henning Bjornlund	University of South Australia (Australia)
Lilian del Castillo-Laborde	International Association for Water Law (Argentina)
Guillermo Donoso	Catholic University (Chile)
Alberto Garrido	Technical University of Madrid (Spain)
Naim Haie	University of Minho (Portugal)
Jun-Haeng Heo	Yonsei University (Korea)
Blanca Elena Jiménez-Cisneros	Division of Water Sciences, UNESCO-IHP (International)
Zelmira May	UNESCO-IHP Regional Office (International)
Götz Reichert	Centre for European Policy (Germany)
Alfonso Rivera	Geological Survey of Canada (Canada)
Ahmet Saatci	Turkish Water Institute (Turkey)
Paulo Salles	Regulatory Agency for Water, Energy and Sanitation (Brazil)
Salman M.A. Salman	International Association for Water Law (Sudan)
Christopher Scott	University of Arizona (USA)
Vladimir Smakhtin	United Nations University (International)
Mariam Sou	International Institute for Water and Environmental Engineering (Burkina Faso)
Cecilia Tortajada	Lee Kuan Yew School of Public Policy (Singapore)
Jun Xia	Wuhan University (China)
Li Yuanyuan	Ministry of Water Resources (China)
Mark Zeitoun	University of East Anglia (United Kingdom)

CONGRESS PLENARY SESSIONS

Opening Ceremony

MONDAY, 29 MAY 2017 (9:30AM - 12:20PM)

One of the Congress's outstanding moments was, undoubtedly, the Opening Ceremony. Its Master of Ceremonies, Prof. Gabriel Eckstein, member of IWRA and Chair of the International Scientific Committee, inaugurated the Congress together with IWRA's President, Mr. Patrick Lavarde, as well as distinguished representatives from Mexico (Mr. Carlos Joaquin Gonzalez, Governor, Quintana Roo; Mr. Ramon Aguirre, President, ANEAS; Mr. Roberto Ramírez de la Parra, Director General, CONAGUA; and, H.E. Mr. Rafael Pacchiano Alaman, Minister, Ministry of Environment and Natural Resources, Mexico).

Moreover, international keynote speeches were delivered by representatives of the World Water Council (Mr. Benedito Braga, President), the People's Republic of China (H.E. Mr. Guihua Lu, Vice-Minister for Water Resources), Senegal (H.E. Mr. Diene Faye, State Secretary for Hydraulics), Asia Water Council (Mr. Sung-Han Kim, Secretary General), Australia (Mr. Tony Slatyer, Special Adviser on Water), and Stockholm International Water Institute (Mr. Torgny Holmgren, Executive Director).

The speeches addressed the Congress's main theme of "Bridging Science and Policy" and how to develop strategies for the achievement of the UN's Sustainable Development Goals (SDGs), including a focus on water quality and distribution, through adapted water policies and governance. As stated by Mr. Patrick Lavarde, "the Congress serves as a means to promote



discussions between scientists, share experiences and suggest ideas on water policy in the hopes of governmental adoption and implementation".

To conclude this memorable event, Mr. Lavarde handed Special Awards to both Mr. Ramon Aguirre Diaz (President, ANEAS) and Mr. Roberto Ramirez de la Parra (President, CONAGUA) for their Excellence in Water Management and the contributions of their institutions over the years. 💧



HIGH LEVEL PANEL

Water and the Sustainable Development Goals (SDGs)

MONDAY, 29 MAY 2017 (12:40PM - 2:10PM)



Moderated by Mr. Torkil Jønych Clausen (International Water Advisor and Chair of the Scientific Programme of the World Water Week in Stockholm), this panel addressed the role of water in the framework of the implementation of the SDGs. It brought together speakers from various institutions, including the Organisation for Economic Co-operation and Development (OECD), the Inter-American Development Bank (IDB) and the Development Bank of Latin America (CAF), the Stockholm International Water Institute (SIWI), Mexico's National Water Commission-CONAGUA, WWF and UN-Water.

The panel discussed the importance of scientists and policymakers working more closely together to achieve the SDGs. On the one side, policymakers need to take informed and robust decisions with the best available scientific evidence and right information in hand, while on the other side, scientists must continue to develop new knowledge and innovative solutions to meet the needs of policymakers to better develop scientifically based decisions. Through co-operation between the spheres of science and policy, they concluded that nations will have more success in achieving the SDGs.




HIGH LEVEL PANEL

Water and Climate

TUESDAY, 30 MAY 2017 (10:50AM - 12:20PM)



The purpose of this Panel was to consider how to further promote the importance of water management under the ongoing COP discussions, particularly when dealing with the challenges posed by climate change. A particular focus was given to climate change adaptation. Mrs. Cecilia Tortajada (IWRA Former President 2007-2009, and Senior Research Fellow, Lee Kuan Yew School of Public Policy, National University of Singapore) chaired this high-level plenary panel made up of important

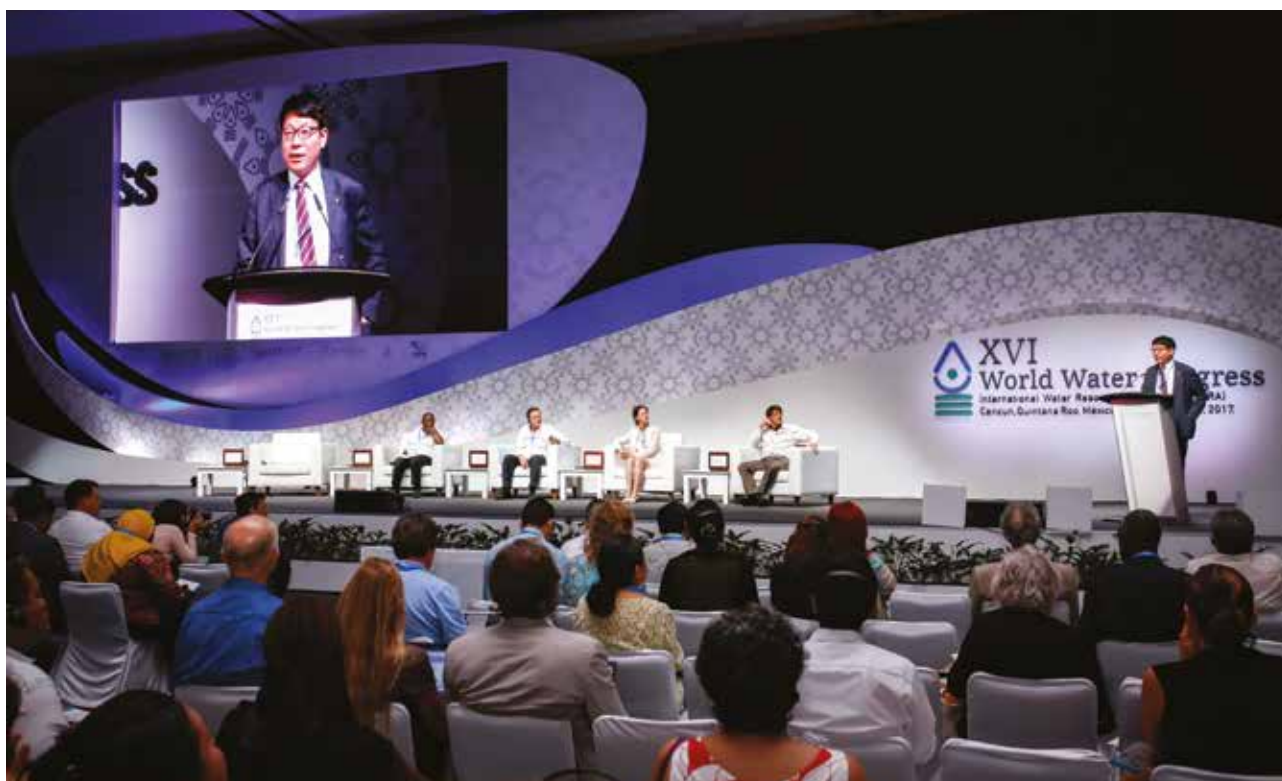
representatives from the World Water Council, the Development Bank of Latin America (CAF), the International Network of Basin Organisation (INBO) and UN-Water. This session intended to be part of the broader process to bring together key actors to further build alliances for water and climate change issues, positioning itself as a main stepping stone between COP 22 and 23, and on the road to the 8th World Water Forum. 




HIGH LEVEL PANEL

Water and Business

TUESDAY, 30 MAY 2017 (12:40PM - 2:10PM)



This third high-level plenary panel was moderated by Prof. Pierre-Alain Roche (President of the Mobility-Transport Section of the French General Council for the Environment and Sustainable Development) and brought together representatives of several institutions such as SUEZ, Mexico's City Water Company, Nairobi City Water and Sewerage Company, K-water and UN-Water. This high-level panel mobilized private and public companies to address how those sectors contribute to the achievement of

the SDG-6. It included an overview of case studies from Asia, Central America and Africa. The Panel stressed the importance of including water under a framework for stewardship and increasing awareness of the resource in a business environment. Invitees highlighted in the end the importance of new methods to better incorporate water management in businesses, through the use of smart technologies, performance indicators, and better asset management. 



HIGH LEVEL PANEL

Integrated Water Resources Management

WEDNESDAY 31 MAY 2017 (12:40PM - 2:10PM)



Mr. Torkil Jørch Clausen chaired a second high level plenary panel during the Congress, this time to emphasize the place of Integrated Water Resources Management (IWRM) in the 2030 Agenda for Sustainable Development, revitalizing the concept of IWRM. Representatives from UNESCO-IHP, the Feria Internacional del Agua, Texas A&M University, the Global Water Partnership, ITAIPI Binacional and the State of Sao Paulo made contributions to the discussion on this important issue. It was agreed that

with political and community stakeholder engagement as well as proper data acquisition and sharing, it is possible for IWRM to provide an over-arching planning and management framework for the SDGs. Concluding remarks called for meaningful data for the proper implementation of IWRM and communication efforts to get policymakers to take science-guided decisions. Good progress in IWRM development, they added, will come in time for the 2030 Agenda. 💧



HIGH LEVEL PANEL


Water-Energy-Food Nexus

THURSDAY 1 JUNE 2017 (12:40PM - 2:10PM)



The last high level panel chaired by Prof. Rabi Mohtar (Texas A&M University), included distinguished panelists from the World Bank Group, the International Commission of Irrigation & Drainage (ICID), the Stockholm Environment Institute (SEI), the Water Foundry, the Global Initiatives and Africa International Water, Universidad Nacional de Cuyo (Argentina), and Universidad de Zaragoza (Spain). Raya Stephan (IWRA Executive Board director), also took part in this panel as an international consultant and water lawyer.

This session aimed to demonstrate the extent of the interconnections between water, energy and food, and highlighted the lessons learned across various

thematic and regional case-studies. Panelists underlined the need to reframe the language of the nexus to stress a more positive tone, focusing on the importance for business/innovation, and for driving economic development, as well as social well-being. The major challenges for implementing nexus solutions were discussed, including poor quality data, as well as a lack of proper governance and institutional capacity. This panel also provided a unique opportunity for youth organizations to express their involvement with regards to the future research and implementation of the Water-Energy-Food Nexus. 



Closing Ceremony

FRIDAY 2 JUNE 2017 (12:40PM - 2:10PM)



Exchange of gifts between Mr. Alcocer Espinosa, host representative of the XVI World Water Congress in Mexico, and Mr. Heo, host representative of the next XVII World Water Congress in Korea.

After a very fruitful and productive week, the successful XVI World Water Congress came to an end. Prof. Gabriel Eckstein moderated this official ceremony and announced one of the main outputs of this Congress: the Cancun Declaration. Its text urges policymakers and donors, scientists and professionals, and the


civil society to take immediate action to help achieve the 2030 Agenda for sustainable development, as described in the document on the following pages. Moreover, another memorable moment was when Mr. Lavarde announced the hosts of the XVII World Water Congress: the Republic of Korea. 💧

CANCUN DECLARATION



One of the desired outcomes of the Congress was a statement of principles and call to action that would capture the essence of the Congress and, in particular, its underlying theme of Bridging Science and Policy. The purpose of such a statement, or “Declaration,” would be to carry forward the outcomes of the Congress and catalyze action toward implementation of those outcomes. During the Congress week, a Declaration Drafting Committee spent countless hours speaking with attendees – in the hallways and in sessions – to solicit their input on what such a statement and call to action might look like. They also sought to extract the numerous sub-themes and concepts that emanated from the many sessions and presentations and incorporate

them into the statement. In addition, the Committee held a public session on the third day of the Congress for all attendees to further solicit contributions and participation.

The members of the Declaration Drafting Committee included: Pierre-Alain Roche, who chaired the committee, and is with the Ministry of Environment of France; Victor Alcocer-Yamanaka, Victor Bourget, and Edwin Zetina of CONAGUA; Blanca Jimenez from the International Hydrological Programme of UNESCO; Tom Soo of the World Water Council; and Agatha Tommasi of the World Youth Parliament for Water. 



International Water Resources Association (IWRA)
XVI World Water Congress

CANCUN DECLARATION

A Call for Action to Bridge Science and Water Policy-Making for Sustainable Development

The XVI World Water Congress convened by IWRA, CONAGUA and ANEAS addressed the issue of "bridging science and policy".

The Congress calls for urgent mobilization of knowledge generators, governments, donors, professionals and civil society to join their efforts to achieve the 2030 Agenda for sustainable development. Water is one of the most crucial needs for the Earth and all of its inhabitants. The holistic ambition of sustainable development in a changing world needs multidisciplinary knowledge, evidence based policies, involvement and participation of everybody for a more effective implementation of solutions.

The importance of water for development and human well-being was reemphasized in 2015 when the Sustainable Development Goals (SDG) were adopted by the UN General Assembly. One of the 17 goals is to "ensure availability and sustainable management of water and sanitation for all" (SDG 6), and the critical role of water is recognised by addressing water issues in many of the other goals. The High Level Panel on Water (HLPW), co-chaired by President Enrique Peña Nieto of Mexico and by President Ameenah Gurib-Fakim of the Republic of Mauritius, made a call to action for a fundamental shift in the way the world looks at water. In 2015 and 2016, the Paris Agreement on Climate Change, the Convention for Biological Diversity, the Sendai Framework on Disaster Risk Reduction and the Habitat III New Urban Agenda, to name a few, also focused on the critical role of water as part of the 2030 Agenda for Sustainable Development.

The Congress stressed the following major issues:

• **"Business as usual" in science, policy and implementation is not an option**

- o The assessment of the current situation and trends illustrate that drastic changes are needed to achieve the SDGs;
- o The 2030 development agenda is a holistic ambition and the SDGs are strongly interlinked: water specialists could benefit from and contribute more to other sectors. They must engage with civil society to assert the role of water in human rights and nature.

• **Stronger efforts for new interdisciplinary knowledge and better knowledge sharing are crucial**

- o In a changing world, with complex interacting systems, science must identify emerging and future challenges. New commitments are constantly needed to generate and share data, information and knowledge from an interdisciplinary perspective, such as the World Water Data Initiative recently launched by the HLPW, and other efforts;
- o Science comprises traditional and modern knowledge, including natural and social sciences, and theoretical and applied sciences, capitalizing on best practices and learning from previous experiences.
- o Education, capacity building and knowledge sharing must be reinforced. As bridging science and policy is a long-term goal, young professionals have a key role in this process.



• **Scientific evidence-based policy making is essential**

- o Science is more than just publishing. Science and knowledge generators have a responsibility to produce and make available their collective expertise to improve policy making and public engagement;
- o Scientists must respond to the needs of civil society and the requests of policy makers through applied research activities;
- o Policy makers must clearly recognize science as a major contributor to evidence-based policies and the public debate.

• **Dissemination of good practices is crucial for fostering implementation of adaptive solutions**

- o Feedback gathered from good practices, especially through integrated water resources management, shows that effective alliances involving scientists, policy makers, major stakeholders and civil society are necessary, feasible, and achievable at all levels.

Time is short until the first review of Goal 6 of the SDGs in 2018 by the High Level Political Forum of the United Nations. The review will clearly reflect that we are not on track to achieve the goals and targets concerning the water sector in due time, and that urgent mobilization is needed.

The Congress solemnly urges:

• **Policy makers and donors:**

- To assimilate science into the decision-making process;
- To finance and facilitate programs and processes to build evidence-based policies.

• **Scientists and professionals:**

- To respond to the needs of civil society and to make new knowledge available for public debate;
- To commit themselves to the implementation of adaptive solutions.

• **Civil society:**

- To adapt its own behaviour to new challenges;
- To share its knowledge of realities and take part in the design and implementation of adaptive innovative solutions.

Cancun, Mexico, 2nd June 2017



IWRA AWARDS

On Thursday, June 1st, 2017, IWRA was pleased to announce the major award recipients at its dedicated Awards Ceremony. The following people were honoured at this event for their contributions to international water management:

Crystal Drop Award

SALMAN M. A. SALMAN AND
HILDA CECILIA TORTAJADA QUIROZ

This award is granted to individuals or organisations in recognition of their laudable contribution to the improvement of the world's water situation. It is awarded once every three years and presented at the IWRA World Water Congress organized by IWRA. 💧



From left to right: Patrick Lavarde, IWRA President, Salman M.A. Salman, Crystal Drop Award recipient, Hilda Cecilia Tortajada Quiroz, Crystal Drop Award recipient, Benedito Braga, President of the World Water Council and James Nickum, IWRA Awards Committee Chair.

2017 Ven Te Chow Memorial Award

VIJAY P. SINGH

IWRA has offered the Ven Te Chow Memorial Award and Lecture since 1988 in the name of the great hydrologist who was also the Association's founder and first president. Selected by IWRA's Awards Committee, awardees prove to have an extensive knowledge and broad experience in the water sector of an unparalleled match. 💧



Patrick Lavarde, IWRA President and Rabi Mohtar receiving the 2017 Ven Te Chow Memorial Award on behalf of Vijay P. Singh.

Distinguished Honourary Members

DOGAN ALTINBILEK AND
LILIAN DEL CASTILLO LABORDE



Few IWRA members are distinguished with this award for their extraordinary work and outstanding career in water resources as well as their significant contributions to the Association. 💧

From left to right: Patrick Lavarde, IWRA President, Elcin Kentel accepting the Distinguished Honourary Member Award on behalf of Dogan Altinbilek, Lilian del Castillo Laborde, recipient of the Distinguished Honourary Member Award, Asit Biswas, former IWRA President, and James Nickum, IWRA Awards Committee Chair.



Best Paper Awards presented in Cancun



Patrick Lavarde, IWRA President presenting the award for the 2014 Water International Best Paper Award to Torgny Holmgren, on behalf of Marian J. Neal (Patrick).

During the XVI World Water Congress, the best paper awards for 2014 - 2016 were recognized.

The 2014 Water International Best Paper Award was presented to Marian J. Neal (Patrick) for her paper entitled "The cycles and spirals of justice in water-allocation decision making", with Honourable Mention awarded to Katie M. Meehan & Anna W. Moore for their paper entitled "Downspout politics, upstream conflict: formalizing rainwater harvesting in the United States".



2016 Water International Best Paper and Honourable Mention recipients group photo with James Nickum.

The 2015 Water International Best Paper Award was given to Mirja Kattelus, Matti Kumm, Marko Keskinen, Aura Salmivaara & Olli Varis for their paper entitled "China's southbound transboundary river basins: A case of asymmetry" with Honourable Mention awarded to S. E. Galaitsi, Annette Huber-Lee, Richard M. Vogel & Elena N. Naumova for their paper entitled "Using water insecurity to predict domestic water demand in the Palestinian West Bank".




Announcement of the 2016 Best Papers Awards

We were pleased to announce at the Congress the Water International best paper and honourable mention awards for 2016. As usual, both exemplify the international and interdisciplinary collaborations that represent the core objective of the IWRA, and Water International.

2016 Water International Best Paper Awardee

Cooperative filling approaches for the Grand Ethiopian Renaissance Dam


Kevin G. Wheeler, Mohammed Basheer, Zelalem T. Mekonnen, Sami O. Eltoum, Azeb Mersha, Gamal M. Abdo, Edith A. Zagana, Jim W. Hall & Simon J. Dadson

Part of a special issue (2016.4) on the Grand Ethiopian Renaissance Dam (GERD), this article uses a river basin planning model with a wide range of historical hydrological conditions and increasing coordination between the co-riparian countries to analyze strategies for filling the GERD and implications for downstream water resources. It finds that risks to water diversions in Sudan can be largely managed through adaptations of Sudanese reservoir operations. The risks to Egyptian users and energy generation can be minimized through combinations of sufficient agreed annual releases from the GERD, a drought management policy for the High Aswan Dam, and a basin-wide cooperative agreement that protects the elevation of Lake Nasser. The authors are based in Ethiopia, the Sudan, the United Kingdom and the United States. 

2016 Water International Honourable Mention Awardee

Desalination and water security in the US–Mexico border region: assessing the social, environmental and political impacts

Margaret O. Wilder, Ismael Aguilar-Barajas, Nicolás Pineda-Pablos, Robert G. Varady, Sharon B. Megdal, Jamie McEvoy, Robert Merideth, Adriana A. Zúñiga-Terán & Christopher A. Scott

In the western US–Mexico border region, both countries' authorities look to desalination as a means to meet increased demands for dwindling supplies. In addition to several existing or planned desalination plants, plans exist to develop projects along Mexico's coasts to convert seawater into freshwater, primarily for conveyance and consumption in the United States. To understand the impacts of such binational desalination systems, the authors of this paper, from Mexico and the United States, assess, through a water-security framework, the case of a proposed desalination plant on the Upper Gulf of California. Their analysis suggests that for binational desalination systems, there are several associated social, political, and economic consequences, costs and constraints against which the benefits of increased water supply must be weighed. 



2016 WATER INTERNATIONAL
BEST PAPER AWARDEE

*Kevin Wheeler accepting the award for 2016
Water International Best Paper.*



2016 WATER INTERNATIONAL
HONOURABLE MENTION AWARDEE

*Nicolas Pineda-Pablos giving an acceptance speech on
behalf of his colleagues, standing behind.*



Congress Youth Ambassadors Program



Prof. Eckstein, Chair of the ISC posing with the Youth Ambassadors of the Congress after the Closing Ceremony.

During the XVIth World Water Congress, IWRA instituted a new program to integrate young professionals from the water sector to participate more actively in the Congress. Throughout the Congress, 19 Congress Ambassadors tirelessly served as session rapporteurs, newsletter writers and editors, and overall assistants for the Congress staff. Their commitment to the

Congress and professionalism was invaluable for the success of the Congress. Moreover, their session summaries have been compiled in the annex of this Final Congress Report in order to ensure that the multitude of presentations, discussions, ideas, and activities were captured and preserved for historical purposes as well as further development. 💧



Thematic Framework

BRIDGING SCIENCE AND POLICY

DISCUSSION NOTE

12 FEBRUARY 2015

Introduction

Water is a vital resource for humanity. It is a crosscutting component of all social, economic and environmental activities. It is a condition for all life on our planet, an enabling or limiting factor for any social and technological development, a source of wellbeing and misery, and all-to-often a basis for conflict and cooperation.

While humanity has widely recognized the imperative of water and sharing, it has not always implemented sound approaches to the utilization, conservation, protection, and administration of the resource. One of the key challenges has been the disconnect between scientific knowledge and policy actions, between those making scientific and technological discoveries and advancements, and those who can mobilize governmental and societal adoption and implementation through practical and robust policies.

The objective of the XVIth World Water Congress is to bridge these gaps in knowledge, communication, and coordination. In particular, it aims to link professionals with information and experiences related to water resources at all levels, with experts working on key global water agendas and strategies. Accordingly, the

Congress is targeted at natural and social scientists, practitioners, and technological innovators, as well as policy and decision-makers, financial stakeholders and investors, legal and regulatory specialists, and groups involved in capacity building. Additionally, the Congress is designed to catalyse cooperation and coordination among these professionals in order to facilitate global goals and strategies related to the Sustainable Development Goals, particularly those related to water, as well as agreements under the auspices of the United Nations Framework Convention on Climate Change, thematic priorities of past and upcoming World Water Forums, and other water-related programs.

In order for us to achieve solutions for the multiple water challenges facing our world, we must strengthen the linkages between science and policy; we must facilitate active dialogue throughout the water community and learn how to translate across disciplines and professions; and we must find opportunities to align our objectives and approaches toward problem solving. By collaborating and combining all of our efforts, by bridging and fortifying relations among scientists and policymakers, we will ensure a more sound future for the world we leave to our children.



Linkages

The WWC in 2017 takes place in the early phase of the “post-2015 development agenda” as shaped by the milestone events in 2015: the Global Risks Report of the World Economic Forum, the Sendai Disaster Risk Reduction Summit, the 7th World Water Forum in Korea, the Addis Summit on Financing for Development, the adoption by the UN General Assembly of the Sustainable Development Goals (SDGs) and the COP 21 climate agreement¹.

From a water perspective, the following linkages are particularly relevant for the thematic framework of the 16th WWC, allowing the 16th WWC to bridge backwards and forwards to other events, as well as the expected SDG 6 implementation mechanisms:

- ◆ The SDGs, primarily the “water goal” SDG 6, but also other relevant goals.
- ◆ The implementation Roadmaps resulting from the 16 themes of the 7th WWF in Korea, to be monitored and reported upon at the 8th WWF in Brazil in 2018.
- ◆ The annual themes of UN-Water (World Water Development Report and World Water Day), and the associated themes of the annual World Water Weeks in Stockholm.

Details are included in Annexes A and B to this Note.

1 - To be followed up at COP 22 in Morocco and at subsequent COP meetings.

Criteria for the proposed thematic framework

The group to be targeted for the XVIth WWC is expected to include policy/decision-makers, academics, civil society and practitioners from the public and private sectors, both within and outside the water sector. The following criteria are suggested:

- ◆ A limited number of themes, supplemented by a few cross-cutting issues (in casu 6+3)
- ◆ For each theme a limited number of sub-themes (in casu max. 4)
- ◆ Brief theme/sub-theme/issue titles, easy to remember and refer to
- ◆ Themes/cross-cutting issues linked to SDG 6 targets as the primary structure
- ◆ Initial “long-list” of sub-themes to be reduced/consolidated later in light of submitted abstracts².
- ◆ Each theme/cross-cutting issue to be introduced by a invited high-level keynote speaker

Details are included in Annexes A and B to this Note.

2 - The final sub-theme structure should accommodate a reasonably even distribution of presentations across sub-themes.



THEMES

1. Water, sanitation and health

(- including implementation of SDG 6.1 and SDG 6.2, and link to SDGs 1 and 3)

- a) Safe and affordable drinking water
- b) Adequate and equitable sanitation
- c) Water and public health

2. Water quality, wastewater and reuse

(- including implementation of SDG 6.3 and link to SDG 14.1)

- a) Water quality and pollution management – from ridge to reef³
- b) Water technologies
- c) The circular economy – reduce, remove, reuse

3. Water security in a changing world

(- including implementation of SDG 6.4 and COP 21/ SDG 13, and the Sendai Disaster Risk Reduction Framework)

- a) Risk management, disaster risk reduction, and the economics of water security^{4&5}
- b) Climate change adaptation
- c) Sustainable and efficient water use – surface water and groundwater
- d) Reliability, equitability, and adaptability

3 - Recognizing linkage to IWRA-lead effort on 7th WWF Implementation Roadmap 3.3: Ensuring Water Quality from Ridge to Reef.

4 - Recognizing linkage to OECD-GWP Dialogue on Economics of Water Security

5 - Encompassing migration due to water scarcity/insecurity to be considered if possible

4. Water policy and governance

(- including implementation of SDG 6.5)

- a) IWRM and transboundary⁶ issues at all levels
- b) Financing, tariffs and the economics of good governance
- c) Water law and regulation⁷

5. Water ecosystems and physical regimes

(- including implementation of SDG 6.6 and link to SDG 15)

- a) Ecosystem and biodiversity⁸
- b) Natural and engineered hydrological systems
- c) The hydro-climatic dimension

6. Water and sustainable growth⁹

(- including link to Addis Summit on Financing Development, and to SDGs 2, 7, 8, 11 and 12)

- a) Managing urban growth - IUWM
- b) The Water, Energy and Food Nexus¹⁰ and Green Growth
- c) Water infrastructure – investment and financing¹¹

6 - Recognizing trans-jurisdictional, national and international concerns, including hydro-diplomacy

7 - Recognizing linkage to OECD Principles on Water Governance

8 - Contemplating both terrestrial and aquatic (from ridge to reef)

9 - Recognizing linkage to World Water Development Report 2016 on “water and jobs”

10 - Linking SDG 2 (food), SDG 6 (water) and SDG 7 (energy)

11 - Recognizing linkage to OECD-WWC Dialogue on Financing Water



CROSS-CUTTING ISSUES

A. Bridging science and policy

(- the theme of the WWC, cutting across all thematic areas)

- a) Policy-relevant science
- b) Scientifically-based policy and management
- c) Modelling and decision support systems

B. Building capacity

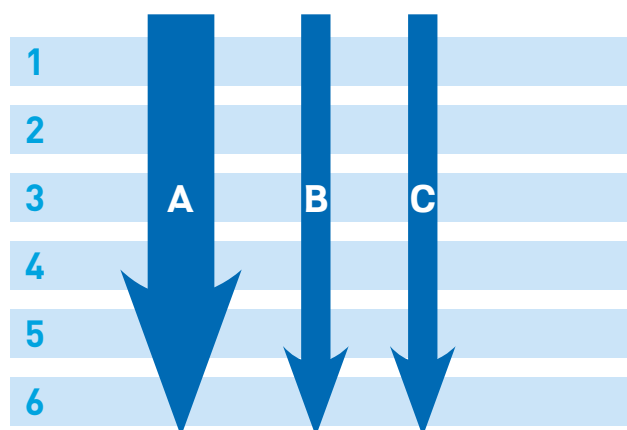
(- including implementation of SDG 6.a and links to SDGs 4 and 17)

- a) Research¹², monitoring, innovation, and education
- b) Technology transfer, information & communication technologies, water information systems and capacity building at all levels
- c) International cooperation

C. Stakeholder participation

(- including implementation of SDG 6.b and links to SDGs 3, 15 and 17)

- a) Promote multi-stakeholder dialogues that involve all¹³: public, private¹⁴, civil society – women and men – young and old
- b) Bridging levels: bottom up and top down
- c) Keeping focus on culture, poverty reduction, justice, and equity
- d) Transparency, corruption, and integrity



¹² - Inclusive of all relevant sciences and disciplines: water (hydrology, hydrogeology, engineering), economic, social, political, legal

¹³ - Recognizing linkage to OECD Stakeholder engagement for inclusive water governance

¹⁴ - Recognizing the important role of private sector to include PPP and new business models

ANNEX A

Water in the Sustainable Development Goals

THE "WATER GOAL"

Goal 6: Ensure availability and sustainable management of water and sanitation for all, with targets:

SDG 6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all

SDG 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

SDG 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

SDG 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

SDG 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

SDG 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

SDG 6.a: By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

SDG 6.b: Support and strengthen the participation of local communities in improving water and sanitation management

"WATER" INCLUDED IN OTHER GOALS

Water (mostly floods/droughts and pollution) is specifically mentioned in other SDG targets, such as:

SDG 2.4 – hunger: floods and droughts

SDG 3.3 – health: water-borne diseases

SDG 3.9 – health: pollution

SDG 11.5 – cities: water-related disasters

SDG 12.4 – production: pollution

SDG 14.1 – oceans: land-based pollution sources

SDG 15.1 – ecosystems: freshwater ecosystem protection

SDG 15.3 – ecosystems: floods and droughts

SDG 15 – ecosystems: invasive species

"WATER" RELEVANT TO OTHER GOALS

While water is relevant to the following goals, it is not specifically mentioned in them:

SDG 1 poverty

SDG 3 gender

SDG 4 education

SDG 7 energy

SDG 8 growth

SDG 9 infrastructure

SDG 12 sustainable production and consumption

SDG 13 climate

SDG 17 implementation



ANNEX B

World Water Forum Implementation Roadmaps

(16 themes addressed in the 7th WWF in Korea)

ACTION TYPES

1. **Water Security for All**
 - 1.1. Enough Safe Water for All
 - 1.2. Integrated Sanitation for All
 - 1.3. Adapting to Change: Managing Risk and Uncertainty for Resilience and Disaster Preparedness
 - 1.4. Infrastructure for Sustainable Water Resource Management and Services
2. **Water for Development and Prosperity**
 - 2.1. Water for Food
 - 2.2. Water and Energy
 - 2.3. Water and Cities
3. **Water for Sustainability: Harmonizing Humans and Nature**
 - 3.1. Green Growth, Water Stewardship and Industry
 - 3.2. Managing and Restoring Ecosystems for Water Services and Biodiversity
 - 3.3. Ensuring Water Quality from Ridge to Reef¹⁵
 - 3.4. SMART Implementation of IWRM

ACTION TOOLS

4. **Constructing Feasible Implementation Mechanisms**
 - 4.1. Economics and Financing for Innovative Investments
 - 4.2. Effective Governance: Enhanced Political Decisions, Stakeholder Participation and Technical Information
 - 4.3. Cooperation for Reducing Conflict and Improving Transboundary Water Management
 - 4.4. Water Cultures, Justice and Equity
 - 4.5. Enhancing Education and Capacity Building

Un-Water And Stockholm World Water Week Themes

UN-WATER

Theme of year, including World Water Development Report and World Water Day (2017 or 2018 may be replaced by “international Year for water and Women”)

2016 Water and jobs

2017 Wastewater (current working title: “Wastewater is Resource Water”)

2018 Ecosystems/nature-based solutions (tentative)

STOCKHOLM WORLD WATER WEEK

2016 Water and sustainable growth

2017 Water and waste – reduce and reuse

2018 Water and ecosystems (presumably, title not decided)

¹⁵ - Theme coordinated by IWRA as Design Group Leader at the 7th WWF





XVI World Water Congress

May 29th – June 3rd 2017
Cancun, Mexico

SUMMARY

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Message from the IWRA President

PATRICK LAVARDE

PRESIDENT OF THE INTERNATIONAL
WATER RESOURCES ASSOCIATION

Following the success of over 40 years of World Water Congresses around the world, I am pleased to invite you to the 16th edition of this famous and prestigious triennial water event in Cancun, Mexico from May 29th to June 3rd 2017.

Since its creation in 1971, IWRA has always strived to lead global thinking on water resources management. The World Water Congress is the platform that IWRA provides for you to present your perspectives to the world on important matters. In 2017, the main theme of the Congress will be "Bridging Science and Policy". This comes at a critical moment in water resources management around the world. Water is now increasingly recognised in the COP processes as a key component in climate change adaptation. The UN Sustainable Development Goals have a dedicated focus on water. The 8th World Water Forum is mobilising global stakeholders to work on water issues around the world. In this dynamic context, the IWRA World Water Congress is a unique opportunity for water policy making and management to build closer ties with multi-

“The IWRA World Water Congress is a meeting place to share experiences, promote discussion, and present new knowledge, research results and new developments in the fields of water sciences and policy around the world. ”

disciplinary water sciences in order to improve decision making in an uncertain world.

The IWRA World Water Congress is a meeting place to share experiences, promote discussion, and present new knowledge, research results and new developments in the fields of water sciences and policy around the world. Importantly, in this 16th edition of the Congress and in partnership with our hosts in Mexico (CONAGUA and ANEAS), we are looking to move science further, move policy making further - by bringing policy makers and knowledge makers together. The Congress aims to create a concrete, dynamic and fruitful meeting of the scientific and policy communities to make a real impact on water resources management around the world.💧



Message from the
National Water Authority

ROBERTO RAMÍREZ DE LA PARRA

DIRECTOR GENERAL OF NATIONAL
WATER COMMISSION OF
MEXICO - CONAGUA

There is no single resource more fundamental and comprehensive for health, development and prosperity than water. Its importance makes it a strategic, crosscutting and multisectoral element required by all human activities, it is undoubtedly the driving force behind our development.

Nonetheless, we must recognise that the climate change effects largely undermine the hydrological cycle behaviour in our basins, by increasing the natural vulnerability of some and creating new water risks in others.

Every year Mexico experiences these effects, from severe droughts to increasingly severe and destructive tropical cyclones. As a result, President Enrique Peña Nieto is driving new public policies based on technical and scientific knowledge to guide the decision-making process and for our hydraulic sector to move from a reactive scheme in the face of disasters, to one of risk prevention, mitigation and management.

As part of this new focus on water, President Peña presented a new initiative at the 69th Session of the UN General Assembly in 2014. His initiative - to create an Intergovernmental Panel on Water - aimed at bringing together technical and political elements to generate better adaptation and resilience capacities. Its creation was announced on January 21st, 2016 in Davos, Switzerland by UN Secretary General and the President of the World Bank Group.

“ I thank you for joining us at the World Water Congress, and participating in this important process, helping to bridge the gap between science and policy.

I hope you enjoy your time at the Congress in Cancun! ”

Which is why, following the same line of work based on water cooperation - sharing cases and jointly seeking the solutions to the water challenges faced by our nations - Mexico shall welcome the members of the International Water Resources Association (IWRA) in 2017 to hold the 16th World Water Congress, having as one of its main objectives to contribute to create a specialised platform of technical and scientific tools and instruments, strengthened by the participation of decision-makers as managers of public policies.

I am certain this forum will be an outstanding opportunity to share work and experiences on best practices.

Lastly, I welcome all members of this renowned and prestigious organisation to a land of incredible natural beauty and hydrology, which makes it one of the most visited tourist destinations worldwide: Cancun, Quintana Roo. Welcome to Cancun! Welcome to Mexico! 💧



Lunes / Monday 29

General Program Overview

Hours	Salon Gran Cancun	Cozumel 1	Cozumel 2	Cozumel 3	Cozumel 4	Cozumel 5	Xcaret	Salon Isla Mujeres	Coba
9:30 - 12:20	Opening Ceremony								
12:40 - 14:10	HLP: Water and the SDGs								
Lunch*									
15:30 - 17:00		RS-1: Water Security in a Changing World: Alternative Sources of Water	SS-13: Towards a special issue of Water International on the OECD Principles on Water Governance	RS-2: Bridging Science and Policy	SS-49(A): Presentation of the online Training Course on the « Greening » of Water Law: Implementing environment-friendly principles in contemporary water treaties and laws	SS-56: Innovative water resources management and green development in China	SS-63(A): The National Water Reserves Program in Mexico: allocation of water for the environment and accomplishment of multiple SDG	RS-8: Water Security in a Changing World: Conflict and Cooperation	SS-45: Water in the World We Want - policy and planning for accelerated SDG success
17:20 - 18:50		RS-10: Water Security in a Changing World: Managing Risks	SS-79: 2nd Water Business Forum 2017	RS-19: Water and Sustainable Growth: Water-Energy Nexus	SS-49(B): Presentation of the online Training Course on the « Greening » of Water Law: Implementing environment-friendly principles in contemporary water treaties and laws	SS-18: Understanding water Security in cities: empirical evidence - and policy implications	SS-63(B): The National Water Reserves Program in Mexico: allocation of water for the environment and accomplishment of multiple SDG	RS-5: Water Security in a Changing World: Climate Change	RS-3: Building Capacity

*Poster Session

Martes / Tuesday 30

General Program Overview

Hours	Salon Gran Cancun	Cozumel 1	Cozumel 2	Cozumel 3	Cozumel 4	Cozumel 5	Xcaret	Salon Isla Mujeres	Coba
9:00 - 10:30		RS-4: Building Capacity	SS-55(A): Shared Waters of North America: Scientific water resources assessment	RS-7: Water Security in a Changing World: Climate Change	SS-75: Peace for Water: The Global High Level Panel on Water and Peace's Vision	SS-71: Making investments on multi-purpose water infrastructure fit to finance	SS-60: Capacity building in the water sector: Creating and developing training centers for water professionals	RS-23: Water Ecosystems and Physical Regimes: Groundwater Resources	SS-10: Smart Water Management (SWM): Bridge to WGG & SDGs - the technological innovation needed for "Water for all"
10:50 - 12:20	HLP: Water and Climate								
12:40 - 14:10	HLP: Water and Business								
Lunch*									
15:30 - 17:00		RS-32: Water Sanitation and Health	SS-55(B): Shared Waters of North America: Policies and issues on Transboundary Water Resources	RS-9: Water Security in a Changing World: Conflict and Cooperation	SS-41(A): Water Security in the Americas	SS-61: The Legacy of COP22: Implementing the Global Climate Action Agenda in the water sector	SS-27: Case Studies in the Challenges of Water Sharing Between "Upstreamers" and "Downstreamers"	RS-19: Water Policy and Governance: Transboundary Aquifers Law and Policy	
17:20 - 18:50		RS-12: Water, Sanitation, and Health: Ensuring Drinking Water	SS-55(C): Shared Waters of North America: Integration of Science and Policy Cooperation	RS-13: Water Policy and Governance: Economics of Water Governance	SS-41(B): Water security in the Americas	SS-46: Building a Green Infrastructure Agenda for the Latin American Water Sector	RS-17: Water Policy and Governance	SS-73: The First Asia International Water Week: Asia Solution for Water	

*Poster Session

Miércoles / Wednesday 31

General Program Overview

Hours	Salon Gran Cancun	Cozumel 1	Cozumel 2	Cozumel 3	Cozumel 4	Cozumel 5	Xcaret	Salon Isla Mujeres	Coba
9:00 - 10:30		RS-24. Water and Sustainable Growth Irrigation	SS-26. Reflecting on Regulating Water Security for Unconventional Gas and Oil	RS-34. Water Quality Management	SS-48(A). Multi-Disciplinary Perspectives on the Grand Staircase-Escalante National Monument (GSENM) and the future of water resources management and development in the Eastern Pale Basin	SS-76. Towards a Green Infrastructure in Latin America and the Caribbean	SS-65(A). Water Security and Climate Change - Challenges and Opportunities in Asia	RS-14. Water Policy and Governance: Economics of Water Governance	RS-21. Water Policy and Governance: Transboundary Aquifers on the Mexico-US Border
10:50 - 12:20		RS-30. Water Quality: Contaminants of Emerging Concern	SS-30. Social Sciences approach to supporting stakeholder engagement for water policy development	RS-26. Water Policy and Governance: Regional and International Law	SS-1500. Multi-disciplinary Perspectives on the Grand Staircase-Escalante National Monument (GSENM) and the future of water resources management and development in the Eastern Pale Basin	SS-77. Achieving Water and Sanitation SDGs in Latin America and the Caribbean	SS-65(B). Water Security and Climate Change - Challenges and Opportunities in Asia	RS-41. Water and Sustainable Growth: Water-Food-Energy Nexus	SS-53. The Draft Articles on the Law of Transboundary Aquifers - Moving forward until the next UN General Assembly session
12:40 - 14:10	HLP: Integrated Water Resources Management								
Lunch*									
15:30 - 17:00			SS-29(A). Water Quality Management - identifying opportunities for policy reform	RS-6. Water Security in a Changing World: Climate Change		SS-48. Two Countries, Nine States: Colorado River Cooperation in a Complex System	SS-16(A). What next for water law and policy? Recent developments, future challenges and potential opportunities	SS-21(A). Water security and global-change adaptation: bridging science and policy	SS-34 (A). Bridging Stakeholders' Knowledge and the 8th World Water Forum Thematic Framework
17:20 - 18:50		RS-18. Water Policy and Governance	SS-25(B). Water Quality Management - identifying opportunities for policy reform	RS-32. Water Ecosystems and Physical Regimes	SS-17. Empowering Young Water Professionals through Engagement in Global Water Community	RS-29. Water Security in a Changing World: Cooperation on the Mexico-US Border	SS-16(B). What next for water law and policy? Recent developments, future challenges and potential opportunities	SS-21(B). Water security and global-change adaptation: bridging science and policy	SS-34 (B). Bridging Stakeholders' Knowledge and the 8th World Water Forum Thematic Framework
19:00 - 20:30						Open Discussion - Preparation of Cancun Declaration			

*Poster Session

Jueves / Thursday 1

General Program Overview

Hours	Salon Gran Cancun	Cozumel 1	Cozumel 2	Cozumel 3	Cozumel 4	Cozumel 5	Xcaret	Salon Isla Mujeres	Coba
9:00 - 10:30		RS-16: Water Ecosystems and Physical Regimes	SS-56(A): Training in Hydro-diplomacy: Legal and Institutional Aspects of Water Resources Governance – From the International to the Domestic Perspective	RS-27: Water Policy and Governance: Law	SS-72: Cooperation and Exchange of Experience in Water Resource Management and Adaptation to Climate Change	SS-33(A): Resilience of coastal watersheds in Latin America and the Caribbean	SS-54: Water Futures and Solutions	RS-33: Water Quality: Managing Contamination	
10:50 - 12:20		RS-31: Water Quality Management	SS-58(B): Training in Hydro-diplomacy: Legal and Institutional Aspects of Water Resources Governance – From the International to the Domestic Perspective	RS-25: Water Policy and Governance: Integrated Water Management	SS-43: Hydropower Development and Reservoir Operation	SS-33(B): Resilience of coastal watersheds in Latin America and the Caribbean	SS-36: Water stress and demographic dynamics	RS-15: Water Ecosystems and Physical Regimes	
12:40 - 14:10	HLP: From WEF Nexus to WEF+Health +Education Nexus								
Lunch*									
15:30 - 17:00	IWRA Awards								
17:20 - 18:50		SS-74: Getting to a Water Security Framework: Breaking it Down to Build it Up	SS-52: Offshore Aquifers – Why Should We Care?	RS-22: Water Ecosystems and Physical Regimes: Groundwater Resources	SS-8: Charges vs. buyback: who pays for water ecosystems restoration?	SS-64: Towards an Integrated Water Management by Sub-basin: Mainstreaming of Science and Policy	SS-38: Water security issues for developing countries in changing environment	RS-28: Water Policy and Governance: Law	

*Poster Session

Viernes / Friday 2
General Program Overview

Hours	Salon Gran Cancun	Cozumel 1	Cozumel 2	Cozumel 3	Cozumel 4	Cozumel 5	Xcaret	Salon Isla Mujeres	Coba
9:00 - 10:30			SS-23(A): Enhancing irrigation productivity and profitability in small scale irrigation schemes lessons from three continents	RS-11: Water Security in a Changing World: Managing Risks	SS-11: Understanding the Forest-Water Nexus: a new global monitoring framework and tool	SS-5: Regulation and Transparency for Water and Sanitation Services in countries with lack of them	SS-62: Towards SDG implementation – ensuring water quality from source to sea	RS-38: Stakeholder Participation	SS-43(A): The scientific underpinnings of global water law instruments: the UN Watercourses Convention, the UNECE Water Convention, and ILC Draft Articles on Transboundary Aquifers
10:50 - 12:20		RS-40: Water and Sustainable Growth: Water-Food-Energy Nexus	SS-23(B): Enhancing irrigation productivity and profitability in small scale irrigation schemes lessons from three continents	RS-42: Water and Sustainable Growth	RS-36: Water Sanitation and Health	SS-67: A "ts'ono'ot" cosmovision: Interdisciplinary science and policy in the Yucatan Peninsula's sinkholes	SS-44: Sustainable Watersheds: Emerging Economic Instruments for Eater Security	SS-78: Introducing the World Water Data Initiative: How water data can help achieve the Sustainable Development Goals	SS-42(B): The scientific underpinnings of global water law instruments: the UN Watercourses Convention, the UNECE Water Convention, and ILC Draft Articles on Transboundary Aquifers
12:40 - 14:10	Closing Ceremony								
Lunch*									
15:30 - 17:00	IWRA General Assembly								

*Poster Session

BRIEF DESCRIPTION OF PLENARY SESSIONS

• OPENING CEREMONY •

Monday, May 29th, 2017
 Gran Cancun Room
 9:30 – 12:20 hrs

Welcome speeches

Opening by the Congress co-chairs
 - Mr. Carlos Joaquin Gonzalez, Governor, Quintana Roo
 - Mr. Patrick Lavarde, President, IWRA
 - Mr. Ramon Aguirre, President, ANEAS
 - Mr. Roberto Ramirez de la Parra, Director General, CONAGUA
 - H.E. Mr. Rafael Pacchiano Alaman, Minister, Ministry of Environment and Natural Resources, Mexico

Keynote speeches

- H.E. Mr. Benedito Braga, President, World Water Council & State Secretary, Sao Paulo State, Brazil
 - H.E. Mr. Guihua Lu, Vice-Minister for Water Resources, People's Republic of China
 - H.E. Mr. Diene Faye, State Secretary for Hydraulics, Senegal
 - Mr. Haksoo Lee, President, Asia Water Council
 - Mr. Tony Slatyer, Special Adviser on Water, Department of Foreign Affairs and Trade, Australia
 - Mr. Torgny Holmgren, Executive Director, Stockholm International Water Institute
 - Mr. Paulo Salles, Co-Chair, 8th World Water Forum

Closing remarks and Congress introduction

- Mr. Gabriel Eckstein, Chair, XVI World Water Congress International Scientific Committee

• HIGH-LEVEL PANELS •

High-Level Panel: Water and the Sustainable Development Goals
 Monday, May 29th, 2017
 12:40 – 14:10 hrs, Gran Cancun Room

The purpose of the Panel is to address the role of water in SDG implementation from different perspectives in light of the 2030 Agenda for Sustainable Development, and make recommendations for actions to be taken - what, when and by whom. The Panel is not intended simply as an "event", but rather as an important milestone in a process of strategy development and alliance-building among key stakeholders that will continue at subsequent key events, including Stockholm World Water Week in 2017 and 8th World Water Forum in 2018.

Speakers:

•Aziza Akhmouch, Head, Water Governance Program, OECD
 •Sergio Campos, Head, Water

and Sanitation, Inter-American Development Bank (IDB)

•Jose Carrera, Vice President, Development Bank of Latin America (CAF)

•Torgny Holmgren, Executive Director, Stockholm International Water Institute (SIWI)

•Karin Krchnak, Director, Freshwater Program, WWF

•Federico Properzi, Chief Technical Adviser, UN-Water

•Roberto Ramirez de la Parra, Director General, CONAGUA

Moderator: Torkil Jøneh Clausen, Chair of the Scientific Programme Committee for the World Water Week, Senior Adviser to the Global Water Partnership and Chair of the Thematic Commission of the 8th World Water Forum, Denmark.

High-Level Panel: Water and Climate
 Tuesday, May 30th, 2017
 10:50 – 12:20 hrs, Gran Cancun Room

The purpose of the Panel is to consider how to further promote the importance of water management in the Climate Change COP process when dealing with the challenges posed by climatic changes, with a particular focus on climate change adaptation. It will also consider implementation of the Global Climate Action Agenda through different concrete actions and projects, and will propose recommendations for actions to be taken. The Panel is intended as part of the broader process that aims to bring together key actors to further strengthen and build an alliance for water and climate

• HIGH-LEVEL PANELS •

change issues, positioning itself as a key stepping stone between COP 22 and 23, and leading to the 8th World Water Forum in 2018.

Speakers:

- Dogan Altinbilek, Vice-President, World Water Council, IWRA Past President
- Eugenio Barrios, Director of the Water Programme, WWF, Mexico
- Jean-Didier Berthault, Vice-President, Paris Region Sanitation Corporation (the Megacities Alliance for Water and Climate)
- Jose Carrera, Vice-President, Social Development,

Development Bank of Latin America (CAF)

- Jean-François Donzier, Executive Secretary, International Network of Basin Organizations (the Global Alliance for Water and Climate)
- Neil Grigg, Professor, Colorado State University, United States
- Jason Morrison, Head, CEO Water Mandate UN Global Compact (the Business Alliance for Water and Climate)

Moderator: Cecilia Tortajada, Institute of Water Policy, Lee Kuan Yew School of Public Policy, National University of Singapore and Past President of IWRA, Singapore.

High-Level Panel: Water and Business
"New paradigms for the water sector's contribution to the SDGs"
Tuesday, May 30th, 2017
12:40 – 14:10 hrs, Gran Cancun Room

The purpose of the Panel is to address the mobilization of the private and public companies involved in the water sector for the implementation of the SDGs, innovative solutions that could be developed in the coming years, new opportunities for innovation, and how innovation and creativity could be encouraged by national and international authorities. The panel will consider issues such as: major innovations that could contribute significantly to the achievement of the SDGs, the main gaps to be bridged, existing and potential alliances among stakeholders that will help implement sustainable solutions, and the changes from "business-as-usual" that are needed to achieve the 2030 Agenda for Sustainable Development.

Speakers:

- Ramon Aguirre Diaz, Director General, Mexico City Water Company-Sacmex, Mexico
- Diane d'Arras, Director, Suez, France & President, International Water Association
- Hak-Soo Lee, President, K-Water, South Korea
- Jason Morrison, Head, UN Global Compact CEO Water Mandate, United States
- Philip Gichuki, CEO, Nairobi City Water & Sewerage Company Ltd, Kenya

Moderator: Pierre-Alain Roche, President, the High Council for Environment and Sustainable Development, France.



• HIGH-LEVEL PANELS •

High-Level Panel: Integrated Water Resources Management

Wednesday, May 31st, 2017

12:40 – 14:10 hrs, Gran Cancun Room

The purpose of the Panel is to address the role of IWRM from different perspectives in light of the 2030 Agenda for Sustainable Development, and make recommendations for revitalizing IWRM toward action at all levels. The Panel is intended as part of the ongoing process of alliance-building among key stakeholders in IWRM implementation that will continue at subsequent key events, including Stockholm World Water Week in 2017 and 8th World Water Forum in 2018. The Panel will address issues such as: successes and failures in IWRM implementation over the last decade, new modalities for operationalizing IWRM, emerging issues and vectors that IWRM must address in the coming decades, and main challenges – at different levels – to achieving SDG Target 6.5 on IWRM.

Speakers:

- Benedito Braga, State Secretary for Sanitation and Water Resources, State of Sao Paulo, Brazil
- Claudia Patricia Ochoa Campuzano, Director, Centre of Science and Technology of Antioquia, Colombia
- Blanca Jiménez-Cisneros, Director, Water Resources, UNESCO
- Rabi Mohtar, Professor and Head of centre, Texas A&M University, USA
- Mark Smith, Director, Global Water Programme, International Union for Conservation of Nature
- James Spalding, Director General, Itaipu Binacional, Paraguay
- Fabiola Tábor, Executive Secretary, Global Water Partnership, Central America

Moderator: Torkil Jønch Clausen, Senior Adviser to the Global Water Partnership, Chair of the Scientific Programme Committee for the World Water Week, Chair of the Thematic Commission of the 8th World Water Forum, Co-chair of the World Water Council Task Force on IWRM, Denmark.

High-Level Panel: The Water-Energy-Food Nexus

Thursday, June 1st, 2017

12:40 – 14:10 hrs, Gran Cancun Room

The Panel will specifically focus on the Sustainable Development Goals related to Water, Energy, and Food (SDGs 2, 6, and 7). The main objectives of the Panel are to: demonstrate the extent of the interconnections between the water, energy, and food goals, explore possible tradeoffs for implementing the SDGs and identifying a holistic assessment criteria for multiple implementation plans at different scales, and discuss ways among which the policy coherence and policy-science communication could be improved across sectors and across scales. The discussion in the Panel will start with challenges in securing adequate tools, data, modelling complexity, governance and financing, starting with the global perspective, and moving to the more local and national scales. It will build on this material by considering lessons learned from various partner institutions on the potential

and risks of adopting the Water, Energy, and Food nexus as a platform for SDG implementation.

Speakers:

- Carl Ganter, CEO, Circle of Blue
- Astrid Hillers, Program Manager, Global Environment Facility
- Antonio Embid Irujo, Professor of Law, University of Zaragoza, Spain
- Louise Karlberg, Director, Swedish Environment Institute International, Sweden
- Liber Martin, Professor, National University of Cuyo, Argentina
- Saeed Nairizi, President, International Commission on Irrigation and Drainage
- Diego J. Rodriguez, Senior Manager, The World Bank
- Will Sarni, President, the Water Foundry LCC, United States
- Raya Stephan, International Water Lawyer, France

Moderator: Rabi Mohtar, TEES Endowed Professor at Texas AM University, USA.



• CANCUN DECLARATION WORKSHOP •

Wednesday, May 31st, 2017
19:00 – 20:30 hrs, Cozumel 5

A special open meeting will be held to contribute to the development and drafting of the Cancun Declaration.

• IWRA AWARDS CEREMONY •

Thursday, June 1st, 2017
15:30 – 17:00 hrs, Gran Cancun Room

Introduction: James E. Nickum, as Chair of the Awards Committee

- Presentation of Honorary Memberships by Asit Biswas, Founding member and Past President of IWRA
- Presentation of the Best Papers Awards by James E. Nickum, as Editor-in-Chief, Water International
- Presentation of the Crystal Drop Award by Ben Braga, President of the World Water Council and Past President of IWRA

Ven Te Chow Memorial Lecture by Prof. V.P. Singh: "Challenges in meeting water security and resilience".

Closing: James E. Nickum, Chair of the Awards Committee.



• CLOSING CEREMONY •

Friday, June 2nd, 2017
Gran Cancun
12:40 – 14:10 hrs

Congress Outcomes

- ISC Chair Report
 - Mr Gabriel Eckstein, Chair, XVI World Water Congress International Scientific Committee
- Adoption of the Cancun Declaration

XVI - XVII Congress Handover

- Mr Patrick Lavarde, President of IWRA
- XVII Congress Host representatives
- Signature of the MoA and Handover Ceremony

Closing Session

- Mr. Roberto Olivares, Director General, ANEAS
- Mr. Luis Felipe Alcocer Espinosa, Deputy Director for Planning, CONAGUA
- Mr. Patrick Lavarde, President, IWRA



• SOCIAL EVENTS •

Welcome cocktail
Wednesday, May 29th, 2017
19:30 hrs.

Welcome cocktail on Monday May 29th. We expect you at the Akuma Terrace in Cancun International Convention Center at 19:30 hrs. Dress Code: Informal.

Gala Dinner
Thursday, June 1st, 2017
19:30 hrs.

Gala Dinner at the Mandala Beach Club on Thursday, June 1st at 19:30 hrs. Dress Code: Gala

Technical Visit
Saturday, June 3rd, 2017

Technical visit to Aktun-Chen, a beautiful nature park in the heart of a tropical rainforest. Splendid views, amazing wildlife and plenty of entertainments is just an hour and a half away from our venue.

9:00 hrs - Departure from Cancun ICC.
17:00 hrs - Departure from Aktun-Chen back to Cancun ICC.



Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	RS#	RS TITLE	DATE/TIME/ROOM
Jad	Ziolkowska	Desalination Technology in the US: Potentials for Economic Growth and Sustainable Water Supply	1	Water Security in a Changing World: Alternative Sources of Water	May 29 th 2017 15.30-17.00 Cozumel 1
Yoram	Eckstein	Quo Vadis Aqua Mundi? The Future of Water			
Sajjad	Ahmad	Potential of Rainwater Harvesting in meeting the domestic outdoor demand: a study in dry and wet regions of the United States			
Biju	George	Water Reuse for Irrigation in Egypt: Farmer's perceptions, knowledge and economics			
Jessica	Rodrigues Pires da Silva	Boosting direct potable reuse: measures to be taken to help shorten the knowledge gaps and uncertainties surrounding this technology			
Angelica	Gutierrez-Magness	GEO Global Water Sustainability (GEOGLOWS): Earth Observations for sustainability in water management in the Americas and around the world	2	Bridging Science and Policy	May 29 th 2017 15.30-17.00 Cozumel 3
Bassel	Daher	Understanding the Science-Policy Gap: Proposing a Formal Delegation Principal - Agent Model			
Thais	Moreira de Classe	Water Footprint Assessment: innovation tool in Brazilian water governance			
Bryan	Jenkins	Translating Science into Policy: setting nutrient limits for agricultural land use			
Alejandro	Salazar	Institutional capacity and performance in water utilities in the North of Mexico	3	Building Capacity	May 29 th 2017 15.30-17.00 Coba
Pankajkumar	Sampat	Quantification of Municipal Water Supply and Role of Metering in Large Indian Cities			
Elaine	Springgay	Understanding the Forest-Water Nexus: monitoring framework and tool			
Lindsey	Aldaco-Manner	Water Education Assessment Standards: The Pipeline to Conserving Water in Urban Cities	4	Building Capacity	May 30 th 2017 9.00-10.30 Cozumel 1
Tom	Arsuffi	Field Stations as Ambassadors and Agents for Bridging Silos: Engagement in Watershed Protection, Research and Natural Resource Literacy in a Land of Private Property			
Alejandra	Mayorga Rodríguez	Environmental Education for Adults based on Participatory Action Research			
Rudolph	Rosen	Future water stewardship and fact-based water policy: an aquatic science education pathway model			

Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	ID ABS	RS#	RS TITLE	DATE/TIME/ROOM
Laura	McCann	Comparison and evolution of water institutions in the U.S. Midwest		5	Water Security in a Changing World: Climate Change	May 29th 2017 17.20-18.50 Isla Mujeres
Meghan	Klasic	Water Quality and Extreme Events in the Face of Climate Change: Does science supply meet demand?				
Inom	Normatov	Modern state of the Transboundary Amudarya main tributaries				
Yukako	Tanaka	Estimation of the damage cost on compound water related disaster in Japan using 2D non-uniform flow model				
Alfredo	Ribeiro Neto	Adaptation mechanisms for extreme events in the Capibaribe River Basin - Brazil				
Maureen	Papas	Climate Change Adaptation and the Pivotal Role of Water: Proposed policy response for Australia?		6	Water Security in a Changing World: Climate Change	May 31st 2017 15.30-17.00 Cozumel 3
Saswati	Roy	Truth Behind Noah's Deluge: An Implication of Climate Change Adaptation				
Céline	Dubreuil	Mediterranean wetlands: Natural solutions to deal with climate change				
Yangwen	Jia	Challenges and Adaptive Strategies of Water Resources Change in the Yellow River Basin under the Changing Environment				
Pedro Antonio	Guido-Aldana	Criteria for the selection and design of climate change adaptation measures for Mexico				
Roberto	Ponce	Economic Evaluation of Climatic Change Impacts on Water Resources at River Basin Scale: Insights from the Vergara River Basin, Chile		7	Water Security in a Changing World: Climate Change	May 30th 2017 9.00-10.30 Cozumel 3
Layla	Lambiasi	Defining future climate conditions for a river basin in northeast Brazil: combining GCMs predictions, promoting scenario planning and embracing uncertainty				
		Estimation of the economic loss associated with the potential water scarcity due to climate change over a river basin in northeast Brazil: guiding policy making process on a tangible scientific basis				
Nidia	Tobon	Paleohydrology record of the stromatolites of the Bacalar Lagoon: new insight for climate change assessment in the Mexican Caribbean				
Hashim	Alsafi	Assessment of climate change impacts on the variability of future streamflow in a selected contributing catchment of the Australian Hydrologic Reference Stations				

Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	RS#	RS TITLE	DATE/TIME/ROOM
Christopher	Rossi	The Transboundary Dispute Over the Waters of the Silal/Siloli (Bolivia v. Chile)	8	Water Security in a Changing World: Conflict and Cooperation	May 29 th 2017 15.30-17.00 Isla Mujeres
Shawna	Moore	Changing Tides of Egyptian Hydro-Hegemony			
Ahmed	Tayia	Transboundary water conflict resolution mechanisms: toward convergence between theory and practice			
Lindsay	Sansom	U.S.-Mexico Water Cooperation and Conflict			
Yumiko	Yasuda	Stepping out of the "water-box" - Re-thinking transboundary water cooperation	9	Water Security in a Changing World: Conflict and Cooperation	May 30 th 2017 15.30-17.00 Cozumel 3
Rebecca L	Farnum	Drops of Diplomacy: Questioning the Scalar Possibilities of Hydro-Diplomacy through a Moroccan Fog-Harvesting Project			
Nando	Lewis	A new framework for investigating the (in)direct role of water in civil conflict			
Dolores	Rey	Historic droughts in the UK: What can we learn to improve agricultural drought management in the future?	10	Water Security in a Changing World: Managing Risks	May 29 th 2017 17.20-18.50 Cozumel 1
Steven	Nebiker	The Transition to Dynamic Reservoir Operations for Municipal Water Supply			
Oscar	Sánchez Montufar	Dam Management in Mexico Cajon de Peña Dam, Jalisco State			
Mustafa Berk	Duygu	Planning of Drought Management by Integrating Science and Policy			
Adriana Maria	Erazo Chica	Hydrological Tools for Flooding Early Warning Systems	11	Water Security in a Changing World: Managing Risks	June 2 nd 2017 9.00-10.30 Cozumel 3
Daisuke	Nohara	A framework to assess effectiveness and risks of integrated reservoir operation for flood management considering ensemble hydrological prediction			
Blandine	Ouikotan	Gaps and challenges of flood risk management in West African coastal cities			
Robert	Šakić Trogrlić	Community based- flood risk management: experiences and challenges in Malawi			
Sydney	Weyand	An application of sociohydrology to predict the long-term effects of the Alberta Drainage Project on flood risk in Texas colonias			
So	Kazama	Adaptation effect for flood in whole Japan using GCMs with scenarios			

Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	RS#	RS TITLE	DATE/TIME/ROOM
Amanda	Fencl	How do we build drought resilient drinking water utilities? Learning from Californian Utilities' Drought Responses	12	Water, Sanitation, and Health: Ensuring Drinking Water	May 30th 2017 17:20-18:50 Cozumel 1
Cristian	Palma Infante	Drinking water and urban growth: analysis of the integration of the land-use and water supply planning instruments in BioBio Region, Chile.			
Juan Carlos	Tejeda-González	Strategic Environmental Assessment of an Integrated Drinking-Water Management Plan for Rural Communities at the Altiplano Potosino			
Fernando	Gumeta-Gomez	Institutional Changes and Governances of Drinking Water in Mexico			
Alex	Godoy-Faúndez	Growth and Convergence of Residential Water Consumption			
Ishita	Singh	Water Pricing and Participatory Irrigation Management under Integrated Watershed Development Project in Jammu and Kashmir, India: Experiences and Lessons Learnt	13	Water Policy and Governance: Economics of Water Governance	May 30th 2017 17:20-18:50 Cozumel 3
Ina	Thome Picoli	Water security and charging for the use of water in river basins: a case study of Sao Paulo, Brazil			
Gisselle	Vila Benites	Tariff creation processes in the Amazon: a case study from an indigenous community			
Salvador	Delgadillo	Proposal of continuous water supply systems in urban Mexico			
Felipe	Vasquez	Effect of the Functional Form on the Residential Water Demand under Block Tariffs: Estimation using Discrete-Continuous Choice Models			
José Bento	Da Rocha	Water Producer Project in the Pipiripau River Basin, Federal District - DF, Brazil	14	Water Policy and Governance: Economics of Water Governance	May 31st 2017 9:00-10:30 Isla Mujeres
Kleverton	Melo de Carvalho	Global value chains and international water security: a critical study			
Adam	Loch	Private water trade transaction costs in the MDB: an empirical assessment over time			
Alfonso	Exposito	The Microeconomics of Water Demand under Deficit Irrigation: A case study in southern Spain.			
Alex	Godoy-Faúndez	Linking Water Scarcity, Copper production and Electricity Market: The Chilean Case of interplay between greener power and uncertainty on copper prices			

Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	RS#	RS TITLE	DATE/TIME/ROOM
Noriko	Uchida	Longitudinal and Seasonal Profiles of Mass of Environmental DNA for Stream Invertebrates in Fresh Water	15	Water Ecosystems and Physical Regimes	June 1st 2017 10:50-12:20 Isla Mujeres
Julio Cesar	Quiñonez Basagoitia	Hydrological analysis of water resources reduction as arising from deforestation processes and land use change in El Salvador and strategic actions proposal			
Saswati	Roy	Developmental Strategies and its Impact on an Island's Ecosystem and Bio-diversity: A Geographical Appraisal on Little Andaman Island, Andaman Archipelago, India			
Freddy	Rey	Ecological engineering for reconciling natural hazard control and land ecological restoration in water ecosystems			
Micael	de Souza Fraga	Identification of Suitable Areas for Implementation of Eucalyptus Cultivation in the Espírito Santo State, Brazil	16	Water Ecosystems and Physical Regimes	June 1st 2017 9:00-10:30 Cozumel 1
Ts'epo Stephen Tiisetso	Sekaleli	The Impact of Eucalypts Plantation on Soil Moisture and Ground Vegetation Cover at St. Michaels in the Roma valley, Lesotho			
Judith	Ramos-Hernandez	Analysis of the vegetation-soil-water interaction and external factors on the water availability in a rain forest			
Nathália	Pivatto Erberelli	Determining the Rainfall Indices Expected in a Return Period for the Region of Guaratinguetá, SP - Brazil			
Barbara	Moreto Fim	Environmental indicators to assist sustainable intensification practices in Espírito Santo, Brazil	17	Water Policy and Governance	May 30th 2017 17:20-18:50 Xcaret
Pooja	Kapoor	Equitable distribution of potable water and realization of water charges for self sustainable water distribution systems in South East Asian countries of Cambodia, Laos, Thailand and Vietnam			
Daniel	Gilmour	Supporting Water Infrastructure Decision Making for Sustainable Rural Communities			
Viviana	Vargas Franco	Towards a water governance index (WGI) for Andean micro-watersheds using pressure-state-response indicators and fuzzy logic system: Case study in Colombia			
Stijn	Speelman	Closing the water cycle: A comparison of the institutional settings for wastewater reuse in 4 countries with a focus on the agricultural sector	18	Water Policy and Governance	May 31st 2017 17:20-18:50 Cozumel 1
Harris	Kuemmerle	The subnational and the international in Pakistani hydropolitics			
Luis Alberto	Labra Hernandez	Use and management of water resources: linking levels of government from the bottom up and top down			

Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	RS#	RS TITLE	DATE/TIME/ROOM
Ronald	Kaiser	Use of a Preference-Feasibility System in Water Resources Planning and Decision-making	18	Water Policy and Governance	May 31st 2017 17.20-18.50 Cozumel 1
Zhuping	Sheng	Lessons learned from long term water resources plans: top down vs. bottom up			
Antti	Belinskij	Local needs at the heart of global water governance			
Christina	Fraser	What Hydrogeological Knowledge is Needed to Inform Transboundary Aquifer Policy: A Malawi Case Study	19	Water Policy and Governance: Transboundary Aquifers Law and Policy	May 30th 2017 15.30-17.00 Isla Mujeres
Pauline	Robert	Do Indigenous Peoples' Rights To Lands And Natural Resources Extend To Transboundary Aquifers Contaminated By Mining Production Within The Lake Titicaca Region?			
Bertram John	Swartz	Legal and Institutional Framework for Groundwater Regulation in the Stampriet Transboundary Aquifer System: A Case Study of Namibia			
Stefano	Burchi	The Nubian Sandstone Aquifer System (NSAS): a case of cooperation in the making	20	Water Policy and Governance: Transboundary Aquifers Law and Policy	May 31st 2017 15.30-17.00 Cozumel 1
Malcolm J.	Gander	Factors Preventing Finalization of the Draft Articles in the 2008 UNGA Resolution on the Law of Transboundary Aquifers			
Alfonso	Rivera	Approaches to implement the Regional Strategy of the Transboundary Aquifers of the Americas			
Raya Marina	Stephan	Sharing of Benefits in the Draft Articles on the Law of Transboundary Aquifers of the International Law Commission	21	Water Policy and Governance: Transboundary Aquifers on the Mexico-US Border	May 31st 2017 9.00-10.30 Coba
Lindsay	Sansom	The Hueco Bolson: A Case for Improved Transboundary Aquifer Management			
Jessica	Foster	Survey of the Rules and Regulations Applied to Ground Water within Jurisdictions along the Texas-Mexico Border and their Transboundary Implications			
Luke	Wilson	Ensuring a Conflict-Free (or at least Conflict-Friendly) Future for US-Mexico Groundwater Regulation			
Rosario	Sanchez	Aquifers Shared between Mexico and the U.S.: management perspectives and their transboundary nature	22	Water Ecosystems and Physical Regimes: Groundwater Resources	June 1st 2017 17.20-18.50 Cozumel 3
Lemuel C.	Ramos-Arzola	Application of the aquifers management model MADA in the Cuenca Sur aquifer, Cuba			
Rodrigo	Peronico	Heterogeneity effects in soil water transferences process under unsaturated conditions in alluvial soil in the mesoscale			

Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	RS#	RS TITLE	DATE/TIME/ROOM
Laura	Rodriguez Lozada	Allende-Piedras Negras Transboundary Aquifer: An Initial Modeling Assessment	22	Water Ecosystems and Physical Regimes: Groundwater Resources	June 1st 2017 17:20-18:50 Cozumel 3
Akira	Kawamura	Clustering fluctuation patterns of groundwater levels in Tokyo caused by the Great East Japan Earthquake using self-organizing maps			
Camilo	Lesmes Fabian	Eco-efficiency Assessment of the Water Resource Management System in the Colombian territories in the Caribbean Sea	23	Water Ecosystems and Physical Regimes: Groundwater Resources	May 30th 2017 9:00-10:30 Isla Mujeres
Shawna	Moore	Artificial Recharge as the Key to Connectivity			
Eric	Garner	Factors Identifying Aquifers with a High Probability of Management Success			
Lili	Yu	Pilot Project of Groundwater Overexploitation Control in the North China			
Biju	George	Efficiency of Irrigation Water Use: A Case Study of Abu Dhabi Emirate in UAE	24	Water and Sustainable Growth: Irrigation	May 31st 2017 9:00-10:30 Cozumel 1
Sebastian	Riera	Estimation of irrigation efficiency and economic value of environmental trade-offs in grapevine production in Mendoza, Argentina			
Amy Uyen	Truong	Facing urban water challenges with integrative irrigation techniques in drought-prone areas			
Gul	Ozerol	Comparative review of the irrigation reforms in Mexico and Turkey from the perspective of science-policy interface			
Pierre-Alain	Roche	Recent progresses in French water governance	25	Water Policy and Governance: Integrated Water Management	June 1st 2017 10:50-12:20 Cozumel 3
Fabian	Drenkhan	Integrated water resources modeling under multiple drivers of change in the tropical Andes of Peru			
Martin	Quinger	A focus on groundwater in the IWRM approach improves drought preparedness in Namibia			
Nathalie	Richards	Water Users Associations in Tanzania: lessons for IWRM policy			
Goetz	Reichert	Reality Check: The Science-Policy Nexus in European Water Law	26	Water Policy and Governance: Regional and International Law	May 31st 2017 10:50-12:20 Cozumel 3
Alexander	Otte	Indigenous peoples and local communities' water rights, international law and water security			
Brett A.	Miller	Navigating the Confluence: Sources of Reconciliation Flowing Between the Human Right to Water and Economic Efficiency			

Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	ID ABS	RS#	RS TITLE	DATE/TIME/ROOM
Andreas	Wendl	International Water Rights on the White Nile of the New State of South Sudan		26	Water Policy and Governance: Regional and International Law	May 31st 2017 10.50-12.20 Cozumel 3
Deborah	Curran	Indigenous and Colonial Water Stewardship in British Columbia, Canada: Practices Towards Collaborative Watershed Planning				
Jane	Cohen	C8: What Does the Dupont Litigation Have in Common With Zeno's (Arrow) Paradox, Greek Tragedy, And Doctor Who, and What Should We Learn From It?		27	Water Policy and Governance: Law	June 1st 2017 9.00-10.30 Cozumel 3
Mario	Carvajal	The Zapotillo dam construction				
Laura	Movilla Pateiro	The need to prove the existence of sufficient water resources as a prerequisite for the authorization of new urban developments: the Spanish model				
Alex	Godoy-Faúndez	Inefficient resolution of conflicts over water rights. Legal actions as a proxy of the increase in number and complexity of conflicts				
Alexandra	Campbell-Ferrari	Exploring consumer rights at the municipal water and sewer authorities				
Marcella	Nanni	Water law implementation: challenges in the Greater Horn of Africa		28	Water Policy and Governance: Law	June 1st 2017 17.20-18.50 Isla Mujeres
Stefano	Burchi	The future of domestic water law: trends and developments revisited				
Niko	Soininen	Triumphs and Failures of Adaptive Water Management in Europe				
Rhett	Larson	Forestry Management and Water Law: Comparing the Paute Basin in Ecuador and the Verde Basin in Arizona				
Deborah	Curran	Adaptive Management in Canada: Water Law Reform and Scientific Uncertainty				
Maria Elena	Ginero	The US-Mexico Border Communities Green Infrastructure Initiative		29	Water Security in a Changing World: Cooperation on the Mexico-US Border	May 31st 2017 17.20-18.50 Cozumel 5
Wayne	Belzer	Binational efforts to improve water quality along the US-Mexico border				
Felipe	Vazquez	The Evaluation of the Impact of Basic Sanitation Infrastructure at the US-Mexico Border				
Suzanne	Tillery	Improving Binational Water Management Policy Through Science				

Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	RS#	RS TITLE	DATE/TIME/ROOM
Birte	Hensen	Environmental Fate and Behavior of Transformation Products of Pesticides used in Agricultural and Urban Areas	30	Water Quality: Contaminants of Emerging Concern	May 31st 2017 10:50-12:20 Cozumel 1
Esra	Şiltu	Developing a Perspective for Management of Endocrine Disrupting Compounds in Water Resources			
Jane	Cohen	Are the Times A Changin? Roots and Shoots in the Regulation of PCPs			
Edward	Acheampong	Mathematical Modelling of Uncertainty and Pharmaceutical Drug Processing in Wastewater Treatment			
Inom	Normatov	Risk Assessment and Risk Management of accumulation of chemical pollution in seasonal snow and glaciers and their transportation by waterways	31	Water Quality Management	June 1st 2017 10:50-12:20 Cozumel 1
Kevin	Wagner	Using Bacterial Source Tracking to Develop Watershed Restoration Plans			
Rachel	Gomes	Simultaneous Analysis including Non-Targeted Approaches for Bioactive Chemicals in Wastewater from the United Kingdom using Liquid Chromatography			
Ramón	Merino Loo	Optimization of activated sludge process through energy saving			
Luis Manuel	Martinez Rivera	Spatial and temporal analysis of water pollution in Cajitlán Lake, Jalisco, Mexico	32	Water Ecosystems and Physical Regimes	May 31st 2017 17:20-18:50 Cozumel 3
Rebeca	Gonzalez-Villela	Holistic approach to catchment management, conservation and recuperation of freshwaters. Case Study			
Yang	Fang	The water environmental governance for tidal lakes based on water ecology model			
Mariela	Yevenes	Seasonal impact of a mega-drought (2010-2015) on the water quality of Biobío river, Central Chile			
Pilar	Saldaña	Managing water quality in transboundary river	33	Water Quality: Managing Contamination	June 1st 2017 9:00-10:30 Isla Mujeres
Shivaraju	Harikaranahalli Puttaiah	Demonstration of Carbon based Multi-functional and Affordable Water Filters: a Sustainable and Compact Drinking Water Facilities for Rural India			
Stefanie	Wieck	Limitations of regulatory risk assessments of chemicals			
Margarita	Loredo-Cancino	Synthesis and characterization of zinc and copper MOFs derived from diazo and oxim ligands for wastewater treatment			
Kristoffer	Still	Evaluating Enzyme Performance in the Face of Process or Water Matrix Complexity and Variability			

Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	RS#	RS TITLE	DATE/TIME/ROOM
Aybala	Koç Orhon	Identification of River Basin Specific Pollutants and Derivation of Environmental Quality Standards under Water Framework Directive: Turkish Experience	34	Water Quality Management	May 31st 2017 9:00-10:30 Cozumel 3
Lucas	Gregory	Application of Consistent Contact Recreation Water Quality Standards Across Hydrological Extremes: Reasonable or Ridiculous?			
Humeyra	Bahceci	Research on Biological Indices for Ecological Assessment of Water Bodies in Turkey			
Viviana	Vargas Franco	Towards a water quality index (WQI) for Andean micro-watersheds using pressure-state-response indicators and fuzzy logic system. Study case in Colombia			
Diane	Boellstorff	Changing Approaches to Water Quality Assessment and Watershed Management through Quantitative Microbial Risk Assessment in Texas, USA			
George	Campos	Microbiological Quality of Water Wells Communities Area Itaipu Are the Municipality of Baranga - São Luís - MA	36	Water Sanitation and Health	June 2nd 2017 10:50-12:20 Cozumel 4
Jake	Larsson	A Low-Cost Hydration Indicator for Urinals in Developing Countries			
Vinay Singh	Baghel	Microbiological Assessment of Ganga River, India			
Romulo Henrique	Teixeira do Egito	The pollution of Brazilian urban rivers, a study about Rio das Bombas river, João Pessoa/Paraíba-Brazil			
Estheia	Sotelo	Domestic Water Access and Periurban Poverty in the Metropolitan Zone of Mexico City: What Can We Learn To Improve Water Access Policy Decisions?			
Tara	Zolnikov	A qualitative study on the interconnected nature of HIV, water, and family	37	Water Sanitation and Health	May 30th 2017 15:30-17:00 Cozumel 1
Ross	Tierney	Design challenges and recommendations for the user interface of low-water toilets in urban environments			
Rafaella	Oliveira Baracho	Municipal Sanitation Plans in Brazil: Analysis of Plans and Recommendations to improve planning sanitation in Brazil			
Jaiza	Leite Lima	Situational study of the drinking water quality in Quilombola communities in the municipality of São Luís Gonzaga, MA, Brazil			
Vanessa	Cruvinel	Water, Environment and Health: The impact of the open dump in Brasília-DF, Brazil			
Christian	Maduka	The Imperativeness of Citizen Participation in Water Governance	38	Stakeholder Participation	June 2nd 2017 9:00-10:30

Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	RS#	RS TITLE	DATE/TIME/ROOM
Muhammad Wasif Bashir	Babar	Multiple Stakeholders Role in Sustainable Water Sanitation and Hygiene Development in South Asia Region (A Case Study From Lahore Pakistan)	38	Stakeholder Participation	June 2nd 2017 9:00-10:30 Isla Mujeres
Carmen	Fernandez	Management and governance support to the Water Stewardship Initiative Water Fund - CuencaVerde (Medellin), Colombia			
Liber	Martin	Managing Water Resources in the Public Interest			
Carlos	Galdeano	Water availability assessment for hydraulic fracturing in Mexico	39	Water and Sustainable Growth: Water-Energy Nexus	May 29th 2017 17:20-18:50 Cozumel 3
Douglas	Aitken	Addressing decreasing water availability for the mining industry using cost-benefit analysis			
Gina S.	Warren	Modeling for Small Hydropower: Policy and Technology			
Sebastian	Riera	Political economy of energy subsidies for groundwater irrigation in semi-arid area in Argentina			
Fernando	Ortiz	Energy Efficiency as a Method to Improve Water Management Practices at the Local Level			
Bassel	Daher	Modeling the Water-Energy-Food Nexus: A 7-Question Guideline	40	Water and Sustainable Growth: Water-Food-Energy Nexus	June 2nd 2017 10:50-12:20 Cozumel 1
Liber	Martin	The water-energy-food nexus in Latin America and the Caribbean: Planning, legal framework and priority interconnections			
Man	Yang	Using the Water-Energy-Food Nexus to Promote Sustainable Development and Combat Climate Change in the Mekong River Basin			
Dorice	Agol	The water-energy-food security nexus for trans-boundary water resources management of Lake Victoria Basin: A critical analysis of how science informs policy			
D.L.	Marrin	Evaluating Consumer Choice in Conserving Water Resources Via Use of the Water-Energy-Food Nexus	41	Water and Sustainable Growth: Water-Food-Energy Nexus	May 31st 2017 10:50-12:20 Isla Mujeres
Clive	Lipchin	Solutions for Off Grid Food-Energy-Water			
Tamee	Albrecht	Water, energy, and food security: A comprehensive review of nexus methods			
Daniel	Gilmour	Decision Support Tools for understanding and managing the Water Energy Food NEXUS			

Regular Sessions

FIRST NAME	LAST NAME	ABSTRACT TITLE	RS#	RS TITLE	DATE/TIME/ROOM
Ioannis	Chronis	An applied tool on Hydromorphology and River Restoration in the European Frame: A Greek Case Study	42	Water and Sustainable Growth	June 2nd, 2017 10:50-12:20 Cozumel 3
Manisha	Deb Sarkar	An urban river on a gasping state: Dilemma on priority of science, conscience and policy			
Feng	Hu	Water-Nomics of the Yangtze River Economic Belt: Strategies & recommendations for green development along the river			
Temur	Khujazarov	Water resources regulation and crops diversification analysis to solve transboundary water sharing: case study from Zerafshan River Basin			
Tugce	Yildirim	Southeastern Anatolia Project (GAP) as a Case Study of a Regional Sustainable Development Project			

Special Sessions

SS#	Title	Hosting Institutions	Session Summary	Congress Theme	Date/Time/Room
MONDAY					
SS-13	Toward a Special Issue of Water International on the OECD Principles on Water Governance	Organisation for Economic Co-operation and Development	There is little debate that water policy making is most effective when informed by science, yet communication gaps and divides endure across communities of practice. To foster dialogue and put the "science-policy interface" into practice, the OECD and IWRA have partnered to develop a special issue of Water International focusing on governance. The special issue seeks to provide the scientific underpinning to the OECD Principles on Water Governance, which set 12 standards for effective, efficient and inclusive design and implementation of water policies. The special session will convene lead authors to share highlights from their articles for the special issue, and will gather economists, policymakers, scientists, legal experts, practitioners and engineers to engage in lively discussions on what makes water governance good or bad.	Theme 4: Water policy and governance	May 29th 2017 15:30-17:00 Congress 2
SS-45	Water in the World We Want - policy and planning for accelerated SDG success	United Nations University/Korean Environment Corporation, the Ministry of Environment, Republic of Korea, and the United Nations Office for Sustainable Development	Achieving SDG 6 is about more than ticking off indicators. More ambitious, evidence-based and multi-sectoral policy frameworks are needed to meet water-related SDGs. However, this can leave decision-makers awash in a sea of complex data that are difficult to base coherent policy on. International policy making and policy implementation support is critical to progress, particularly in LDCs. Conveners propose six policy-critical components for water-related SDGs, discuss how countries can assess these components and use this assessment to plan for more effective policy implementation. Examples from Ghana and Tunisia will illustrate how innovations in policy can accelerate water-related SDG success.	Theme 4: Water policy and governance	May 29th 2017 15:30-17:00 Congress 2
SS-49	Online Training Course on the "Greening" of Water Law: Implementing environment-friendly principles in contemporary water treaties and laws	International Association for Water Law (AIWA)	The Special Session will introduce the IAIWA Environment "Online Training Course on the 'Greening' of Water Law: Implementing environment-friendly principles in contemporary water treaties and laws", developed by the International Association for Water Law (AIWA). An abridged version of the five modules will be presented by the respective authors, including a demonstration of the group exercises provided in the training course. The main topics covered in the course are the 'greening' of international and national water law, the principles of equitable and reasonable utilization, no significant harm, and ecosystem protection, and the protection of aquifers.	Theme 4: Water policy and governance	May 29th 2017 15:30-17:00 Congress 4
SS-56	Innovative water resources management and green development in China	General Institute of Water Resources and Hydropower Planning and Design at the Ministry of Water Resources of China	China special session will focus on problems and challenges we are confronted with in the sustainable use of water resources as water resources are getting increasingly stressed in the new period. Speakers ranging from officers from Ministry of Water Resources to well-known experts from China will introduce the innovative water management policies and measures currently implemented in China. Several international experts are also invited to attend the discussions "guidelines and scientific support for sustainable management of water resources".	Theme 5: Water and Sustainable Growth	May 29th 2017 17:30-18:00 Congress 5
SS-63	The National Water Reserves Program in Mexico: allocation of water for the environment and accomplishment of multiple Sustainable Development Goals	CONAGUA, WWF-Mexico	The aim of the Program is to establish a system of water reserves focused on preserving the environment and ecosystems, giving support to all activities that are developed in them and strengthening the integrated management of water resources in 331 hydrological basins identified in Mexican territory. This Session presents the conception and implementation of the Program, showing its development as dynamic process involving the joint work of a large number of institutions, researchers and society. The results obtained have allowed it to acquire international recognition for being an innovative instrument to integrate the social assessment of water to the environment.	5: Water ecosystems and physical regimes	May 29th 2017 A: 15:30-17:00 B: 17:30-18:30 Congress 5
SS-18	Understanding water security in cities: empirical evidence and policy implications	CAF-Development Bank of Latin America	Nearly 60 per cent of the world's people will be living in cities that cannot be sustainable without ensuring reliable access to safe drinking water and adequate sanitation. Coping with the growing needs of water and sanitation sectors within cities is one of the most pressing issues of this century. Sustainable, efficient and equitable management of water in cities has never been as important as in today's world. The seminar will discuss the empirical evidence emerging from the studies and the policy implications for the urban and water sectors.	Theme 3: Water security in a changing world	May 29th 2017 17:30-18:30 Congress 5
SS-79	2nd Water Business Forum 2017	Korean Water Forum, Korean Ministry of Land, Infrastructure and Transport	We are at the beginning of a technological revolution that will fundamentally alter the way we interact with each other through global policy and development of diverse methodologies used for linkage between public and private sectors. In its scale, scope, and complexity, the transformation is becoming unprecedented. WBF 2017 in Cancun will provide an opportunity to create devotions towards the new era of the fourth industrial revolution. This session will also offer a chance to share the insights of renowned water experts on the roles of cutting-edge technologies and well-defined, developed policies in the process of this new movement.	Theme 6: Building capacity	May 29th 2017 18:30-19:30 Congress 7

Special Sessions

SS#	Title	Hosting Institutions	Session Summary	Congress Theme	Date/Time/Room
TUESDAY					
SS-75	Peace for Water: The Global High Level Panel on Water and Peace's Vision	Secretariat of the High-Level Panel on Water and Peace	A group of 13 coalition from all parts of the world launched the Global High Level Panel on Water and Peace at a ministerial gathering in Geneva in 2015. The mandate of the panel is to propose a global architecture to transform water from a source of potential stress to an instrument of cooperation and peace. The aim of this Special Session is to present the activities and the main recommendations of the Panel which will be submitted to the United Nations and the international community in September 2017.	Theme 4: Water policy and governance	May 30th, 2017 9:00-10:30 Cometel 4
SS-10	Smart Water Management (SWM): Bridge to WGG & SDGs - the technological innovation needed for "Water for all"	Korea Water Resources Corporation	As global water challenges increase, the necessity for more systematic and innovative water management approaches now stands out as a critical global issue. SWM is a combination of existing water management practices with ICT technologies applied to the entire water cycle. SWM, which is a new instrument that integrates information and communication technology in all processes of water management, from source to tap, that can provide technological solutions. The objective of this session is to share potential and best practices of SWM as a new technological approach to achieve Green Growth and SDGs by promoting discussion on institutional innovation as an enabling condition.	Theme 6: Water and sustainable growth	May 30th, 2017 9:00-10:30 Coca
SS-60	Capacity building in the water sector: Creating and developing training centers for water professionals	International Network of Water Training Centers	Significant investments are made annually in an attempt to bridge the remaining gaps in the management of water resources and water sanitation services. These investments often fall short of expectations since the lack of skilled water professionals can result in either design faults, infrastructures or multiple deficiencies in the way these infrastructures are operated and managed. In a time of strong budget constraints, it is vital to optimize investments. This session will present the interest to create and develop training programs and training centers for water professionals to address the increasing demand for skilled professionals in water management.	Theme 8: Building capacity	May 30th, 2017 9:00-10:30 Kazari
SS-71	Making investments on multi-purpose water infrastructure fit to finance	CAF - Development Bank of Latin America and World Water Council	Multipurpose infrastructure (MPI) is very attractive due to the added value of providing energy and water services like water supply, irrigation, flood control, navigation and others, to harnessing economies of scale and scope. Nevertheless, this type of water infrastructure poses formidable policy and operational challenges. Finance, governance, and proper care of environmental and social concerns are cornerstones of MPI development. The seminar will discuss case studies focusing on project cycle of large-scale projects under climate change, and innovative financial mechanisms for MPI. A panel of experts will discuss their implications from the public policy perspective.	Theme 6: Water and Sustainable Growth	May 30th, 2017 9:00-10:30 CZouma 5
SS-27	Case Studies in the Challenges of Water Sharing Between "Upstreamers" and "Downstreamers"	St. Edward's University	There are challenges to responsible water sharing between "upstreamers" and "downstreamers" worldwide. Science must inform public policymakers, the only fair and reasonable public water policy is scientifically-based following integrated water management concepts. We explore issues in water scarcity in general, we analyze an international case study of the Rio Grande's waters between the United States and Mexico, we discuss an international case study of Potomac River and Rio Grande River waters between New Mexico and Texas, and we examine water sharing issues in the confluence interface of waste, agriculture, and energy from a local perspective.	Theme 4: Water policy and governance	May 30th, 2017 15:30-17:00 Araucari
SS-61	The Legacy of COP22: Implementing the Global Climate Action Agenda in the Water Sector	International Network of Basin Organizations	The Global Climate Action Agenda (GCAA) is a permanent global program to boost between the COPs cooperative action between governments, cities, business, investors and citizens to cut emissions rapidly and help vulnerable nations adapt to climate impacts. The water sector's contribution to the implementation of the GCAA is structured around four Global Alliances for Water and Climate: the Alliance of the Basins ("Pam-Pac"), the Business Alliance for Water And Climate change (BAFWAC), the Alliance of Megacities for Water and Climate Change and the Global Clean Water Desalination Alliance. This session will present their actions.	Theme 3: Water security in a changing world	May 30th, 2017 15:30-17:00 CZouma 5
SS-41	Water Security in the Americas	El Colegio de México and the Consortium of the Hemispheric Observatory of Water Security	The America's region has the 47% of the water in the world. The strategic management of the water will be important in the near future. The objective of the session is to present the importance of a strategic analysis of the water resources in the Americas, especially in some themes that are crucial for the region.	Theme 3: Water security in a changing world	May 30th, 2017 18:30-19:00 CZouma 4

Special Sessions

SS#	Title	Hosting Institutions	Session Summary	Congress Theme	Date/Time/Room
TUESDAY					
SS-46	Building a Green Infrastructure Agenda for the Latin American Water Sector	Forest Trends	Green infrastructure – management of the ecosystems that provide and regulate water – is an indispensable complement to conventional “gray” infrastructure in addressing water security. One of the major barriers to scale for green infrastructure, however, is the ability to quantitatively estimate its hydrological benefits. This session will bring together engineers, policymakers, and environmental experts to highlight scientific innovations to support benefit quantification to support innovative policies and advance cross-sectoral efforts to address critical gaps in data, methodologies and capacities. Organizations: Forest Trends, Asociación de Entes Reguladores de Agua y Saneamiento (ADERASA), the International Water Association (IWA), and The Nature Conservancy (TNC)	Theme 5: Water ecosystems and physical regimes	May 30 th 2017 17:30-19:30 Exhibition 5
SS-73	The First Asia International Water Week: Asia Solution for Water	Asia Water Council	Asia is home to 4.4 billion people, or more than 60 percent of the world's population. However, Asia is facing serious water challenges in terms of both quality and quantity due to climate change, urbanisation and population growth, which can be found in South America as well. Water stakeholders all over the world will be met in this section to share their insights and experiences for resolving the water problems in Asia as well as to introduce Asia International Water Week (AIWW), a platform to promote cooperation among the nations.	Theme 6: Water and Sustainable Growth	May 30 th 2017 12:30-13:30 1015 Main Hall
SS-55	Shared Waters of North America	Natural Resources Canada / Resources Naturelles Canada, Univ. of Arizona, Water Resources Research Center, Natural Resources Canada, North American Research Partnership, Water Resources Institute of Texas and New Mexico, and Univ. of Arizona, Water Resources Research Center	“Shared Waters of North America” is a three-part Special Session that brings together water analysts and officials from the three countries of North America to compare approaches to transnational water cooperation. First, speakers will provide scientific water resources assessment, with a particular focus on transboundary aquifers along the Canada-US and US-Mexico borders. The second segment will focus on transboundary water resources policies, including legal frameworks, mechanisms for cooperation, and water rights administration. The third and final segment will engage high-level policy makers and government officials in a discussion of their vision for future collaboration including prospects for liminal water management/water management.	Theme 4: Water policy and governance	May 30 th 2017 A: 9:00-10:30 B: 10:30-12:00 C: 12:00-13:00 Coliseum 2
WEDNESDAY					
SS-76	Towards a Green Infrastructure in Latin America and the Caribbean	Inter-American Development Bank	Green infrastructure is an approach to water management that protects, restores and mimics the natural water cycle. It entails restoring wetlands or other nature-based solutions, rather than building costly new grey infrastructure. Green solutions give communities the ability to handle increased floods and droughts that come with global warming, as well as create jobs and supports supply chains and the jobs connected to them. In LAC, many forward-looking cities are already embracing this green infrastructure approach, including Santiago, Lima and Medellín. This seminar will discuss leading cases and opportunities for green infrastructure in LAC.	Theme 6: Water and Sustainable Growth	31 May 2017 2017 9:00-10:30 Coliseum 5
SS-26	Reflecting on Regulating Water Security for Unconventional Gas and Oil	Baker Institute for Public Policy, Rice University	This session seeks to advance understanding of regulatory and policy regimes around the world in relation to the use of water for shale oil and gas production. Regulatory and policy issues surrounding the water use for hydraulic fracturing are present at every stage of operation, requiring operators to understand the legal, political, and hydrological context of their surroundings. Speakers will examine who is fraking and where, water allocation, managing wastewater, and other water impacts, including public acceptance. Some of the research presented will be included in an edited book on water security in the context of shale production, currently in preparation.	Theme 3: Water security in a changing world	31 May 2017 2017 A: 9:00-10:30 Coliseum 5
SS-65	Water Security and Climate Change - Challenges and Opportunities in Asia	Asian Institute of Technology (Thailand), TLRS (Technische Universität Braunschweig, Germany), and THK (Technische Hochschule Köln, Germany)	The special session will provide a summary of key findings of conference “Water Security and Climate Change – Challenges and Opportunities for Asia”. The reports cover the results of thematic sessions, special sessions and roundtable discussions identifying research demand. A further element will be a science policy dialogue with emphasis on relevance of the national agendas for SDGs and Paris agreement implementation. The expected outcome will be a short report with best practice examples on “climate-resilient research” and “future research demand and format” in the area water security.	Theme 3: Water security in a changing world	31 May 2017 2017 A: 9:00-10:30 B: 10:30-12:00 101 Main

Special Sessions

SS#	Title	Hosting Institutions	Session Summary	Congress Theme	Date/Time/Room
WEDNESDAY					
SS-35	Multi-disciplinary perspectives on the Grand Ethiopian Renaissance Dam (GERD) and the future of water resources management and development in the Eastern Nile Basin	Stockholm International Water Institute, Northumbria University, the University of Aberdeen, and International Center for Water Cooperation	This Special Session brings together researchers working on cross-disciplinary themes in the transboundary water resources management and development in the Nile River Basin. The session will focus on how a large-scale and symbolic hydraulic infrastructure such as the GERD can influence future directions in water resources management and development from multiple perspectives – technical, climate/environment, social, economic, legal, diplomatic and political. The presentation, based on recent developments and associated research, will lay the foundations for an in-depth facilitated discussion bringing together researchers and policy-makers.	Theme 4: Bridging science and policy	May 31 st , 2017 A: 09:00-10:30 B: 10:40-12:00 C: 13:40-14:10 Counsell 4
SS-77	Achieving Water and Sanitation SDGs in Latin America and the Caribbean	IADH, UNESCO, IHP, GWP, AHEAS, USWP and Ministry of Integration of Brazil	More than 150 million people in Latin America and the Caribbean (LAC) still do not have access to safe water and sanitation. The challenge for the region is to undertake and pursue a new set of Sustainable Development Goals (SDGs) where water is central to the challenge. A dedicated global goal on water, with targets to be achieved by 2030, has been established. While the new targets trigger a service universalization challenge, they go beyond access and emphasize the importance of guaranteeing service quality, sound wastewater management and adequate governance. The post-2015 development agenda is now entering a final phase. It is time to discuss how LAC will effectively implement, measure and monitor the new dedicated goal and targets.	Theme 4: Water and Sustainable Growth	May 30 th , 2017 A: 10:55-12:20 Counsell 5
SS-30	Social Sciences approach to supporting stakeholder engagement for water policy development	IWRA, French Water Partnership, French National Center for Scientific Research, French national alliance for environmental research, WGEI	Water-related representations and uses contribute to constructing the human relations to water, however they are still too little taken into account or misunderstood by decision makers and other donors, rendering the implementation or the sustainable continuation of development projects difficult. Human and social sciences help this implementation and the co-construction of projects, facilitating the projects' appropriation which is a factor of success for the implementation of the SDGs, Habitat III and the Paris Climate Agreement. This session aims to highlight and bring inputs to this reflection process through different case studies from all horizons, showing the territorial, cultural and socio-economic complexities and specificities.	Theme 4: Bridging science and policy	May 30 th , 2017 Counsell 3
SS-53	The Draft Articles on the Law of Transboundary Aquifers – Moving forward until the next UN General Assembly session	UNESCO, AIDA, and IAH Commission on Transboundary Aquifers	While the sustainable and efficient management of the 592 transboundary aquifers identified to date is recognized as critical for the success of the 2030 Agenda for Sustainable Development, still only six arrangements are specifically dedicated to transboundary aquifers. One critical tool in bridging the gap between science and policy-making and supporting states in setting appropriate arrangements for the management of their transboundary aquifers is the Draft Articles on the Law of Transboundary Aquifers. This session organized by UNESCO-IHP, IAH and AIDA brings together the science, law, policy-making to address the crucial interlinkages that can allow good governance of transboundary aquifers.	Theme 4: Water policy and governance	May 30 th , 2017 A: 10:55-12:20 Counsell 4
SS-48	Two Countries, Nine States, Colorado River Cooperation in a Complex River System	International Boundary and Water Commission, United States and Mexico Section	The Colorado River Basin in the United States and Mexico covers 612,000 square kilometers and provides water to more than 2 million hectares of farmland and more than 40 million residents. After years of water scarcity, diverse interests in the basin reached agreement in 2012 on a 5-year pilot program under the auspices of the International Boundary and Water Commission, United States and Mexico, to address the challenges. A panel of scientists and policymakers will explain how that effort has laid the groundwork for a longer-term agreement.	Theme 4: Water policy and governance	May 31 st , 2017 A: 13:55-15:00 Counsell 5
SS-16	What Next for Water Law and Policy? Recent Developments, Future Challenges and Potential Opportunities	Northumbria University Newcastle	The purpose of this special session is to capture some of the most recent trends and developments in water law and policy, both at a national, transboundary, regional and global levels; and to consider how water law and policy might have to evolve in order to address future water-related challenges or respond to advances in scientific knowledge and understanding. The session will draw upon the outputs of a recently published Handbook on Water Law and Policy (Quilley 2017), which reflects a collaboration amongst over 35 leading experts in the field, both as academics and practitioners.	Theme 4: Water policy and governance	May 31 st , 2017 A: 15:35-17:00 B: 17:20-18:50 Xcoun1
SS-21	Water security and global change adaptation: bridging science and policy	El Colegio de Sonora, Inter-American Institute for Global Change Research, Collaborative Research Networks	The objective of these sessions is to disseminate and apply innovative science and conduct influential science-policy dialogues through the perspective of water security in a manner that strengthens global change adaptation in the arid/semi-arid Americas. They comprise to undertake river basin assessments, to document human and ecosystem exposure to hydro-climatic and global change processes, and to conduct science-policy dialogues to diagnose current adaptive capacity and promote climate change adaptation. The sessions are organized by the project, Innovative Science and Influential Policy Dialogues for Water Security in the Arid/semi-arid Americas, supported by the Inter-American Institute for Global Change Research (IAI-CRNC).	Theme 3: Water security in a changing world	May 31 st , 2017 A: 15:35-17:00 B: 17:20-18:50 Xcoun2

Special Sessions

SS#	Title	Hosting Institutions	Session Summary	Congress Theme	Date/Time/Room
WEDNESDAY					
SS-25	Water Quality Management – Identifying opportunities for policy reform	University of South Australia	Water Quality Management is a multi-faceted issue with clear relevance to water quantity and involves both water for human consumption, industry and agriculture. The session will include short papers presenting scientific information, predominantly from the social sciences, related to a range of water quality issues. Each presenter will provide key scientific findings which they consider represent policy challenges/opportunities or where policy reform is needed. The respondents and the subsequent discussion will focus on the policy dimension. This process is intended to inform an IWRA policy brief on Water Quality Management.	Theme 2: Water quality, waste water, outcomes	May 31st, 2017 A: 11:00-12:00 B: 12:10-13:10 (Continued)
SS-34	Bridging Stakeholders' Knowledge and the 8th World Water Forum Thematic Framework	World Water Council	The 8th World Water Forum, organized jointly by the World Water Council (WWC) and Brazil, will take place in Brasilia in March 2018. Preparations are underway, and following the second Stakeholders Consultation Meeting, this special session will give the opportunity to all interested stakeholders to contribute to the development of the Forum's program. The meeting will gather the Forum's coordinators and other interested stakeholders to develop together the Forum's program at a more detailed level, guaranteeing linkages to other processes (i.e. Forum, SDGs, Implementation Roadmaps).	Theme 1: Stakeholder Participation	May 31st, 2017 A: 13:30-12:00 B: 17:30-18:00 (Continued)
SS-17	Empowering Young Water Professionals through Engagement in Global Water Community	World Youth Parliament for Water	World Youth Parliament for Water (WYPW) is a worldwide youth movement to engage & empower young generations in water & climate change sector for inclusiveness of youth actions to meet SDGs 6&13. WYPW has been organizing youth activities during the XVth World Water Congress at Cancun Mexico 2017 comprised of youth Session/Panel Discussion, Young Prof's Round Booths, Signature Campaign & Interviews of senior professionals and as Youth Representative Team. These youth activities are a unique preparatory Series for the 8th World Water Forum to build to ensure capacity building & youth involvement in sustainable water development to ensure the water secure world.	Theme 6: Building capacity	May 31st, 2017 12:20-18:30 (Continued)
THURSDAY					
SS-54	Water Futures and Solutions	International Institute for Applied Systems Analysis	This session will explore stakeholder's views on water futures across sectors and countries in central and Latin America. The WIAS initiative of IASA is developing a series of communities of practice and regional hubs which builds on a successful global first phase of WIAS. The regional hubs will focus on the co-design and implementation of emerging options for future water management (across sectors and between countries). Outcomes could be a report as well as a discussion at Congress. Particularly how the results and opinions expressed fit with evolving the HLP on Water, the Paris Agreement and achieving the SDGs.	Theme 5: Water security in a changing world	June 1st, 2017 9:00-10:30 (Continued)
SS-33	Resilience of coastal watersheds in Latin America and the Caribbean	Tropical Agricultural Research and Higher Education Center	Resilience assessment has been methodologically addressed, but we still lack specific tools, proved and quantified. In this session we will analyze the theoretical basis and science-policy bridge of resilience assessment. With this purpose we will present methodologies to assess vulnerability and ecosystem services for resilience analysis applied in coastal watersheds, but able to be used at any territorial scale. We will also present and discuss how good watershed management practices for mitigation and adaptation to climate change, as well as for productive purposes, contribute to build socio-ecological resilience of local communities in coastal zones.	Theme 3: Water ecosystems and physical together	June 1st, 2017 A: 9:00-10:30 B: 10:50-12:00 (Continued)
SS-58	Training in Hydro-diplomacy: Legal and Institutional Aspects of Water Resources Governance – From the International to the Domestic Perspective	International Association for Water Law (AIWA), UNESCO-IHP	The UNESCO training manual "Hydro-diplomacy: Legal and Institutional Aspects of Water Resources Governance – From the International to the Domestic Perspective" (published 2016, available at http://unesdoc.unesco.org/images/0024/002452/245263e.pdf) will be illustrated and demonstrated. Mock classes on, respectively, the Trans-boundary Legal Perspective module of the Manual (chapter 2), dealing with international water law, and on the Bridging Perspective module of the Manual (chapter 3), linking international water law and domestic water law, will be conducted by the chapter authors. Classes will consist of a lecture followed by a group exercise with the Session participants. Certificates of attendance may be handed out at the end.	Theme 8: Building capacity	June 1st, 2017 A: 9:00-10:30 B: 10:50-12:00 (Continued)
SS-36	Water Stress and Demographic Dynamics	El Colegio de México, CONEAG and ITESM	Water is used inefficiently and now in the framework of climate change (CC) some areas and population groups will be strongly affected in their quality of life and wellbeing. We emphasize territorial differences in the availability and access to the resource in relation to the scales considered. We focus on two aspects of these changes: 1) Increase in water stress resulting from the necessary allocation of water to different consumptive uses, urban in particular; 2) Increased demand of water and sanitation services due to city sprawl. Relatively insufficient service coverage in quantity and quality affects health and wellbeing of users.	Theme 4: Water security in a changing world	June 1st, 2017 10:50-12:00 (Continued)

Special Sessions

SS#	Title	Hosting Institutions	Session Summary	Congress Theme	Date/Time/Room
THURSDAY					
SS-43	Hydropower Development and Reservoir Operation	Middle East Technical University	The sustainable use of water resources to maximize their potential benefits is a big challenge and currently hydropower generation constitutes a significant portion of these benefits. Being a domestic and renewable energy source, hydroelectric power has the additional advantage of acting as a large-scale energy storage alternative through pumped storage hydropower plants. Social and environmental objectives, climate change and political issues further complicate development of optimal operating policies. The objective of this special session is to gather researchers together to share their recent works on hydropower reservoir operation and to highlight challenging problems and future research topics.	Theme 6: Water and sustainable growth	June 1 st , 2017 10:30-12:30 Conference
SS-8	Charges vs. buyback: who pays for water ecosystems restoration?	University of Adelaide	Economic instruments are critical to water conservation. We ask: what policy (rule) yields a (re)allocation of resources that maximizes welfare? This special session explores the characteristics of these instruments, their applicability in different contexts, and their transferability to the rest of the world. The speakers will debate: the necessary policy sequencing required when implementing instruments; provide real world contexts in their applications; and highlight the potential pitfalls in their adoption. Expected outcomes from this session include: closer links to other researchers and policy-makers interested in the topic for future collaboration and project work. We also anticipate gaining useful insights into a specific instrument or case studies that could be included in this work as we seek funding and other support around topics related to this discussion.	Theme 6: Water policy and governance	June 1 st , 2017 13:30-14:30 Conference
SS-38	Water security issues for developing countries in changing environment	Institute of Geographic Sciences and Natural Resources Research (China)	Water scarcity, water pollution, ecosystem degradation are the major water problems in China also in the world. Water security means water supply security, water quality security, eco-water security and so on. China is the case to address all these water problem and water security related to social & economic development in the future. This session purpose is to address this issue and how science & technology and good water governance can give support for the solution of water security issue. This session would be one of special issue for water international in coming years. Several international experts most coming from China will be invited as key note presentation to address this issue on the social sciences approach to support stakeholder engagement for water policy development in China and also other developing countries in the world.	Theme 6: Water security in a changing world	June 1 st , 2017 13:30-14:30 Conference
SS-52	Offshore Aquifers – Why Should We Care?	UNESCO-IHP & University of Strathclyde	In a 2013 feature magazine article, scientists highlighted the presence of major reserves of fresh and brackish water in continental shelves around the world, with reserves that could amount to 100 times the volume of water extracted from the Earth's subsurface since 1990. If confirmed, this phenomenon may potentially help addressing the "global water crisis". Vast offshore freshwater reserves raises complex issues regarding applicable legal regimes, exploitation, resource preservation, extraction, transportation, treatment. UNESCO-IHP and the University of Strathclyde are co-organizing this session to raise awareness of the existence and accompanying challenges of this potentially vast reserve of freshwater.	Theme 4: Water policy and governance	June 1 st , 2017 17:30-18:30 Conference
SS-64	Toward an Integrated Water Management by Sub-basin Mainstreaming of Science and Policy	COLIF	Given the basis, it is possible to establish relationships between water availability and its uses, and it is where different demands and competing uses come together for formulating management alternatives. In this context, the panel will analyze alternative methodologies for water availability estimation and water economic valuation by type and use. It will also discuss advances and challenges in the implementation of the IWRM model in Mexico. Three hydrological subregions were studied at the north, center and south of Mexico with the objective of evaluating the relevance and validity of current water management practices.	Theme 6: Bridging science and policy	June 1 st , 2017 17:30-18:30 Conference
SS-74	Getting to a Water Security Framework: Breaking it Down to Build it Up	Center for Water Security and Cooperation	A comprehensive water security framework can provide a clear, long-term vision for water management and governance. However, water is a complex resource with an intricate relationship to our lives and livelihoods. In this Special Session, we break down the concept of water security and engage participants in breakout discussion groups. After an opening panel discussion, participants will discuss focal questions on the concept of water security and its underlying measures. These discussions will be reported and published as part of the Center for Water Security and Cooperation's Water Security Challenges and offer a unique opportunity to influence the development of a water security framework.	Theme 3: Water security in a changing world	June 1 st , 2017 17:30-18:30 Conference
FRIDAY					
SS-5	Regulation and Transparency for Water and Sanitation Services in Countries That Lack Them	Instituto Mexicano de Tecnología del Agua	To discuss needs and experiences about regulation for public water services. Those could range from social oversight, to proper regulatory watchdogs for tariffs and service quality. Will comment if those improve quality and reduce operation costs by benchmarking their supervised utilities. To comment if legislations for water services in some countries hinder or promotes the establishment of such regulators. The session will present cases and strategies to promote regulation and certainty and clarity of intention about the performance of water utilities, with weak or lacking regulation and transparency.	Theme 1: Water, sanitation, affordability	June 2 nd , 2017 09:00-10:30 Conference

Special Sessions

SS#	Title	Hosting Institutions	Session Summary	Congress Theme	Date/Time/Room
FRIDAY					
SS-11	Understanding the Forest-Water Nexus: a new global monitoring framework and tool	Food and Agriculture Organisation of the UN	Forests play a crucial role in the hydrological cycle, influencing water availability and quality, as well as reducing water-related risks such as landslides, local floods and droughts. Forested watersheds and wetlands supply 75% of the world's accessible freshwater for human and ecological needs. This special session will highlight the need to mainstream an integrated approach to forest and water resources management and policy. The occasion provides an opportunity to present a forest-water monitoring framework that is under development. Participants are invited to engage in a workshop to discuss the benefits of such a framework and how best to implement it.	Theme: B Building capacity	June 2nd, 2017 9:00-10:30 Congress 4
SS-62	Towards SDG implementation – ensuring water quality from source to sea	IWRA and SIWI	This session will share experiences in addressing freshwater, coastal and marine water quality priorities at different scales from source to sea, and discuss water quality in the context of the SDGs. Local experiences from marine pollution in the Yucatan peninsula will set the scene for the session. Technical presentations will cover gaps and opportunities for coordinated water quality management from source to sea, and case studies related to micro-plastics. A panel will discuss needs and ways to maximise synergies in the SDGs when addressing water quality priorities. The session provides an opportunity to craft messages for the upcoming High-Level UN Conference to Support the Implementation of SDG14.	Theme: 2 Water quality, wastewater and reuse	June 2nd, 2017 9:00-10:30 Acara 1
SS-23	Enhancing irrigation productivity and profitability in small-scale irrigation schemes lessons from three continents	University of South Australia, ACIAR (Australia) and IDRC (Canada)	This special session is about enhancing irrigation productivity and profitability for small-holder farmers, in Mozambique, Tanzania and Zimbabwe, India and Latin America. Soil moisture and nutrient monitoring tools were introduced to farmers in Mozambique, Tanzania, Zimbabwe, and Punjab to improve crop productivity. In the Sub-Saharan countries this was done in conjunction with the establishment of Agricultural Innovation Platforms (AIPs) to connect farmers to market and overcome other systemic problems. The theoretical underpinning of the tools and the AIPs will be outlined and research on their combined impacts will be discussed. This session is sponsored by ACIAR (Australia) and IDRC (Canada).	Theme: B Building capacity	June 2nd, 2017 A: 9:00-10:30 B: 10:00-12:00 Congress 2
SS-42	The scientific underpinnings of global water law instruments: the UN Watercourses Convention, the UNECE Water Convention, and ILC Draft Articles on Transboundary Aquifers	Northumbria University Newcastle	The 1997 UN Watercourses Convention, the 1992 UNECE Water Convention, and the 2008 ILC Draft Articles on Transboundary Aquifers are all the outcome of political processes. However, each instrument, while legal, was informed to a greater or lesser extent by science and scientific experts. The purpose of this special session is to compare how science underpins each of the aforementioned legal instruments, and what processes were in place (formal and informal) to engage scientific experts in their drafting. In addition, the session seeks to explore how contemporary science can help inform and strengthen the implementation of, and compliance with, the commitments set out in the instruments.	Theme: A Building science and policy	June 2nd, 2017 A: 9:00-10:30 B: 10:00-12:00 C006
SS-44	Sustainable watersheds: emerging economic instruments for water security	University of New Hampshire	This session explores emerging economic and financial instruments for enhancing water security worldwide in a changing climate, with a focus on understanding which instruments are the most suitable for a given watershed or basin. Emphasis will be placed on understanding the challenges and opportunities of developing effective economic instruments for improving water resource management. Specific initiatives that will be discussed include national assurance schemes, water abstraction licenses, and payment for watershed services programs. Successful application of these instruments requires a deep understanding of the interactions and feedbacks between the human and natural systems that determine watershed sustainability.	Theme: 1 Water security in a changing world	June 2nd, 2017 10:00-12:00 Xavier
SS-67	A "ts'ono'ot" cosmovision: interdisciplinary science and policy in the Yucatan Peninsula's sinkholes	Department of Water Sciences at Centro de Investigación Científica de Yucatán and the King's Water Activity Hub in the Department of Geography at King's College London	The Yucatan's karstic cenotes present a challenge – and opportunity – for water governance. The sinkholes' cultural, historical, and ecological value compares with the economic benefits of their use. Limited extant research joins the lack of a legal framework governing tourism and consumption. This session will use cenotes as a case study for how historic research can inform policy. After a hydro-legal overview of the aquifer ecosystem, an interdisciplinary team will present results from speculative fieldwork considering what truly interdisciplinary research on the cenotes would look like. Participatory discussion will debate if and how researchers can produce integrated, policy-relevant water science.	Theme: A Building science and policy	June 2nd, 2017 10:00-12:00 Congress 3

Special Sessions

SS#	Title	Hosting Institutions	Session Summary	Congress Theme	Date/Time/Room
FRIDAY					
SS-78	Introducing the World Water Data Initiative: How water data can help achieve the Sustainable Development Goals	High Level Panel on Water	This session will be the first time the World Water Data Initiative has been presented to the international water community. The session will include explanation of the features and purposes of the initiative by the project leads, and will be supported by a panel discussion on implementation of the initiative including the roles of international water agencies. The World Water Data Initiative is an outcome of the High Level Panel on Water, consisting of 11 sitting Heads of State and Government and one Special Adviser. The Panel was convened by the United Nations Secretary-General and President of the World Bank Group to provide the leadership required to champion a comprehensive, inclusive and collaborative way of developing and managing water resources, and improving water and sanitation related services.	Theme: B Building capacity	June 2nd, 2017 10:00-12:00 WCA Mijares

Poster Sessions

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37	Tara	Zolnikov	My walk to water
44	Bhishma	Karki	Water Rights: A key to sustainable development in Nepal.
72	Harshit	Jain	Modelling of Arsenic Concentration in Bengal Delta Plain and Predicting the case of Cambodia and Vietnam.
77	Dillip	Ghose	Estimation of Runoff from Precipitation and Prediction of Water table depth in scanty rainfall region Using BPNN and RBFN networks.
78	Li	Yan	The Discuss of Some Legal Question about the Pearl River Estuary River and Sea Boundaries.
83	Aldo	Castañeda	Governance of water resources in the Highlands of Jalisco, Mexico: the case of the microwatershed of Jihute in the municipality of Tepatitlan de Morelos.
95	George Ricardo	Andrade	Plasmon enhanced degradation of methylene blue via photocatalysis (solar and ultraviolet) and sonocatalysis using hetero-nanocatalysts based on ZnO and Au nanoparticles
100	Walter	Pardave	Estimation of Water Footprint of an industrial processing plant of gold minerals in the town of Vetas Colombia.
105	Samuel Dare	Fagbayide	Effects of Human Activities on Water Quality Assessment of Ala River In Akure, Ondo State, Nigeria.
114	David	Ortega-Gaucin	Critical Analysis of Communications Campaigns to Encourage "Water Culture" in Mexico
115	Maritza Liliana	Arganis Juarez	Determination of digital elevation model in a plain surface of Mexico using genetic programming and estimation of flood volumes
120	Ranjan	Sarukkalige	Assessment of Crop Water Requirements for Sustainable Agriculture in Western Australia
122	Prem	Rangsiwanichpong	Relationship between the probability of landslide and sediment yield in Thailand.
127	María Laura	Muruaga	Rivers of Tucuman Contamination by Vinasse Spills: Alternative to Reduce the Levels of this Pollutant and Promote its Uses.
129	Arvind	Lakshmisha	Collective action against water insecurity in peri-urban areas: learnings from the global south.
134	Luiz Carlos	Pereira	Impacts Caused by Substances Present in Electronic Waste in Your Contact With Water.
139	Natarajan	Pachamuthu	Sustainable Water Resources Development in Tamil Nadu, India Through Water Security Pathways
144	Alan	Sañudo	Pump shutoff and startup transient analysis in a well network.
151	Angélica	Vieira	Green synthesized copper nanoparticles into granular activated carbon of babassu coconut by Hibiscus Sabdariffa flowers for removal of nitrate
175	Natarajan	Pachamuthu	Achieving Permanent Water Security to Colorado Basin is a Dream. Without Transbasin Diversion from Mississippi River

Poster Sessions

ID ABS	FIRST NAME	LAST NAME	ABSTRACT TITLE
176	Jan	Macháč	Disproportionate cost assessment according to the WFD: Comparison of applications of two approaches in the catchment of the Stanovice reservoir (Czech Republic)
177	Jiri	Louda	How to Successfully Achieve Urban Adaptation Using Green and Blue Infrastructure?
185	Amrisha	Pandey	"Water Security" - through Techno-Sustainable Mechanism
207	Xinfeng	Zhang	The Mechanism of Salty Tide Intrusion in Pearl River Estuary and the Sustainable Use of Water Resources in Pearl River Delta
209	Daniela	Bitencourt	Sustainable Contribution: Consumer and Access of Freshwater
215	Gonzalo Daniel	Mejia Santana	Behavior Pattern Models of the Monthly Rainfall Against Mean historical Temperature Under Climate Change Scenarios
228	Muhammad Aslam	Khan	Deep-Seated Challenges to Water Sector and Human Life in Pakistan
229	Rosangela	Bergamasco	Graphene Associated with Nanomaterial for Pesticide Removal.
230	Rosangela	Bergamasco	Towards sustainable drinking water treatment - the use of natural coagulant in the removal of microalgae.
231	Rosangela	Bergamasco	Photocatalytic degradation of Methylene Blue (MB) dye under UV/visible light by TiO ₂ nanoparticle self-assembled commercial polyethersulfone ultramembrane.
234	Micael	de Souza Fraga	Study on the Self-Purification Capacity of the Piracicaba River, Minas Gerais State, Brazil.
242	Joo-Hyeon	Lee	Using Vegetation-Temperature-Precipitation Data from Satellite Products for Drought Monitor in Korea.
246	Angélica	Vieira	Adsorption capacity study of activated carbon of babassu coconut to remove yellow dye tartrazine from aqueous solution
253	Abdelaziz	Gherrou	Chromium recovery from electroplating rinsing waters using a novel metal exchange technology
279	Melih	Calamak	Effects of Burrowing Animals on Seepage Behavior of Earthen Dams
292	Carlos Alexandre	Burgos Garcia	Assessment of water quality using Principal Component Analysis: a case study of the açude da Macela, Sergipe, Brazil
293	Carlos Alexandre	Burgos Garcia	Assessment of water quality of the Nossa Senhora das Dores-SE reservoir
301	Yongnan	Zhu	Assessing the Impacts of Climate Change on the Water-Energy Nexus: Case study for Shanxi's energy bases, China
303	Juliana	Pinheiro Gomes	Sharing Water: water conflict management and building relations, the case study of the city of Brazilândia, Brazil - The Descoberto Basin
317	Teresita	de Jesús Mora Ortiz	Predicting the freshwater inflows into a coastal wetland: The Biosphere Reserve "Pantanos de Centla", Tabasco, Mexico
320	Sunghun	Kim	Comparison of methods for rainfall frequency analysis under climate change in the Han River basin, South Korea
325	George Ricardo	Andrade	Rapid detection of heavy metal ions in aqueous media based on fluorescent carbon dots obtained from beetroot

Poster Sessions

ID ABS	FIRST NAME	LAST NAME	ABSTRACT TITLE
331	Cristiane	Nascimento	Efficient sunlight driven photocatalytic degradation of organic dyes by CdS/bentonite nanocomposite
342	Fernando	Soares	Microbiological analysis of the ice marketed in Coari, city of Amazon state, Brazil
393	Alvar	Escriva-Bou	Accounting for Water in Dry Regions: a Comparative Review
403	Ajay	Kalra	Urban Stormwater runoff under changing climatic conditions
409	Toshiyuki	Moriyama	Making Smart Rainwater House
411	Haydeana Isabel	Navarro Solis	Identification Arsenic (V) by Cyclic Voltammetry and Recovery of Arsenic by Electrodeposition
422	Sara	Medrano Lucas	Participation and social capital for watershed management: Evaluation of Water Safety organisms in Lower Balsas (Michoacan)
441	Rebecca Annick Nireti	Lawani	Organic pollution of Oueme River in Benin Republic
442	Esra	Şiltu	Deriving Water Quality Based Discharge Limits: A Case Study for Gediz River Basin
447	Carlos Alexandre	Burgos Garcia	Environmental diagnosis of the aquifer free of the north zone of Aracaju-Sergipe through metal, ions and BTEX concentrations
456	Malay	Mukhopadhyay	Installation of Marker Stone to Restore River Source Water Infrastructure: A Newer Vista for Geomorphosite-geotourism
459	Marcelo	Fernandes Vieira	Biosorption Potential Evaluation of Atrazine by Moringa Seed Husks in Fixed Bed
460	Marcelo	Fernandes Vieira	Adsorption of Diclofenac on activated carbon and Moringa oleifera Lam.: Kinetic and equilibrium studies
467	Yoshiya	Touge	Study on Snow Melting Process in Land Surface Model in High Altitudes in Zeravshan River Basin
472	Rômulo Henrique	Teixeira do Egito	Water resources policy for the Brazilian semiarid region
473	Cunwen	Niu	Research on compensation of Hydrological project regulation for Eco-environmental flow Guarantee in the WEIHE River Basin, China
478	Kaoara	Batista de Sa	Increasing block rate tariffs and water conservation: a case study of individually metered dwellings in multi-storey buildings in the Federal District, Brazil
480	Nasir	Ahmed	Isotope Based Assessment of Deep Groundwater Resources for Sustainable Management in the Coastal Areas of Bangladesh - Crisis in Overexploitation and Salinization
486	Ramiro	Vallejo-Rodríguez	Water Quality Index of Lake Chapala in Mexico and its potential risk to public health
491	Romina	Battistella	Spatial Prediction of Arsenic on Groundwater Perforations of Santa Rosa Basin, Catamarca, Argentina
492	Alex	Godoy-Faúndez	Hydrometeorological risk assessment for crops in Chile
493	Carolina Alexandra	Perret	Assessment of surface water availability in the San Alberto watershed, Oxapampa, Peru
494	Carlos Alexandre	Burgos Garcia	Strategies for water quality reservoir assessment: Water Quality Index, Trophic State Index and Fuzzy Logic
507	Cristiane	Nascimento	Evaluation of the water quality in Sergipe hinterland reservoirs, Northeast Brazil.

Poster Sessions

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508	Rafaella Oliveira	Baracho	Evaluation of Agenda 21 implementation in Brazil: Chapter 18 - Protection of Water Resources Focused on Drinking Water Supply and Sanitation case.
510	Roberto	Ponce	Assessment of farmers' vulnerability to climate change at river basin scale: an integrated modeling approach
512	Josilene	Chaves	Evaluation of the seawaters influence in the lotic ecosystem Franquinho River in Archipelago Bailique, Amapa, Brazil
519	José Angelim	da Silva Neto	Anatomical Characteristics and Water Relations in Coffea Canephora L.
521	Arllon José	dos Santos Dias	Seawater influence on the mouth of the Amazon River: Water Quality Analysis and the impacts to a riverside community in the Amazon, Brazil
530	Hugo	Arangoitia Valladares	Nutrient removal of nitrogen and phosphorus in an artificial wetland subsurface flow under the influence of macrophyte Chrissopogon Zizanioides
534	Roberto	Ponce	The Economic Value of Water in the Chilean Manufacturing Industry
536	Sebastian	Riera	Good water governance. Review of tools and indicators for successful implementation.
540	Sajjad	Ahmad	Study of Potential Integrated Management of Water Resources in Las Vegas Valley
541	Romina	Battistella	Hydrochemical and spatial grouping of groundwater of Santa Rosa Valley, Catamarca, Argentina
543	Jeffrey	Cheng	Low Impact Development Benefit Quantification for Urban Stormwater Management
545	Carlos	Salazar	Flood frequency analysis in the New River Basin, Mexico
559	José Bento	da Rocha	Sharing water resources and water allocation
565	Judith	Ramos-Hernandez	Water reuse for irrigation as part of the wastewater management for the sanitation of the Atoyac River Basin, Mexico: an alternative from a hydraulic point of view
573	Marcia Araujo	Van der Boor	Microbiological Water Quality Monitoring That Fuels Hospitals Supply from Maranhão State Municipalities Alternative or Not
575	Elia	Tapia Villaseñor	The Transboundary Aquifer Assessment Program and the San Pedro River Aquifer Binational Report for the United States and Mexico
576	Cristina	Torres	Water Management in a High Mountain Community
588	Sofía	Garrido	Analysis fo the Physical and Chemical Properties to Improve Arsenic Sludge Dewatering and Disposal
592	Humberto	Silva-Hidalgo	Effects of Climate Change on Water Availability in a Hydrological Watershed Located in an Arid Region in the North-Central Portion of Mexico
594	Antonio	Gómez Arteaga	Numerical Model of the Netzahualcoyotl Dam Emergency Spillway and Hydraulic Validation Operation With the Physical Model

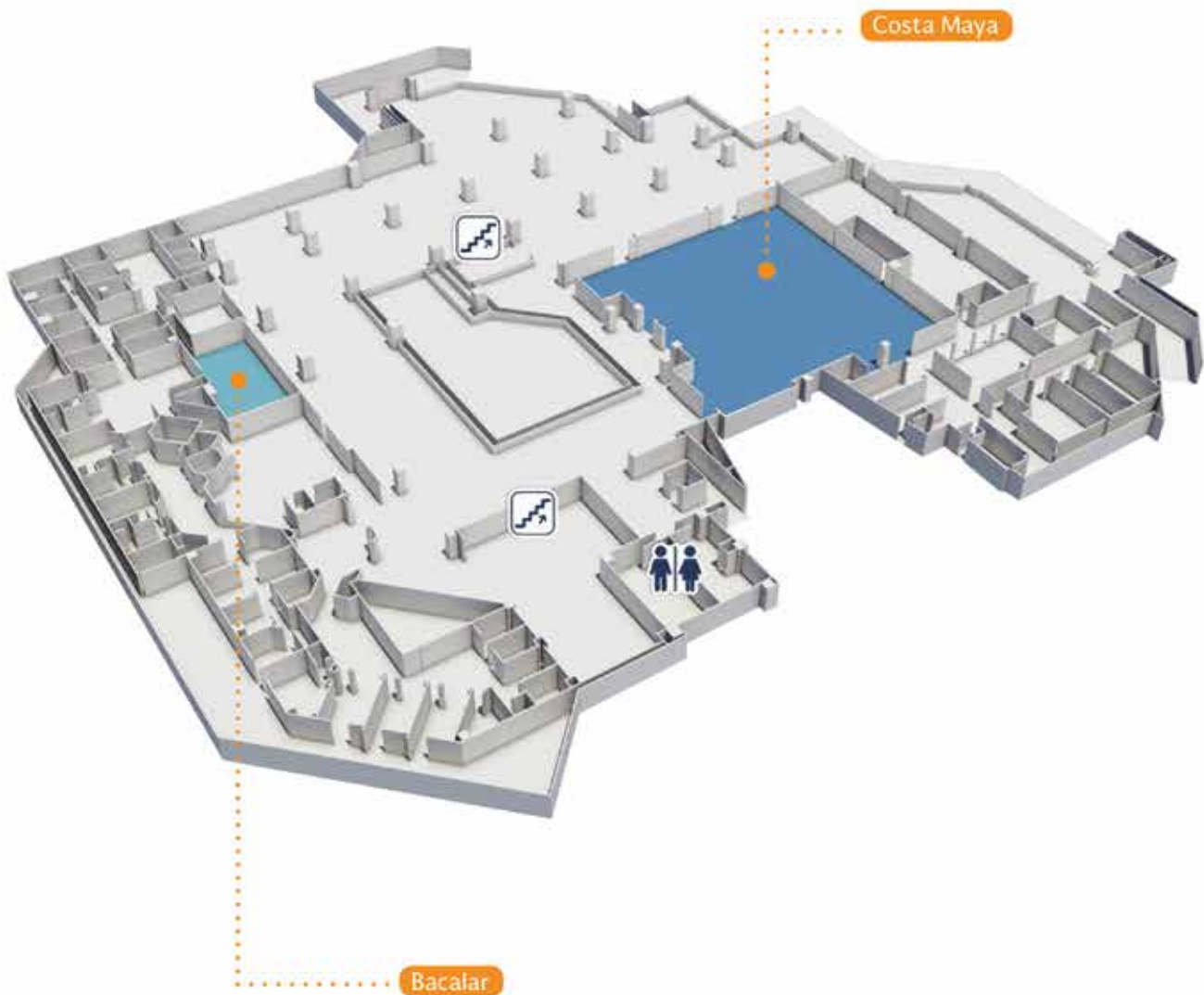
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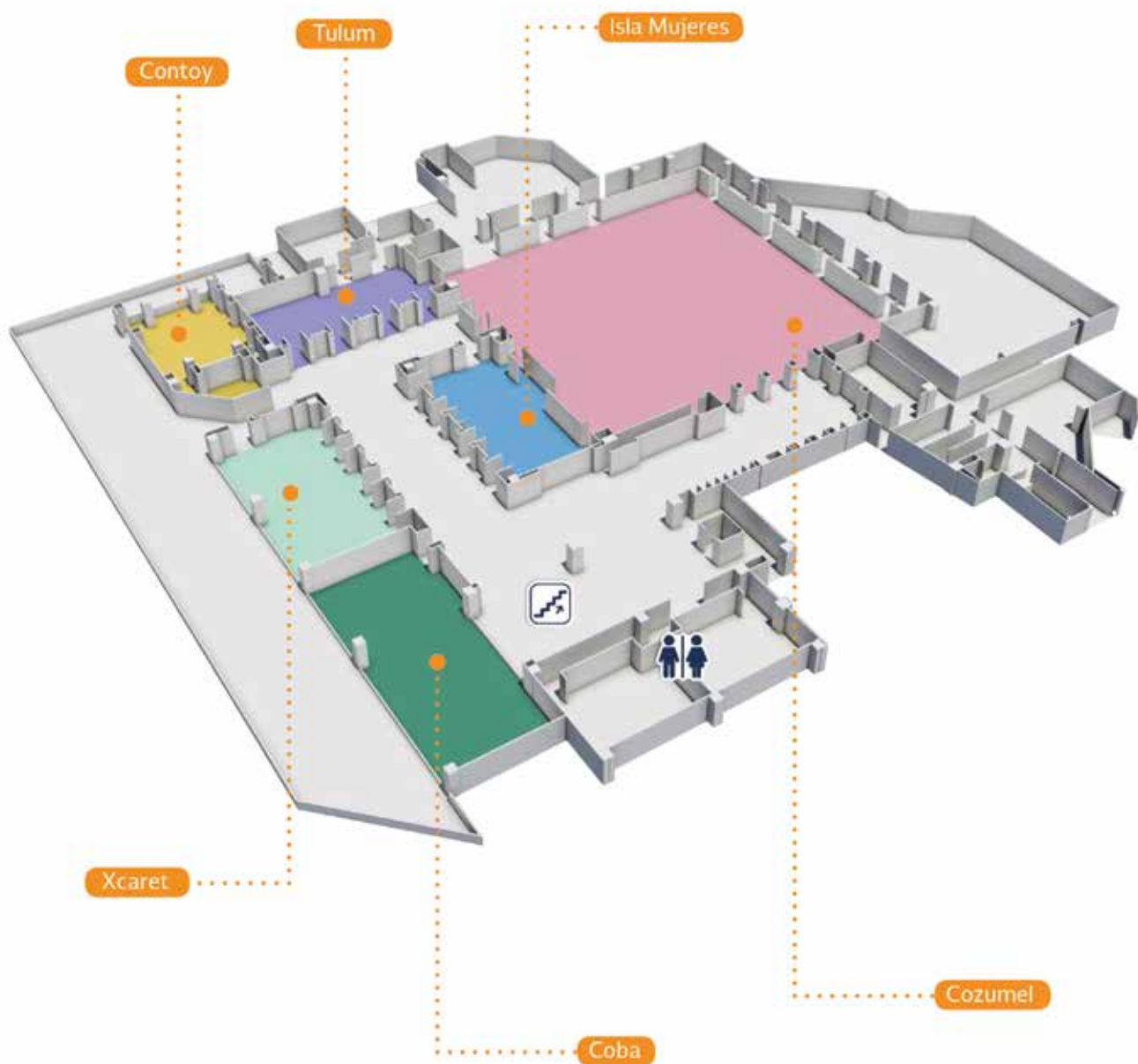
The World Water Congress of the IWRA
will be on May 29th to June 2nd in the
Cancún Center (ICC).



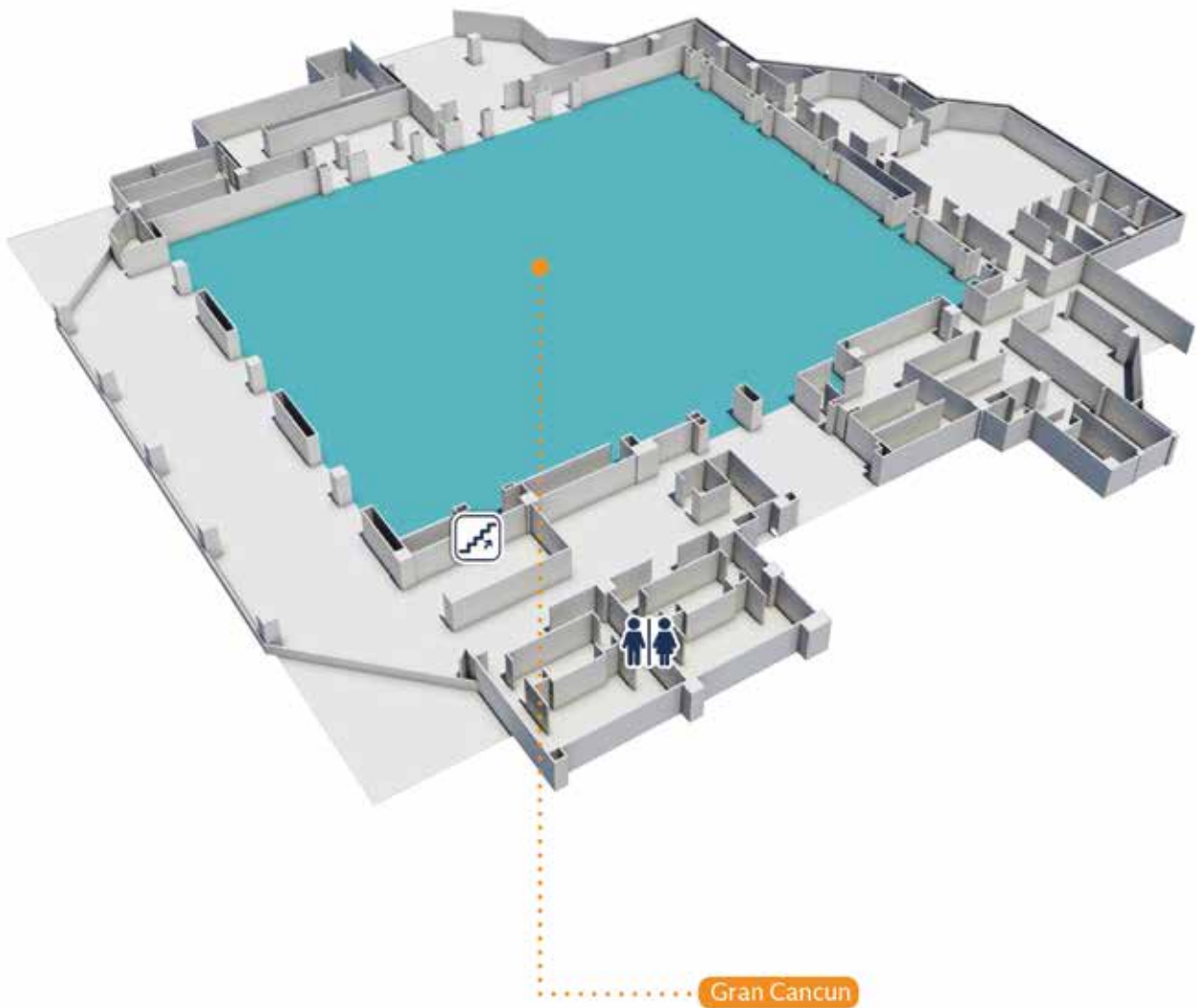
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Second Floor



Third Floor





IWRA XVI World Water Congress

CONGRESS SESSION SUMMARIES

During the XVI World Water Congress in Cancun, Mexico, Youth Ambassadors participated in High Level Panels, Regular and Special Sessions, reported on the content and topics of discussion during these sessions, and developed these notes into short summaries. There were a total of 93 summaries from 5 high level panels, 39 regular sessions and 49 special sessions. These session summaries are compiled in the following section, organized by Congress theme and cross-cutting issue, searchable through the Table of Contents.

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HLP HIGH LEVEL PANEL

RS REGULAR SESSION

SS SPECIAL SESSION

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HLP: Water and the Sustainable Development Goals

TIME AND ROOM: 29 May 2017, 12:40 - 14:10; Gran Cancun Room

CHAIR: Torkil Jønych Clausen

SPEAKERS: Aziza Akhmouch, Sergio Campos, Jose Carrera, Torgny Holmgren, Karin Krchnak, Federico Properzi, Roberto Ramirez de la Parra

SESSION SUMMARY

The Sustainable Development Goals (SDGs) are a list of priorities for the United Nations and various countries to focus on while constructing policies in the future. The UN's Sustainable Development Goal number 6 (SDG 6) is directly related to the World Water Congress, which is focused on bridging the gap between science and policy. SDG 6 is included in the UN 2030 Agenda for Sustainable Development because the Rio+20 meeting realized that "water is at the core of sustainable development." The exact wording of SDG 6 is: "Ensure availability and sustainable management of water and sanitation for all." SDG 6 is broken down into multiple targets, each of which are managed by different international organizations through the UN.

This panel set the stage for the entirety of the World Water Congress. It focused on SDG 6's role in working across all SDGs and their targets in the 2030 Agenda. There are a total of 169 SDG targets, of which approximately 60 are important to water and sustainable development and 15 are potentially in conflict with each other. When working on SDG 6, there are three pillars interacting: (1) Society, (2) Economy, and (3) Environment. Every action taken to benefit one SDG will have a domino effect, both positive and negative, on other SDGs. Preferably, policy addressing one SDG should work in synergy with other SDGs, rather than in conflict. Instead of water being a point of contention between communities, it can be a point of cooperation.


A great example of meeting a target within SDG 6 is the construction of the third largest wastewater treatment plant in the world. This treatment plant ensures cleaner water within streams. However, it had a negative impact on farmers in the region because of that society's view that non-treated waters are more beneficial for crop production over treated water. Although it was more economically beneficial for the farmers, and more ecologically beneficial to the environment, it created a social problem within the farming communities. This was an example of the

interaction of not only the multiple SDGs, but also the interaction of society, economy, and environment.

To be more successful in reaching goals, SDGs need to focus on the private sector as well, not only on governments. In doing so, SDGs must work inside and outside of private businesses. Working within a company, the bottom line is affected by increasing the efficiency of supply chains. Outside of a company, entire water basins are affected by working across institutions, public and private, where efficiency is gained. Businesses know and understand their water risks, which makes it important that the private sector works in tandem with the public sector.

Further, there are vertical challenges to address in addition to these horizontal challenges. The scale of the SDGs is global, yet their impacts are individual. The same interactions of the social, economic, and environmental pillars work on both local and global scales.

Action must happen at a local level with local input otherwise it will not be sustainable. However, the localities cannot work in isolation because their decisions and actions have a ripple effect on neighboring communities. SDGs are an initiative of government, but the local people need to become involved because they are the ones who will implement many of these initiatives.

While the emphasis of this congress is water, and therefore SDG 6, it is important to remember that any decision will have an impact on other SDGs. Preferably, those impacts should be positive, not only on a global scale, but also a local scale. The next step for many organizations is to link ideas together, bring in the private sector, think on all scales, and meet multiple goals with one implementation. This is positive efficiency through policy construction. In the end, this is not a summary of a conversation, but the beginning of a larger conversation. 



HLP: Water and Climate

TIME AND ROOM: 30 May 2017, 10:50-12:20, Gran Cancun Room

CHAIR: Cecilia Tortajada


SPEAKERS: Tom Soo, Jose Carrera, Jean-François Donzier, Jason Morrison

SESSION SUMMARY

The purpose of this Panel was to first consider how to further promote the importance of water management in the COP process when dealing with the challenges posed by climatic changes. A particular focus was given to climate change adaptation. The Panel then considered the implementation of the Global Climate Action Agenda through different projects, and proposed recommendations for future actions to be taken. The Panel was intended as part of the broader process that aimed to bring together key actors to further build an alliance for water and climate change issues, positioning itself as a key stepping stone between COP 22 and 23, and leading to the 8th World Water Forum.

The first speaker, Tom Soo, the Executive Director of the World Water Council, explained how collaborative thinking is central to shaping approaches to climate resilience. Jose Carrera, Vice-President of the Development Bank of Latin America (CAF), shared the perspective of Climate Change Adaptation in the Latin American context, providing examples of climate change adaptation actions in Peru and Mexico. Considering the variety of issues faced in water allocation and water management, a crucial question was raised: how can COP 22 support these challenges?

Jean-François Donzier, the Executive Secretary of the International Network of Basin Organizations, explained the significance of trust between basin level organizations to achieve sound water management. He stated that we are still facing problems of extreme climate phenomena such as droughts and water issues are now starting to be comprehensively considered. However, he concluded that there are tools to adapt to the effects of climate change. The need for private sector involvement in climate and water considerations was addressed by Jason Morrison, CEO of the Water Mandate UN Global Compact. Involving businesses in local climate change adaptation also benefits these same businesses, through return on investments. Examples of partnerships between corporations and communities which have been hit by water resources issues stemming from the effects of climate change were provided. There have now been many pilot projects that have showcased success in these business partnerships, the next step is to increase the scope and scale of such projects.

“Fresh water is a time bomb, on the way to crash.” Jean-François Donzier, Executive Secretary, International Network of Basin Organizations. 



HLP: Water and Business

TIME AND ROOM: 30 May 2017; 12:40 – 14:10; Gran Cancun Room

CHAIR: Pierre-Alain Roche

SPEAKERS: Jason Morrison, Diane D'Arras, Ramon Aguirre Diaz, Hak-Soo Lee, Philip Gichuki

SESSION SUMMARY

This High Level Panel mobilized private and public companies to address how those sectors contribute to the achievement of the SDG 6. The goals of this panel were:

- To share experiences, practices, and knowledge from multiple countries regarding the role of technological innovation;
- Build alliances for the implementation of sustainable solutions;
- Provide perspectives on the most promising solutions; and
- Determine how to ensure sufficient human and financial resources to successfully meet the SDGs.

The business sector cares about water and perceives it as an important theme considering that each year since 2013, has been identified as one of the top three risks to business performance. Thus, the need to address risks such as flood damage and unreliable supply is obvious to businesses. There are many challenges facing businesses in contributing to the water sector including understanding what technology is adequate for what places, the governance capacity, and sharing knowledge and information.

Jason Morrison, head of the UN Global Compact CEO Water Mandate, has advocated for water stewardship to be adopted as a response strategy to high risks and to support achieving SDG 6. Since most companies are not prepared to engage in catchment-based collective action on water, companies must enhance their understanding of water uses in the catchment where they operate in order to develop a more sustainable water use. Morrison presented two case studies relating to this water stewardship strategy. In India, the appliance of smart agriculture helped one million farmers reduce 20% water use. In Brazil, companies launched a commitment letter to mayors in the São Paulo, in 2016, alongside the major water crisis in the metropolis (Pacto Global Rede Brasil).

Diane D'Arras presented the SUEZ business case, explaining that the company invested in research and development to adopt sustainable technologies. She highlighted that the process for innovation in the water sector and SDG achievement must be slower, taking into account the risk averse nature of public tenders, the cycles of investment that often work under 5-10 year timeframes, and the fact that the cost-benefit analysis of innovative technologies is not visible to everyone. D'Arras raised the issue that innovation in the business sector must consider the diversity of situations: people are not the same and have different needs, which requires modern and innovative technological solutions to address diverse socio-economic requirements. She believes technology can play a role in the SDGs, but this demands the coordination with governance processes and other efforts.

Additionally, the session included an overview of cases from Asia, Central America and Africa, including:

1. K-water on its improvement in utility management systems to respond pro-actively to climate change;
2. Mexico City and public investments for water security to the growing metropolitan region, having as an ultimate goal of doubling the existing water network to supply water for all; and
3. The city of Nairobi in managing existing water infrastructure with the support of development aid, as financial resources remain a key challenge for the public sector. The focus in Nairobi has been in investing in programs to improve the capacity of the water utility by welcoming professionals and collecting data on the field to enhance performance and build trust with clients. Nairobi is also targeting new water sources, such as reuse and groundwater to improve the resilience and reduce the costs of services.



HLP: Integrated Water Resources Management

TIME AND ROOM: 31 May 2017, 12:40 - 14:10; Gran Cancun Room

CHAIR: Torkil Jønych Clausen

SPEAKERS: Mark Smith, Benedito Braga, Blanca Jiménez-Cisneros, Claudia Campuzano, Rabi Mohtar, Fabiola Tábora, James Spalding

SESSION SUMMARY

The purpose of this high-level session was to highlight the place of Integrated Water Resources Management (IWRM) in the 2030 Agenda for Sustainable Development by revitalizing the concept of IWRM. The goal is to deliver results that are accounted in the SDGs and lives across the globe with scale and speed. With political and community stakeholder engagement as well as proper data acquisition and sharing, it is possible for IWRM to provide an overarching planning and management framework for the SDGs.


The session began with remarks from Mark Smith, the Director of the IUCN Global Water Programme, on the evolution of IWRM, featuring four new strategies. These strategies include:

1. High-level policy and strategy setting to put in place agreed high-level policies and goals;
2. Pragmatic problem solving that complement strategy setting to meet stakeholder priorities at all levels;
3. Operating mechanisms that bridge strategy setting and problem solving, focusing on action;
4. Monitoring of progress, goals, and targets by using data tools for transparency, trust, and accountability.

Other key concepts from the opening remarks included the need to think about IWRM beyond the basin scale with a scope that can encompass other models and national issues.

Torkil Jønych Clauson, moderator of the session, continued the dialogue by allowing panelists to share the successes and potential paths forward in implementing IWRM across the globe. Brazil was highlighted as a steward of using IWRM concepts in the face of drought, while the Itaipu Dam could serve as an IWRM turnkey to good transboundary water governance.

A highlight of the dialogue was the recognition of the need to change and a potential path forward to achieve those goals. There needs to be an effective strategy to dynamically catalyze and manage change at all levels and to operate mechanisms that bridge strategy setting and problem solving. This strategy needs to be paired with robust education and outreach efforts that integrate not only civil society but the political class as well. Water practitioners also need to rethink IWRM across disciplines and scale by thinking of the SDGs each as a system connected with other disciplines such as water, food, energy, and health.

The concluding remarks called for the need to have meaningful data in the scope of IWRM for proper implementation and to work on communication to get policymakers to make decisions. Good progress in IWRM development will come in time for the 2030 Agenda for Sustainable Development. 



HLP: The Water-Energy-Food Nexus

TIME AND ROOM: 1 June 2017; 12:40 - 14:10; Gran Cancun Room

CHAIR: Prof. Rabi Mohtar

SPEAKERS: Carl Ganter, Astrid Hillers, Antonio Embid Irujo, Louise Karlberg, Liber Martin, Saeed Nairizi, Diego J. Rodriguez, Will Sarni, Raya Stephan

SESSION SUMMARY

The aim of this High Level Panel was to demonstrate the extent of the interconnections between the water, energy, and food goal and highlight the lessons learned across various thematic and regional case studies and experiences. It was also centered around exploring possible tradeoffs for implementing the SDGs, and identifying holistic assessment criteria for multiple implementation plans at different scales. The panel further focused on discussing ways in which policy coherence and policy-science communication can be improved across sectors, and across scales.

The HLP brought together experts from diverse backgrounds and organizations including Global Environment Facility, The World Bank Group, Circle of Blue, Water Foundry, International Commission on Irrigation & Drainage, SEI International, Universidad Nacional de Cuyo, Universidad de Zaragoza, and Texas A&M University.


The session began with remarks by Prof Rabi Mohtar from Texas A&M University on the value of the Water-Energy-Food Nexus as a holistic, interdisciplinary, cross-sectoral platform that builds upon strong pillars of IWRM, water productivity, and energy efficiency. He also emphasized the role of the platform as one with equal distance from the water, energy, and food communities, and ways it could catalyze an inclusive dialogue informed by analytics, developed within the scientific community, and communicated among different stakeholders.

The first panel covered Global and Regional Challenges with SDGs implementation in reflection of the above issues. Panelists highlighted the need to reframe the

language the nexus stresses into a more positive one which focuses on the opportunity for business and for driving economic development, social wellbeing, and innovation. This would allow us to bring to the table stakeholders who are not part of the discussion today. There was also a focus on the objectives of ensuring water and food for all. The existing international instruments, such as SDGs and Human Rights goals, overlap with WEF nexus objectives and facilitate effective resource management.

The second panel further focused on national and local cases and was moderated by Carl J. Ganter from Circle of Blue, who focused on the human face of water and the need for effectively communicating its story. The panelists discussed major challenges for implementing the nexus solutions including poor quality data, lack of proper governance and institutional capacity. There was also a focus on the diversity of the players involved and their different priorities and value systems. Panelists emphasized the need to establish regulatory frameworks and generate incentives to improve the efficiencies across sectors, which will promote more synergies and co-investment.

YOUTH

This HLP panel was unique in dedicating time to a statement representing Youth Organizations with regards to their involvement with the future of Water-Energy-Food Nexus research and implementation. A statement by Amrita Guatam asked for the youth to be included in decisions regarding pushing the nexus discussion and implementation forward. "Achieving WEF is a long-term goal and youth have a role to play". 



2. Water, Sanitation and Health

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RS 12 - Water Sanitation and Health: Ensuring Drinking Water

TIME AND ROOM: 30 May 2017, 17:20 - 18:50; Cozumel 1

CHAIR: Guy Fradin

SPEAKERS: Cristian Palma Infante, Juan Carlos Tejeda Gonzalez, Fernando Gumeta Gomez, Alex Godoy Faundez

SESSION SUMMARY


Water is an essential and necessary component for all aspects of life. No water use is more vital than providing water for human health, from clean drinking water to adequate hygiene and sanitation. Unfortunately, the provision of these two services can be expensive and difficult to attain and maintain, particularly in rural areas where communities can be far from centralized service areas. In this panel, speakers considered drinking water allocation case studies in Chile, as well as two different parts of Mexico (Oaxaca and San Luis Potosi). This provided for several interesting case studies that are applicable to many parts of the world.

The first speaker presented on a project analyzing the efficiency of water and land use planning processes. Mr. Cristian Palma Infante, Professor at the Universidad del Desarrollo, Chile, and his colleagues created a qualitative and quantitative approach to analyze the connection between water planning and land use planning to discover if both were jointly taken into consideration within the policymaking process. This approach is useful for objectively determining the level of integrated planning for water and could bring outputs to be implemented in other regions of the world.

Moving from Chile to Mexico, Juan Carlos Tejeda-Gonzalez, Professor at Colima University, presented his work on how to improve integrated drinking water

planning for rural areas in the Altiplano. This research involved a strategic environmental assessment of the planning process for areas that are underserved by the government. Based on this research, it was determined that stakeholder engagement at the local level could provide long-lasting, community-driven solutions to integrated water planning.

However, currently achieving meaningful stakeholder engagement is difficult in Mexico, where there are not always forums for such engagement, which was also seen in Mr. Fernando Gumeta-Gomez's research. In his presentation, Mr. Gumeta-Gomez considered the impact of institutional changes on different governance structures, with a focus on how different land tenure arrangements shaped the success of communal management of water in rural areas.

Unfortunately, situations in which the poor are disproportionately impacted by lack of adequate water for drinking and sanitation are common in rural areas all over the world. The case studies presented in this session all managed to effectively weave in the importance of bridging the gap between science and policy by focusing on the importance of institutional, legal, and social aspects of water delivery services for human health. 



RS 36 - Water, Sanitation and Health

TIME AND ROOM: 2 June 2017, 10:50 - 12:20; Cozumel 4

CHAIR: Pierre-Alain Roche

SPEAKERS: Esthela Sotelo, Ramiro Vallejo Rodriguez, Jake Larsson, Romulo Teixeira

KEY MESSAGES

- **Rivers need to be constantly monitored for better governance.**
- **Improvements of key indicators related to WASH are necessary for more accurate policies.**
- **Monitoring WASH results can be used as proof of bad management. This can empower civil society with the necessary information to help them to require better rules and codes.**
- **Scientific findings and social policies provide evidence to governments on the direction they can take action.**


SESSION SUMMARY

With reducing costs, it is now easier to monitor human health and wellbeing around the world. This can benefit developing countries by helping to develop a better understanding of sanitation. An ethnographic study in Kumasi, Ghana, showed that while people fear disease, heat, and waste from others, they cannot imagine owning a toilet. Moreover, people avoid drinking water in developing countries to avoid visiting inadequate toilet facilities or to avoid drinking contaminated water. A wellbeing monitor consists in sensors annexed to normal toilets to collect data, with 12 prototypes of this device, 20 versions of the software and already having tested over 100 urine samples. The data from this monitoring device showed that people's health can be easily tested through Low-Cost Hydration Indicators.

Measuring the quality of river water is also a measure of the quality of people's health, as demonstrated in a study in Lake Chapala. Through measuring the quality of water in different sections of the lake, it was possible to identify different water quality problems. First of all, 17 locations were selected for sampling, and after measuring all necessary parameters for each sample, it was possible to calculate the Water Quality Index. Most of the samples presented results between bad and a medium quality, indicating this water is not recommendable for drinking.

In Brazil, significant concern has been raised regarding sewage water. Only 42.6% of domestic sewage from the country's urban population (about 160 million people) is collected, and only 30.5% receives some

form of treatment. Further problems with wastewater include poor management of solid waste, storm water network irregularities, and a lack of supervision by the Brazilian Public Power - all affecting the quality of water in Brazil. Considering this scenario, researchers carried out analyses in four different rivers; Rio das Bombas, Tiete River, Tamanduatel and Paraíba do Sul. The methodology used in these studies was from the Standard Methods for the Examination of Water and Wastewater, and as guidance a Practical Handbook called Water Analysis was provided by FUNASA (National Health Foundation). During this session in Cancun, a representative from the Rio das Bombas river study presented the project and information from 7 different points on this river system were analyzed. It was possible to identify pollution due to sewage (when the faecal coliforms quantity was too high) and solid waste. The results were used to protest against public policies and to provide civil society with information, through media channels.

The final discussion of the session described the two major problems related to water access in Latin America: inefficient water management models and transformation of spaces. Two cases have illustrated this research, which compares scenarios from 2010 and 2016. The first case presented the San Sidra Tlaixco river and second, the Santiago Teplaxco river. Both of these rivers are in the Metropolitan Zone of Mexico City (MZMC), which is a living laboratory for all of the most complex matters which concern urban governments. The results from the case studies were helpful not only in painting a better understanding of the main political and social factors involved in the domestic water and sanitation access process in the studied regions, but also in providing key information to improve policy decisions. The conclusions also stress that the water access must be based on a dynamic process of interactions and exchanges between different actors, rather than public actions. 



RS 37- Water, Sanitation and Health

TIME AND ROOM: 30 May 2017, 15:30 - 17:00; Cozumel 1

CHAIR: Asit Biswas

SPEAKERS: Tara Zolnikov, Ross Tierney, Rafaella Oliveira Baracho, Jaiza Leite Lima, Vanessa Cruvinel

SESSION SUMMARY

Safe drinking water and basic sanitation facilities are indispensable needs for human civilization. This session intended to highlight crucial issues of quantitative and qualitative aspects in relation to health and best practices to tackle such issues in different parts of the world.

One of the panelists, Ross Tierney, PhD researcher at Cranfield University, indicated the fact that 2.5 billion people still lack access to adequate sanitation and about 1.5 million children die every year from contaminated water. He emphasized the problems in sanitation services in developing countries, also quoting the scenario in most of the cases – “Flush and forget” mentality. The examples of the physical block, non-stick surfaces, odor neutralizing technology in using available services and the importance of the user experience kept the attention of the audience.


During the presentation of a case study on drinking water quality in Quilombola communities in the municipality of São-Luís-Gonzaga, MA, Brazil, Marcia Araujo said that the mere presence of a public water distribution system has no guarantee of meeting the needs of the population for clean drinking water in adequate quantity. This is due to several factors such as a lack of system maintenance, poor design, improper usage, total absence of treatment of distributed water, etc. This leads to the need for an urgent new public policy on a national level which can fulfill these development gaps with sustainable water distribution systems and proper public administration in cooperation with local communities and government authorities.

Another example from Brazil, presented by Rafaella Oliveira, discussed a project aimed at improving the planning of sanitation services in Brazil by analyzing Municipal Sanitation Plans (MSPs) of Paraná State. A set of check-lists were applied to evaluate the categories of universal access, equity, “Municipal Policy of Sanitation”, management capacity, drinking water and sewage and showed that the MSPs vary in

quality and comprehensiveness. The main problem lies in the concept that does not appear in MSPs: although each plan has positive features, none of them completely meet the legal requirements. As such, there is a lack of legal framework in the creation of Municipal Sanitation Plans, which jeopardizes the guarantee of the implementation process.

Moreover, presenter Vanessa Cruvinel described the case of Brasília, the capital of Brazil that still depends on the biggest open dumpsite of the Americas which receives 9.000 tons of waste per day. During her presentation, she compared the results of groundwater analysis from two wells (the porous and fractured domain wells) owned by ADASA (Regulating Agency for Water, Energy, and Basic Sanitation of the Federal District) monitoring network which reveals that there is evidence for groundwater contamination in the vicinity of structural controlled landfill. The quality of the water consumed by waste collectors working in the landfill and adjacent areas presents risks to health and the environment on a long term. Avoiding the dissemination of water-borne diseases is notified, hence the importance of integrated and inter-sectoral actions to monitor water quality and health conditions of the collectors.

A different aspect about Water and Health was highlighted by Tara Rava Zolnikov through her doctoral research on “A qualitative study on the interconnected nature of HIV, water and family”. This research provides evidence on an increased need for access to potable water to improve the quality of life of HIV-infected individuals and HIV-affected families.

Contributing to the theme “Bridging Science and Policy”, the session emphasized the requirement of cooperation between water practitioners, local and government authorities -policymakers, and water users to come together to identify relevant and effective measures to combat current issues in the WASH sector for long lasting impact and sustainable solutions. 



SS 5 - Regulation and transparency for water and sanitation services in countries with lack of them

TIME AND ROOM: 2 June, 2017, 9:00 - 10:30; Cozumel 5

HOSTING INSTITUTION: Instituto Mexicano de Tecnología del Agua

SESSION SUMMARY

This special session focused on the need for regulation and transparency in WASH services, with a focus on Latin American countries. There was a consensus that for proper water and sanitation services to be supplied to citizens there must be standards and professional impartial regulation with transparency for the public. Without proper regulation and transparency, the human right to water cannot be guaranteed.

However, adequate regulation and transparency in the sector is not the case in many countries in Latin America, such as Mexico and the Dominican Republic. In Mexico, regulation of water services does not exist because local governments have the autonomous right to make their own laws concerning water systems, without influence from the state. This is especially problematic because water is a legal monopoly. Without oversight, there are few consequences for poor municipal leadership in the water sector and most leaders are incompetent with no background in water. Furthermore, there is a fast turn-over rate of around 1.5 years, making it very difficult to create long-term useful plans.

A representative from CONAGUA, the National Water Commission of Mexico, acknowledged that there are currently standards for the quality of water in the country, but not for the quality of service. This is demonstrated through the widespread intermittent provision throughout Mexico. The poor services for WASH provided by municipalities have created distrust among citizens. Studies have shown that more people are now resorting to buying bottled water, accounting for 5-10% of household income. There is a general lack of credibility for public institutions in Mexico, leading citizens to move away from participation and a willingness to pay for services. This makes it difficult for municipalities that are working to improve WASH services for their citizens. For example, one municipality in Mexico showcased their new monitoring and maintenance technology that is working in the region to ensure high-quality continuous water availability; however the ingrained mistrust from the public limits their willingness to pay for the good service. A method that has helped gain

public confidence in water services is the involvement of more technology and less human capital in the WASH distribution systems.

The shortcomings of WASH in Mexico indicate the need for a national water policy including clear regulations through a clean legal framework, reliable information system, performance indicators, affordable rates that ensure sustainability of the services, authority and capacity to exert this authority. The largest hurdle to overcome in creating this policy is the political will. The state of Morales, Mexico is a clear example of the struggle for regulation in the water sector under the Mexican system. The topic of introducing a regulatory body has been discussed in the state for decades, but it has still not been able to materialised, mostly due to political reasons.

In 2012, the Mexican government stated that there should be a new water law with a human right to water, yet it is now 2017 without progress on this law. The Santillo Water Users Organisation is critical of the lack of transparency and forward political movement for WASH improvement, noting that there still needs to be secondary guidelines and policies for achieving the 2012 goal. A representative of the organisation stated that there is a total lack of public participation and consultation mechanisms in place.

Another civil society organisation fighting to improve water services in Mexico is the Morelos rinde cuentas. This organisation is demanding accountability from authorities and pressuring municipalities and states to increase investment in water services. They have strong proposals of how to improve water services through, for example, removing cash payments to prevent corruption and installing smart meters to prevent over usage of water. As of right now, they have submitted eight detailed proposals to the municipality of Morelos, but have had no luck in reaching management to consider their ideas.

While this may seem like a daunting task for Mexico, success in other parts of Latin America offers encouraging guidance. In Columbia, a regulatory committee with a supervisory committee has been



SS 5 - Regulation and transparency for water and sanitation services in countries with lack of them

able to increase the coverage of drinkable tap water to 60% in the country. In the Mexican state of Sonora, stakeholders are working on a specific plan to guarantee proper service and supply of water. This will include a sound legal framework so that regulations and oversight cannot be removed by a change in the political group. To ensure the services cannot be politicized, certain stakeholders in the state intend to create an independent regulatory body and proposed service rates.

After the presentations of the above groups of stakeholders, a discussion on the topic introduced new potential solutions on the issue. One such idea was for civil society itself to act as a regulator in Mexico, relying on open information law and the entitlement to ask for information and its interpretation. There were several other ideas, but it was noted that there needs to be well-defined roles for regulators, as corruption cannot be regulated. There needs to be an independent autonomous regulatory body, and hired lawyers to draft this program with the support of local congress.

Finally, there was an important clarification of the term 'regulation' to include not just penalties, but also preventative actions and incentive measures. Moving forward, Mexico should use the successful models of other countries to develop a strong regulatory agent. To end the session focused on the struggle for Mexico to overcome its political corruption to provide adequate WASH, a final quote was read: "[You] cannot politicize something so sensitive as water".



3. Water Quality, Wastewater and Reuse

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RS 30 – Water Quality: Contaminants of Emerging Concern

TIME AND ROOM: 31 May 2017, 10:50 – 12:20; Cozumel 1

SPEAKERS: Birte Hensen, Esra Şiltu, Jane Cohen, Edward Acheampong

SESSION SUMMARY

In this session, several emerging and dangerous aquatic contaminants were described, for the purpose of researching their characteristics and policy mechanisms to control their spread. First, Birte Hensen described the environmental fate and behavior of transformation products or pesticides used in agriculture and urban areas. Emissions of pesticides from agricultural fields are threatening water quality of aquatic systems in large parts of the world. After their application, pesticides are to some extent retained and degraded in the environment, depending on the specific compound properties and application they are used for. However, a share is often incompletely mineralized resulting in transformation products (TPs). TPs are generated by biological and chemical processes in the environment and water treatment. The important parameters governing their properties, behavior and toxicity are often unknown. In contrast to the parent compounds (PCs), fate and effects of the single TPs as well as in mixture with PCs is poorly investigated. To analyze the behavior of TP's compared to its PC, mecoprop (methylchlorophenoxypropionic acid) was chosen due to its widespread application in agricultural as well as in urban areas. The research demonstrates that new insights on the fate and behavior of TPs in the aquatic environment are necessary to provide the assessment of risk potential and the development of water pollution control measures.

Another emerging contaminant in water resources

is endocrine disrupting compounds, of significant interest because of their catastrophic effects in ecosystem and human health. These chemicals are mostly of synthetic origin and when they enter the body of a living being, they mimic the hormones or interfere with the endocrine system and cause severe health problems. Moreover, most of them are very persistent in the environment and exist for many years after the emission. Therefore, control of endocrine disrupting compounds in water resources is an urgent policy issue. Esra Şiltu presented her research to develop a management perspective for endocrine disruptors in surface waters of Turkey. In this scope, a list of endocrine disruptors having tendency to occur in surface waters in Turkey were identified. These chemicals were monitored in wastewater discharges and water bodies in pilot basins, where the fate of these pollutants was assessed. Based on the monitoring of these fate studies, a designation of chemicals to be monitored was established and environmental quality standards were derived. As a result of this study, a roadmap and perspective were developed for Turkey to manage the endocrine disrupting pollutants in water resources. The outputs of the study are planned to be integrated to the national legislation and necessary measures will be implemented by related institutions and organizations.

Next, the regulation of Personal Care Products (PCP's) in the United States was discussed by Jane Cohen. Her research explores yet-oncoming developments within the U.S. regulatory environment, motivated

RS 30 – Water Quality: Contaminants of Emerging Concern

as they are by advances in scientific understandings that are making the harmful effects of PCP's on water sources as well as species-welfare increasingly available to be understood. She traced, analyzed, and robustly applauded one, but only one, of two very recent developments in the regulation of PCP's in the United States—two shoots—against a quad of background conditions—four roots. The shoots are (1) the single-target microbead bans first enacted in some bellwether states and in a subsequent federal prohibition, effective this year; and (2) the efforts in Congress to pass the narrowly-drawn Personal Care Products Safety Act. The roots are: (1) the science-driven campaign to arouse consumer hostility toward microbeads and to steer the campaign into legislative forums; (2) the market-driven campaign to intensify consumer distrust of chemical pollutants; (3) lobbyist push-back within the PCP industry; and (4) taproot federal legislation, the 1976 Toxic Substances Control Act, practice norms under it, and its recent revisions. Preliminary findings are that only the single-target anti-microbeads approach has satisfied its own strong ambitions so as to deserve unqualified applause, whereas the other U.S. approaches are too slow and compromised to effectuate critically-needed regulatory change. However, the single-target approach is unsuitable for an environment that is polluted to the extent that U.S. water sources are. Therefore, we need to extract the best practices to be derived from every approach and continue the hunt for innovative institutional reform.

The session finished with a look at pharmaceutical drug processing in wastewater treatment by Edward Acheampong. The Benchmark Simulation Model No. 1 (BSM1) is widely used to model the family of Activated Sludge Models. The Activated Sludge Model No. 1 (ASM1) is commonly used within the Benchmark Simulation M1 to model the activated sludge process (ASP). In the real-world, the ASP suffers from variabilities arising from process operational parameters, environmental factors, input loadings and model input parameters. These variabilities have both temporal and spatial effects on the ASP leading to uncertainties in the removal of pharmaceutically active compounds from wastewater. Consequently, there are strong governmental drivers and evolving legislation that protect the aquatic environment, with the aim of promoting water resilience which falls under the umbrella of building a sustainable society. Mathematical modelling and computer simulations are valuable tools in improving the current treatments

technologies and developing new ones to remediate pharmaceutically active compounds since they will help to reduce the experimental workload in defining the system and the uncertainties surrounding it. In the research presented here, it investigates how variability in the ASM1 model impacts behaviour of the BSM1 model. Edward Acheampong described a parameter sensitivity analysis of the existing ASM1, revealing that nitrite and nitrate nitrogen, and free and ionized ammonia, are the most sensitive state variables, and are sensitive to a large number of rate parameters. In addition, the stochastic model shows large fluctuations in heterotrophic and autotrophic biomass, particulate inert organic matter, and particulate product from biomass decay and alkalinity. We also report preliminary results of extensions to ASM1 which describe the removal of various pharmaceutically active compounds. From the wide range of pharmaceutically active compounds and conjugates, we select a few to mathematically model in detail. This is the first stage in the construction of a generalized ASM predicting and optimizing the removal efficiency of pharmaceutically active compounds. 💧



RS 31 - Water Quality Management

TIME AND ROOM: 1 June 2017, 10:50 - 12:20; Cozumel 1

CHAIR: Mukand Babel

SPEAKERS: Inom Normatov, Kevin Wagner, Kris Still, Ramon Merino Loo

KEY MESSAGES

Assumed sources of pollution cannot be relied upon. We must use scientific studies in order to determine sources of pollution so that we can accurately curb pollution residing in water resources. We must continue to find energy saving, but accurate and efficient ways to clean wastewater and sludge. Reducing pollutants in water is a team effort. As we determine sources of pollution, those in a position to reduce entry into the water system have a responsibility to revise their activities.

SESSION SUMMARY

Risk assessment of contamination by chemical and isotope studies.

The transboundary river basins between Uzbekistan and Tajikistan create transboundary conflicts. Policymakers in Uzbekistan believed that those in Tajikistan were responsible for polluting the water solely because Tajikistan is upstream from Uzbekistan. Chemical and isotope research analyzed points from upstream to downstream in order to determine whether pollution actually came from Tajikistan. Upon completion, it was found that the pollution is likely caused from agricultural territories downstream, not from pollution upstream in Tajikistan.

Studies in this areas stem from a lack of information in the region. This shows how without information, it is impossible to determine causes of pollution and find a solution.

Using bacterial source tracking to develop watershed restoration plans

Bacteria are a major problem not only throughout the US, but in Texas. The number one cause of river and stream impairment in Texas is bacteria/pathogens. The bacteria, E. Coli, can come from human, domesticated animals (livestock or pets), or wildlife. Methods to determine sources of contaminates include: source survey, modeling, and bacterial source tracking (BST). BST is based on the premise that different animals have different "guts." They have different E. Coli strains that can be differentiated. BST in Texas began

in 2002 in Lake Waco/Belton. BST tests vary in cost and vary in accuracy. A task force was initiated and confirmed that a certain type of BST, the ERIC-PCR, is the recommended BST in Texas in cost saving and accuracy.

Known sources of bacteria were studied in order to isolate E. Coli strains and find a DNA fingerprint for each. The Texas BST library now contains over 1,600 E. Coli isolates. About 41% come from wildlife species, 25% from humans, and 34% from domesticated animals.

Before source surveys, it was believed that cattle caused the most bacteria pollution, but about 1/2 of bacteria in rural watershed areas actually comes from wildlife. As wildlife habitat increases, you see increased E. coli runoff and concentrations. BST is a useful tool for identifying significant bacteria sources. One way for people to help control bacterial contaminants is to develop ways to manage bacterial sources that result specifically from human waste. This will help improve safety in our waterways. Once again, data has proven a belief about water contamination false.

Simultaneous analysis including non-targeted approaches for bioactive chemicals in wastewater from the United Kingdom using Liquid Chromatography

We must identify pollutants in wastewater in order to have good health and wellbeing, clean water and sanitation, and responsible consumption and production. Bioactive chemical pollutants can cause physiological changes in marine life. Depending on the wastewater treatment plant, there is variability in the chemical pollutant removal. We need to consider precursors that biotransform to the pollutant of interest in order to understand the performance of the treatment process. Precursors may be pollutants that biotransform or metabolites that de-conjugate. Treating wastewater from human and industrial uses enables management of water quality that is fit for reuse. Analyzing what we can see (targeted) and cannot see (untargeted) is important to understand how efficient wastewater treatment really is.




RS 31 - Water Quality Management

Optimization of activated sludge process through energy saving

Reducing energy use in sludge treatment in San Juan, Mexico is important because the current use of energy is too expensive. An oxidization process was established which puts bacteria in "high stress." This helps to effectively treat sludge. Factors that affect the biological process are: temperature, PH, sludge age, recirculation, and quantity of nutrients.

The factor which influences the process of wastewater treatment the most, is composition. However, knowing the origins and variability of the wastewaters received at the plants helps to determine which treatment processes will work most efficiently. Information helps to optimize the use of aeration systems and allows us to save costs.

How does the session feed into the theme "Bridging Science and Policy"?:

Regarding bacterial pollution in water in Texas, about 41% comes from wildlife species, 25% from humans, and 34% from domesticated animals. This science can help us communicate with policymakers in order to inform them of specific sectors that may need to revise current practices in order to reduce bacterial entry to our waterways. 



RS 33 - Water Quality: Managing Contamination

TIME AND ROOM: 1 June, 2017, 9:00 –10:30; Salon Isla Mujeres

SPEAKERS : Shivaraju Harikaranashalli Puttaiah (not present), Stefanie Wieck,

Margarita Loredo-Cancino, Kristoffer Still

KEY MESSAGES:

While the presentation of scientific solutions was reputable, discussion of the session led to a conclusion that public education is a must in communities in order to better eliminate products coming into the wastewater treatment plant in the first place.

SESSION SUMMARY

A fascinating session on wastewater treatment highlighted innovative new physical methods for treatment as well as important regulatory considerations surrounding managing chemicals in wastewater. Two separate methods for filtering wastewater were presented by Kristopher Still and Margarita Loredo. The session's third speaker, Stephanie Wieck presented on the limitations of regulatory risk assessment of chemicals.

With the development of enzymes in wastewater treatment sciences, Still's research focused on understanding how a complex wastewater environment impacts enzyme activity. His findings identified enzymes that are effective in reducing pollutants in wastewater and found that Inherent enzymes' activities vary both spatially and temporally. Margarita stressed the importance of absorption in effective wastewater treatment and presented on the synthesis and characteristics of a new Metal Organic Framework (MOF) for this purpose. She shared research findings that when synthesizing MOFs, conditions may be altered in order to acquire the porosity and size required to clean water depending on the water's conditions.

The research that Stefanie presented inventoried chemical products in residential areas of Germany, in order to characterize effluent to treatment plants and determine to what degree biocidal active substances

are entering the wastewater treatment system while not falling under EU regulations. Results found that personal care products and washing products outnumbered biocidal products. These findings suggest that regulations in the EU are not addressing the right products, and that there is an underestimation of risks considered by regulatory agencies. It was thought that it is too complex to manage all of these waste products in current risk assessment concepts, and so a proposed solution was the development and use of more sustainable biocides.

While the presentation of scientific solutions was reputable, discussion of the session led to a conclusion that public education is a must in communities, in order to better eliminate products coming into the wastewater treatment plant in the first place. Comments from the audience fed that federal funding of this type of education is a major policy need. Coupling this social innovation with the technologies proposed, may be a better approach for managing contamination of wastewater in the future.

Furthermore discussion targeted the issues of pharmaceutical drugs entering water systems. On this matter, it appears to the audience and the panel that scientific innovations may not solve the issue but that social innovation and political transformation will be needed in order to manage contamination of drugs and pharmaceuticals in water and the environment.

How does the session feed into the theme "Bridging Science and Policy"?:

While regulatory agencies consider biocidal products higher than personal care and washing products, her (Stephani Weick) findings suggest that regulations are not addressing the right products, and that there is an underestimation of risks considered by regulatory agencies.



RS 34 – Water Quality Management

TIME AND ROOM: 31 May 2017, 9:00 – 10:30; Cozumel 3

SPEAKERS: Lucas Gregory, Aybala Koc Orhon, Humeyra Bahceci, Diane Boellstorff, Viviana Vargas Franco

SESSION SUMMARY


This session focused generally on water quality management and more specifically on different types of Water Quality Standards (WQSs) such as contact recreation WQSs, river basin specific environmental QSSs, microbial risk assessment driven water quality assessment, pressure-state-response indicator based water quality index, and ecological status assessment.

Lucas Gregory, from Texas A&M University, focused on contact recreating (such as swimming, fishing, boating, hiking) WQSs which aim to protect human health mainly from fecal pollution (for which E.Coli is used as an indicator). He explained the implementation of the approach with a case study on Navasota River. He concluded that to develop cost-effective water quality standards, the level and type of use for the water body and flow conditions need to be considered.

Aybala Koc Orhon, from Middle East Technical University, talked about identification of river basin specific pollutants and water quality standards of these pollutants in Turkey. As an initial attempt three pilot projects are conducted on three basins in Turkey. A total of 250 chemicals are identified as special pollutants and their WQSs are determined. Specific attention was paid to include stakeholders from urban, industrial and agricultural sectors into the process.

The next talk, delivered by Humeyra Bahceci representing the Ministry of Forestry and Water Affairs, Directorate General for Water Management, focused on the identification of biological indices for ecological assessment of water bodies in Turkey. The ecological status, which is composed of biological, chemical and hydro-morphological parameters, is investigated and biological indices specific for Turkey were developed. The outcomes of this study will be used in the ecological assessment of water quality in Turkey.

Diane Boellstorff of Texas A&M University discussed water quality assessments through microbial risk assessment in Texas. Texas Commission on Environmental Quality (TCEQ), the primary agency responsible for establishing WQS in Texas, identifies designated uses of water body monitors as a variety of parameters such as pH, OD (optical density), BOD (Biological Oxygen Demand), E.Coli at these water bodies and sets WQSs for different uses. According to the Texas WQ inventory of 2014, 42% of the water bodies in Texas were polluted and more than half of them were infected by bacteria/pathogens. Thus, watershed management through microbial risk assessment is a viable option. Sources of bacteria pollution are identified as leakage or malfunctioning of septic systems, pets, livestock, wildlife, etc. Based on the results of their study, wildlife was the major contributor of the bacterial pollution but human waste had higher contribution to health risk (i.e causes illness at humans). She concluded that identifying the source and potential of the source to cause illness is important in selecting the best management practices to manage water bodies.

The final presentation, delivered by Viviana Vargas Franco from the Universidad Nacional de Colombia, focused on the development of a WQ index for Andean micro-watershed using wastewater, mining and erosion level as pressure indicators, COD (Chemical Oxygen Demand), fecal coliform as state indicators and wastewater treatment plant and strategies for sustainable mining as response indicators. Importance of integration of social, economic and political dimensions into the WQ index is highlighted. 



SS 25 - Water Quality Management - Identifying Opportunities for Policy Reform

TIME AND ROOM: 31 May 2017, 15:30 - 17:00, 17:20 - 18:50; Cozumel 2


HOSTING INSTITUTION: University of South Australia

SESSION SUMMARY

As world populations grow and countries continue their path to development, water quality remains a core concern for drinking water, sanitation, and agriculture. This panel session highlighted the fact that, despite technological innovations, water quality is still a major source of water insecurity for many places in the world.

Presentations in this session highlighted examples from New Zealand to Canada and from the MENA Arab countries to Latin American countries. Panelists emphasized the fact that water quality must remain a priority for management. In many places, especially water scarce regions, diminished water quality further exacerbates water stress by reducing viable water sources. In order to overcome this problem, many countries have turned to alternative sources of water,

such as desalination or wastewater reuse. However, these solutions can be expensive and unattainable, especially in rural areas.

The cumulative impacts of non-point source pollution are especially pertinent in rural areas and under developed countries, where there is a lack of technological infrastructure to deal with increased pollutant loads. Panelists stressed the fact that, especially in less developed countries, policies are generally more focused on water quantity, leading to poor water quality policies. Some argued that market-driven approaches could be used to change the culture of pollution, particularly in western countries. Panelists and audience members agreed that a top-down and bottom-up approach or community-driven solutions to water quality are necessary to change the culture around water quality. 



SS 62 – Towards SDG Implementation - Ensuring Water Quality from Source to Sea

TIME AND ROOM: 2 June 2017, 9:00 – 10:30; Salon Xcaret

CHAIR: Torkil Jønych Clausen

SPEAKERS: Birgitta Liss-Lymer, Gaston Romero Gonzalez, Callum Clench, Stefano Burchi, Raya Stephan, Simon Langan

HOSTING INSTITUTIONS: International Water Resources Association (IWRA) and Stockholm Institute of Water Institute (SIWI)

SESSION SUMMARY


This Special Session was jointly organized by the International Water Resources Association (IWRA) and the Source-to-Sea (S2S) Platform that gathers around 25 organizations. It is devoted to managing river and seawater. Managing seawater and freshwater together is a crucial issue that IWRA and S2S Platform addressed during the session because the water community tends to think about managing one or the other. The session showed the importance and challenges that are raised when thinking about managing water quality as a system from Source to Sea. For the chair of the session, Torkil Jønych Clausen, « The ocean community is freshwater blind ». This is also reflected within the Sustainable Development Goals, that differentiate freshwater and oceans in SDG 6 and SDG 14. Moreover, the first target of SDG 14, which focuses on improving ocean water quality, does not mention pollution coming from freshwater sources, only mentioning land-based activities. As such, this special session aimed to raise awareness within the water community, including lawyers and policymakers, in order to suggest a new framework when approaching water pollution.

One of the main challenges addressed is in understanding the system of upstream activities on downstream effects because water cycle management relies on linkages. Indeed, water quality themes are usually connected to ecosystems and health, but do not match with economic growth and increasing production, or so it is often thought by policymakers. However, the SDGs offer a solution in terms of implementation. To do so, a more integrated and indivisible agenda needs to be carried out by policymakers and agencies.

In the Mediterranean region, the 1976 Barcelona Convention is a milestone to seawater protection. Raya Stephan, consultant and board member of IWRA, stressed the importance of considering coastal aquifers because they are at the nexus between freshwater and seawater. Freshwater from coastal aquifers can be contaminated by land-based pollution or through salinization, thus the

importance of regulating water quality deterioration. Consequently, the Barcelona Convention provides a legal framework that sets measures to protect and control pollution of the Mediterranean Sea from land and water based pollution. In 2008, the Protocol of Integrated Management of Coastal Zones set another step in the protection of coastal regions by considering coastal aquifers and ecosystems. The extension of the Barcelona Convention with the 2008 Protocol acknowledges seawater with its connection to freshwater as a system.

Beyond the incorporation of coastal aquifers within legal frameworks, the implementation of water quality policy is more effective when data on water pollution can be documented and communicated. Gaston Romero Gonzalez, President of the Yucatan Basin, presented a local case study which showed the vulnerability of water quality within the Yucatan Peninsula. Water quality is poor because rainwater is not treated and coastal aquifers suffer from salinization as well as chemical pollution. Rivers become weaker due to high sedimentation. Moreover, the main issue when considering the case of the Yucatan Peninsula is that government representatives and concerned agencies lack information and lack institutional support. As such, a complete data system is necessary in order to provide better governance of water quality.

As a conclusion, the panel of the session discussed the needs of knowledge for institutions to implement adapted policies. Considering seawater and freshwater together as a cycle is a difficult challenge, raising new questions and problems. For example, how far inland should freshwater be considered as polluting seawater and vice versa? Three categories help organize the considerations of water quality levels: water which people can drink, fish or swim. Stefano Burchi called to bring the ocean within the river basin structure of governance. Overall, it seems that prior to regulating water systems, the cycle of water quality from source to sea needs to be apprehended and included within policy frameworks. 



4. Water Security in a Changing World

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RS 1 - Water Security in a Changing World: Alternative Sources of Water

TIME AND ROOM: 29 May, 2017, 15:30 - 17:00, Cozumel 1

CHAIR: Mary Hilderbrand

SPEAKERS: Jessica Rodrigues Pires da Silva, Jad Ziolkowska, Yoram Eckstein

SESSION SUMMARY

A key message from this panel was that while technology will be very important for the future supply of water, education is also extremely important. It will be crucial to educate the public about water usage and new water sources. For example, developed countries are very unlikely to use wastewater or recycled water for irrigation because of public perception about recycled water.

Some important facts related to water:

- A large concentration of the world population is concentrated on coastal zones.
- In many parts of the world, water is not distributed evenly.
- Agriculture uses 70% of the world's water.

The Chair of the session began by asking participants to be proactive and consider the downsides to new technologies and the solutions to those issues, as they will be the problems of the future.

Jad Ziolkowska, who presented on "Desalination Technology in the US: Potentials for Economic Growth and Sustainable Water Supply", talked about the development of a geospatial system in desalination. Desalination is the process of removing salt particles and minerals from seawater or brackish groundwater. She mentioned that the desalination market is led by Saudi Arabia and the US, followed by a number of middle-eastern countries.

In most countries, seawater is mostly desalinated but the US relies primarily on brackish water, which has a lower salinity and is therefore cheaper to desalinate. There is an increasing gap between water demand and water supply and no centralized data on the location and activities of desalination plants. She mentioned the development of an interactive model to increase transparency and asked audience to go for the link for more details: www.hitechmex.org/US_desal/US_desal.html

The main challenges of desalination are:

- Economically not feasible for agriculture;
- Produces CO₂ and salt run-off (some affluent goes into the sea i.e. Brownsville); and
- Permits for desalination plants can take a long time (5-10 years)

A couple of the solutions proposed to the future of water:

- Incineration may be a way to deal with our waste in the future.
- Simplifying the licensing process may be the key to efficient and effective uses of water.


A discussion on desalination would not be complete without mentioning the experiences in Israel. Israel has the most efficient reverse osmosis in the world. Forty percent of Israel's agriculture water demand is supplemented by desalination. The biggest barrier to desalination is price. In Israel, old plants dump effluent brine into the Mediterranean, which increases the salinity of the sea. New desalination plants are evaporating the brine and then mining it for various minerals.

Jessica Rodrigues Pires da Silva who presented on, "Boosting direct potable reuse: measures to be taken to help shorten the knowledge gaps and uncertainties surrounding this technology", focused on using wastewater as an alternative source of useable water. Most vulnerable communities have only a single source of water, which is climate dependent; wastewater treatment plants are a steady source and not climate dependent. Additionally, wastewater treatment plants can be relatively cheap. However, there are several challenges to wastewater treatment including:

- public acceptance - widely agreed to be the largest challenge;
- lack of specific legislation;
- water quality concerns; and
- economic feasibility

To improve the success of wastewater projects, there are several actions possible, including:

- altering language to market the idea to the public better;
- evaluating economic feasibility;
- choosing the best technology for your specific situation

For example, a common alternative practice in the US is mixing treated wastewater with conventional water. This water is re-treated, in order to help avoid social stigma of wastewater. 



RS 5 - Water Security in a Changing World: Climate Change

TIME AND ROOM: 29 May 2017, 17:20 – 18:50; Salon Isla Mujeres

SPEAKERS: Laura McCann, Meghan Klasic, Inom Normatov, Yukako Tanaka, Alfredo Ribeiro Neto

SESSION SUMMARY


The first speaker, Laura McCann, presented research on the comparison and evolution of water institutions in the U.S. Midwest. In the Midwest, climate change will lead to lower precipitation and increased variability, which may threaten water supplies. A better understanding of the current water institutions in Midwestern states can help policymakers face water scarcity and variability. This study focuses on five neighboring states enforcing three distinct water allocation doctrines; riparianism (Illinois and Missouri), regulated riparianism (Iowa), and prior appropriation (Kansas and Nebraska). It compares water institutions and implementation in these states and assesses institutional adaptations, concluding that there are lower transaction costs for switching from riparian to regulated riparian rather than prior appropriation but this switch means water is considered state property rather than a common good.

Focusing on another region of the United States, Meghan Klasic asked if science supply meets demand for water quality and extreme events in the face of climate change in California. As a first line of defense on public health and safety, water resource practitioners must consider water quality in long-term climate change planning. Current policies on climate change tend to disproportionately focus on water supply and availability rather than water quality. Water quality threats from extreme events, such as drought and wildfire, are becoming more commonplace, globally affecting drinking, domestic use, food production, and ecosystem health. To begin understanding why water quality and extreme events are not prioritized, the research considers whether published science supply is meeting managerial science demands. Science demand in this study is defined using water quality and extreme events data from a 2015 survey of California public drinking water systems with more than 200 service connections. Science supply is defined as the subset of published literature that addresses water quality and extreme events or climate change in California. . All but two water quality issues (groundwater agricultural contaminants and surface water infrastructure impairment) indicate some level of misfit between supply and demand when linked with drought. The work benefits both researchers and decision makers by identifying appropriate fit and misfit linkages between water quality and extreme events science demand and supply.

In Brazil, the adaptation mechanisms for extreme events in the Capibaribe River Basin were presented by Alfredo

Ribeiro Neto. River basins are impacted by extreme hydrological events (droughts and floods), especially in the face of climate change. This study characterizes the climate spatial variability and mechanisms used to deal with hazards in the Capibaribe River Basin (CRB) – Brazil. A comparison with similar regions helps to identify the level of climate variability in the CRB, the solutions developed to deal with both shortage and excess of water, and the status of the study area in terms of vulnerability caused by this characteristic. The main strategies identified in the basin for handling both drought and flood events are the construction of reservoirs.

The impacts from extreme events were also explored in Japan by Yukako Tanaka, who presented an estimation of the damage cost on compound water related disasters in Japan using a 2D non-uniform flow model. This study runs the simulation of a compound disaster involving flood and storm surge and evaluates the damage cost for the disaster in Japan. The tide level and daily rainfall, which cause the compound disasters, are calculated by means of frequency analysis for annual minimum atmospheric pressure. The 2D non-uniform flow model expressing the inundation depth is carried out using the tide level and daily rainfall distribution interpolated as input data. Damage cost is estimated using the inundation depth by each land use. Using this methodology, the total damage cost in Japan with a 50-year return period of compound disasters is 75 trillion JPY.

Finally, the modern state of the transboundary Amudarya main tributaries was described by Inom Normatov. The hydrograph of the tributaries of the Vakhsh River shows two extreme periods during the year: May-June and August-September. The period 1931-1961 is characterized by more stable temperatures with a significant increase since 1981. Also during the period 1931-1961, water flows in the Zeravshan River's has had a decreasing trend. Results show that the average annual volume of runoff has reduced and that the water resources upstream of the Transboundary Rivers depend on temperature and precipitation and therefore are subject to constant fluctuations. In order to avoid conflicts over allocation of water between upstream and downstream countries it is necessary to improve the exchange of information and timely notification of downstream countries about the estimates of future runoff. For this to happen, there needs to be a systematic monitoring of water resources in the upper reaches of the rivers. 



RS 6 - Water Security in a Changing World: Climate Change

TIME AND ROOM: 31 May 2017, 15:30 - 17:00; Cozumel 3

CHAIR: Bruce Currie Alder

SPEAKERS: Saswati Roy, Céline Dubreuil, Yangwen Jia, Alvar Escriva-Bou

SESSION SUMMARY

This regular session on water security through the lens of climate change gathered a variety of speakers and thematics. Climate change was discussed through history thanks to Saswati Roy's presentation. Examples from the Mediterranean region and California showed that the issue revolves around whether there is too much or too little water. A case study from China and the Yellow River basin showed the alternative solution to water scarcity on a large scale.


Saswati Roy from Calcutta University discussed the fact that there have always been myths around great floods in places such as Mexico, China, India and Europe. In the Bible, Noah's flood could have existed and she traced geography to understand where the truth stands in a myth. She also studied the example of Atlantis flood theory, which according to hydrology studies, could have happened in Turkey to create the Bosphorus Strait, probably due to deglaciation. As the ice melted, the sea level rose and more storms were formed. Noah's deluge could have occurred in the same region. The open question she raises through this study is to understand whether myths can be clues and answers to climate change and environmental reactions.

Still in the Mediterranean region, Plan Bleu, represented by Céline Dubreuil, has the objective to protect wetlands as a natural solution to floods. The Mediterranean basin has been identified as a hotspot for climate change with increasing temperatures, sea levels, and extreme events. With the Med-ESCWET project (2013-2016), the main goal is to promote the integration of climatic buffers with designated pilot areas. Through the study, it has been shown that wetlands should be protected because they allow for a natural flood control service. To do so, a biophysical assessment and an economic evaluation are conducted. As such, it offers an effective alternative to conventional flood management schemes at a lower cost.

Another alternative solution to extreme events was presented by the Public Policy Institute of California. Alvar Escriva-Bou discussed the method of water accounting to prevent heavy droughts in California. Improving water accounting by analyzing data and reviewing practices in other comparable regions is a key to understanding the policy that needs to be

adopted. The study compared California to Australia or Spain, regions where severe droughts are also occurring, to understand the balance sheet in water availability and how to distribute this resource. By accounting water, it allows policymakers, water users and operational agencies to acknowledge water availability and act upon it. There is a need for adapted hard and soft infrastructure to develop water accounting such as monitoring river basins, quantifying major water rights, clarifying environmental water claims, measuring strategic water uses and improving estimates. Overall, water accounting fits into modern and sustainable solutions, using data to make water consumption more efficient.

In China, the example that was presented during the session was a large scale project: adapting the Yellow River basin to climate change and to changing environment. Urban development, pollution discharge and sedimentation have contributed to decreased water flow as well as water quality. Meanwhile, urban floods have been increasing. So, in order to provide a greater security for water, the Chinese government has been implementing the sponge city concept on various cities within the basin. The concept's goal is to reuse rainwater by storing and treating it. This helps provide an optimal allocation and regulation of water resources. Moreover, it allows for control of groundwater overexploitation. Thirty cities are part of the program and several cities with multi-million populations are part of the basin. This case study showed that there are new techniques being developed going towards the implementation of a more sustainable use of water.

To conclude on this session, speakers emphasized the need to bridge the communication gap between scientists and policymakers. Both Céline Dubreuil and Alvar Escriva-Bou agreed that methods of communication and increased data sharing are central to bridging science to policy. Yangwen Jia added that fees and tariffs need to be taken into consideration when dealing with new solutions of water management. On a final note, Saswati Roy mentioned the fact that indigenous people possess highly scientific knowledge on environmental issues which leads to their sustainable life. According to her, it would be wise to consult on their opinion prior to implementing policies. 



RS 7 - Water Security in a Changing World: Climate Change

TIME AND ROOM: 30 May 2017, 9:00 - 10:30; Cozumel 3

CHAIR: Asit Biswas

SPEAKERS: Roberto Ponce, Hashim Alsafi, Layla Lambiasi, Nidia Tobon


SESSION SUMMARY

It is important to know how much water we have in order to evaluate the climate change situation properly, and we need the hydrologic data to comprehend water availability. It is also important to have economic and social data to model economic behavior. Integration of these two sciences can provide us with an analytical tool that allows policymakers and stakeholders to identify the impact of climate change on water availability at a basin scale, take into consideration spatial interactions of users and allows evaluating adaptation strategies to minimize the economic impact of climate change. A spatial analysis of both economic and social vulnerability shows that communities with the largest social vulnerability are the same communities that face the largest economic impacts for the agricultural sector. Our economic model should be based on efficiency. Climate shock brings about the changes in water availability. Old economic tools can be used to solve new economic challenges and economic dimension is one of many to be considered for policy assessment. A more interdisciplinary research focus is needed to solve local issues (social, ecological, economics and political).

Climate change impacts on long-term water availability, food security and the environment. In order to make an assessment of climate change impacts

on the variability of future streamflow in an area that is solely affected by climate change, not man-made changes, the Australian Bureau of Meteorology has conducted a study. The hydrological modeling results show decreasing tendencies in the future streamflow. The study complies with the previous studies and shows a noticeable decrease in the future rainfall & runoff. As such, these findings may be significant to manage the usage of future water resources in the catchment such as irrigation, water supply and even ecological/environmental use considering the low flows condition.

It is important to deal with uncertainty in a proactive matter in order to predict the future and be prepared for whatever might happen. This way, a decision making process can be scaled up and take into account a range of possible and plausible future scenarios and set a satisfactory setting that represents future conditions of interest.

As a key message, this session highlighted the importance of social behavior changes in order to cope with climate change. Societies need to adapt to possible scenarios and remain informed of water availability. The final step to implement measures for societies to be aware of their behavior is through communication of policies. 



RS 8 - Water Security in a Changing World: Conflict and Cooperation

TIME AND ROOM: 29 May 2017, 15:30 - 17:00; Salon Isla Mujeres

CHAIR: Gotz Reichter

SPEAKERS: Christopher Rossi, Shawna Moore, Ahmed Tayia, Lindsay Sansom

KEY MESSAGES

Transboundary water conflicts must be solved by cooperation between countries.

SESSION SUMMARY

This session discussed conflicts that may arise between two countries sharing transboundary aquifers.

What is a transboundary water conflict resolution?

A conflict is a situation in which parties perceive that they have mutually incompatible goals. A perception of mutual goals may not be an actual systematic conflict. A resolution is a multidimensional process that aims to facilitate a constructive social change among water-sharing countries. In order to promote cooperation and find a way to cure conflict, you must consider the physical, social, economic, and legal constraints governing each country. Neighboring countries sharing water bodies experience mutual interdependence. To resolve such conflicts that impair international relations and national water use, it is crucial to determine the basin benefits of each country. Shaping transboundary water management regime is also part of conflict resolution, leading to a greater cooperation between countries.

During the session, three case studies were presented by Christopher Rossi (Johns Hopkins University), Shawna Moore (United States Military Academy) and Lindsay Sansom (Texas A&M University) who respectively discussed the case of Bolivia / Chile, Egypt / Ethiopia and US / Mexico.

The Transboundary Dispute Over the Waters of the Silal/Siloli (Bolivia v. Chile)

Bolivia and Chile have had a transboundary dispute over the water flowing from the Silal, as it is known in Bolivia, or the Siloli, as it is known in Chile for over a hundred years. The water flows only four kilometers in Bolivia before entering Chile and only four more kilometers before merging with other water sources. Both countries may be using this transboundary dispute in order to create an external enemy. They seem to be using water for political reasons, framing an issue of water in terms of otherness: the other country is responsible for water problems. This otherness diverts attention from water scarcity internally.

Changing Tides of Egyptian Hydro-Hegemony

The Nile River supports irrigation and hydro power for over 200 million people; it covers 303 million square miles, and serves 11 riparian states. 80% of the Nile's headwaters come from Ethiopia, but the country has not owned its own water for decades due to the British Empire creating a legal framework in the region in the early 1900s that put Egypt at a serious advantage.


Until the recent political unrest in Egypt, the country had veto power over any dam built on the entire Nile River. This produces problems for Ethiopia, a country with a growing population that has a need for building dams. Ethiopia began building the Grand Ethiopian Renaissance dam even though Egypt vocally opposed it.

Egypt said it was an act of war to build the dam, but could not act on the threat because of political instability in the country. Ethiopia has continued building the dam, resulting in a power shift in that may knock Egypt from the top.

U.S.-Mexico Water Cooperation and Conflict

The United States and Mexico have shown great examples on conflict and cooperation with transboundary water issues in the Rio Grande and Colorado Rivers. However, drought has been a source of tension around the Rio Grande. Mexico and the US are actually able to cooperate more over the Colorado River rather than the Rio Grande. Conflict and Cooperation are not mutually exclusive; all countries with transboundary water courses go back and forth between conflict and cooperation.

How does the session feed into the theme "Bridging Science and Policy"?:

Bolivia and Chile have been fighting over water for over 100 years, yet neither country wishes to obtain the science behind the transboundary watercourse in which they fight, because the science may determine ownership over the water in a way one country would refuse to accept. This is a perfect example of policymakers refusing to bridge science and policy for political purposes. 



RS 9 - Water Security in a Changing World: Conflict and Cooperation

TIME AND ROOM: 30 May 2017, 15:30 - 17:00; Cozumel 3

CHAIR: Salman M.A. Salman

SPEAKERS: Nando Lewis, Yumiko Yasuda, Rebecca Farnum

SESSION SUMMARY

Transboundary water resources can be a source of conflict between countries. In this session, one presentation focused on the question of whether water can be a source of major conflict resulting in actual warfare, i.e. water wars. Recently, it was said that a drought in Syria caused a serious war, but this was blown massively out of proportion by the media and politicians. The drought may have been a factor in the civil war, but there were many other factors at play.

There is very little evidence that water can cause actual conflict. So far, countries have been able to compromise on water disagreements because war is a very expensive alternative. For example, a war almost began in the Middle East but the government quickly realized it would be much cheaper to implement desalinization plants instead of initiating warfare. Accordingly, water does not create actual war, but it can create civil conflict. Many factors affect conflicts between countries, not just water availability. We must look to water, food, and forced migration to find a conflict relationship.

Forced migration due to lack of water is a potential issue. Forced migration often leads to refugee camps but studying these camps is difficult due to a lack of accurate data. One researcher presented a study of sources of conflict in refugee camps in the Horn of Africa, examining factors such as a lack of water and rainfall to determine whether the influx of refugees was caused by water or food. Water affects food production and then may result in forced migration, but it is still questionable as to whether this causes conflict. A conclusion of the study was that refugees are normally a result of political unrest, rather than water or food shortages. Political unrest, food price, and climate across Africa are a set of factors contributing to international conflict. However, food is usually only related to conflicts when coupled with economic downturn.

In order to examine transboundary water sources for monitoring conflict, it is important to: (1) identify and analyze key factors that affect water cooperation and (2) identify the Zone of Possible Effective Cooperation (ZOPEC). A ZOPEC includes potential areas that could promote effective cooperation and mutual benefit. Effective cooperation is defined as a mutual

satisfaction and gain determined by a satisfaction model which includes procedural and psychological factors. An example of a psychological factor affecting transboundary water is concerning the India - China relationship on the Brahmaputra River. This relationship shows sensitivity and 'distrust' due to territorial disputes. The ZOPEC for the Brahmaputra River was determined to be: "Basin wide cooperation among all the riparian countries through cross-sector cooperation." An example of cross sectoral benefit sharing is in Bangladesh. Bangladesh is the lowest riparian user on the Brahmaputra River, and it receives access to water in exchange for providing internet for upstream inhabitants.


While promoting cooperation in areas that share transboundary water resources is important, some areas are unable to fight over water because they do not even have enough water to sustain a healthy lifestyle. For example, in Morocco, people were dying of thirst above the Sahara Desert due to vast water scarcity in southwest Morocco. Women were walking 3 to 4 hours a day and waiting for water to rise if it has been recently collected from a well. In these dire circumstances, an NGO heard about fog harvesting and thought it may work in Morocco where thick fog is quite common. The process of fog harvesting involves a thick mesh that the fog passes through, condenses and is then collected underneath in a trough. The NGO spent 10 years studying feasibility and sustainability for fog harvesting in the region. It required a long-term sustainability study and a collaborative process resulting from nontraditional forms of diplomacy.

After this work, the world's largest operating fog harvest project is now deployed in southwest Morocco, where communities in the region receive sufficient quantities water. Besides the increased water availability there have been many benefits to the project. Community engagement resulted from six villages linking to fog systems where water is piped into the homes of inhabitants. This forced villages to talk to each other over a shared resource, and create a "fog council". The operation brought jobs to the people in this rural region, empowering women who can now attend school, and improving children's education. It also brought rural villages and university students from the cities together, as well as outsiders who



come to study the scientific process of fog collection. Finally it helps counter islamophobia and brings a new conversation regarding international cooperation.

This example in Morocco showed that the potential conflict over international shared water sources has actually led to interesting solutions for providing water to citizens, resolving conflicts and encouraging integration. There are three tracks of diplomacy over scarce water sources between nations: (1) official negotiations, (2) unofficial dialogue between civil

society leaders such as international NGOs and academics; and (3) people-to-people relationship building (the bulk of diplomacy occurs here). It was concluded that in order to examine transboundary water sources, it is important to identify and analyze key factors that affect water cooperation. Water scarcity can be the reason new technology is created, and promoting collaboration and cooperation is how we reach success in creating sustainable communities. 

RS 10 - Water Security in a Changing World: Managing Risks

TIME AND ROOM: 29 May 2017, 17:20 – 18:50; Cozumel 1

SPEAKERS: Dolores Rey, Steven Nebiker, Oscar Sánchez Montufar, Mustafa Berk Duygu, Robert Šakić Trogrlić


SESSION SUMMARY

This session explored the management of risks for several water-related extreme events, including droughts and floods, from areas around the world. Climate change is expected to increase the frequency and severity of extreme events, including droughts. Thus, all the efforts to improve our future preparedness and to reduce our exposure and vulnerability to drought are worthwhile. Droughts are the main cause of economic losses in agriculture in many countries. Despite being a humid climate, droughts are a recurrent phenomenon in the UK. To start this session on managing risks, Dolores Rey shared research from Cranfield University exploring how droughts have affected agriculture in the United Kingdom for the purpose of improving decision making in the future and to increase the resilience of this sector to this natural hazard. For doing this, a systematic literature review of the main sources of information related to the UK agricultural sector has been carried out for the most recent drought episodes (1975-76, 1988-92, 1995-97, 2003-06 and 2010-12). The information has been classified according to different criteria. Using a DPSIR framework (Drivers, Pressures, States, Impacts, Responses) the information has been categorized accordingly to facilitate its analysis afterwards. This method facilitated the process of aggregating all the individual pieces of information associated with a particular theme, and hence the interpretation of the qualitative data contained in the dataset. From the dataset created with this information, a timeline based on the DPSIR analysis and a narrative for each drought event were constructed, facilitating the comparison between different drought periods and allowing the evaluation of the evolution of the impacts

and responses based on changes in technology, cropping and irrigation techniques, regulation and information. The results show how the different drought events have impacted the agricultural sector, how farmers and regulators have responded to those impacts, and how the management of droughts in UK agriculture has evolved over time.

Drought management was also discussed by Mustafa Berk Duygu, through the integration of science and policy. Drought is a vital phenomenon, particularly in closed basins where water resources are scarce to meet the demands. In Turkey, Konya and Akarçay Basins are among the closed basins which are susceptible to droughts at the highest level. In this study, drought, climate change, hydrological analyses and sectoral studies were performed to prepare drought management plans. The studies show that these basins will possibly experience more severe droughts in the future. By considering the results of these scientific studies together with the institutional capacities, the necessary policies to mitigate droughts for these basins were determined.

Next, Steven Nebiker of Suez described the transition to Dynamic Reservoir Operations (DRO) for municipal water supply. Suez depends on the Hackensack River Basin to supply drinking water for more than 1 million people in New York and New Jersey. The reservoir system consists of four reservoirs and multiple raw and finished water diversions that had been managed using operating rules developed in 1997. Since then, system demands and permit water allocation have changed, prompting the need to more effectively manage this critical resource. The water industry has long relied on the concept of safe yield




RS 10 - Water Security in a Changing World: Managing Risks

for reliability assessment and capacity planning. However, operators would never run their system to the safe yield for fear of running out of water, so rules are needed to reduce the risks. Operators often rely on storage-or elevation-based rule curves that lead to corrective action – like demand restrictions, cutbacks to downstream releases, or backup supplies-- but rule curves fail to account for the specific nature of individual droughts.

In a pilot study in September 2014, Suez decided to adopt DRO, which rely on rules that change based on the state of the system and/or forecasted conditions, including rainfall and runoff, demands, and potential outages. They provide insight on the potential severity of the current drought and thus give operators a complete understanding of the risks to the water supply. These DRO immediately demonstrated their value during extremely dry conditions that materialized in early 2015 and again in 2016. They allowed for data-driven decisions to improve the timing of drought response and made the system more resilient and cost-effective. In addition, the forecasts have been shared with state environmental regulators. Regulators have recognized the use of DRO as state-of-the-art science with which to inform regional water policy and have been working with Suez to test their use. Based on the success of the pilot, Suez expanded the DRO to include all of its diversions, resulting in a complete transition from rule curves that had been in place for nearly 20 years to nine probability-based triggers. This is the largest system in the United States testing probability-based triggers for drought management. The use of DRO received an internal Innovation Award from Suez North America for its contribution to sustainable water management.

For the management of risks from dams, Oscar Sánchez Montufar presented on the management of the Mexico Cajon de Peña Dam in the Jalisco State. Dams are classified based on their use under 3 types: storage (for water supply, irrigation, power generation, recreation, fish farming, etc.), diversion (to provide the hydraulic load required for their diversion into ditches, canals or other conveyance systems) and regulation (to retard stormwater runoffs, groundwater recharge, sediment control, etc.). During extraordinary hydro-meteorological events, it is important for the safety of dams, population and infrastructure located downstream to maintain a permanent surveillance on the climatological,

meteorological, hydrological and hydraulic forecast scenarios in order to reduce the risks that could be generated by a sudden discharge or dam failure. Oscar Sánchez Montufar described the policy implemented by the National Water Commission to monitor weather events and storage level management of the country's dams. Its implementation has reduced the risk of damage to the population and infrastructure located downstream, as well as to the dam.

Finally, managing the risks from floods in Malawi was explored by Robert Šakić Trogrlić. Current flood risk management strategies rely on international funds from donors, which tend to be used to facilitate Community- Based Flood Risk Management (CB-FRM) practices implemented by non- governmental organisations (NGOs). This study provides a critical overview of CB- FRM in Malawi, identifies lessons learned with respect to challenges faced, and presents the evolution of approaches for enhancing its efficiency and sustainability. A research framework, involving data gathered through focus group discussions, surveys and visits during field work in April 2016, has been used to analyse the current CB-FRM approaches. The fieldwork involved 11 focus group discussions, survey and field visits. The findings of the study indicate that risk reduction activities in the Lower Shire Valley of Malawi are implemented across different stages of the disaster management cycle (i.e. mitigation, preparedness, response, rehabilitation). Examples include community- led dike construction, early warning systems, economic empowerment through village savings schemes, and afforestation. Although disaster relief remains a prominent component of the process, increased emphasis on risk reduction and preparedness has been observed. Despite the stakeholders' recognition that CB- FRM has the potential to enhance the community resilience to disaster, a number of challenges and areas for improvement have been identified. The main challenges involve the relatively poor quality of existing CB- FRM projects which often undermines their long- term sustainability, weak governance in terms of coordination and reporting mechanisms between government and NGOs, and the lack of integration of rich, local knowledge into projects and policies. 



RS 11 - Water Security in a Changing World: Managing Risks

TIME AND ROOM: 2 June 2017, 9:00 - 10:30; Cozumel 3

SPEAKERS: Daisuke Nohara, Blandine Ouikotan, Robert Šakić Trogrlić, Sydney Weyand and So Kazama

SESSION SUMMARY

The session was generally on the topic of managing flood risk. Flood management is important in the face of climate change and severe floods are damaging not only to the infrastructure and human life, but also devastating for the economy.


Daisuke Nohara, from the Disaster Prevention Research Institute of Kyoto University, discussed assessments of the effectiveness of integrated reservoir operation for flood management. He highlighted the importance of addressing uncertainties in developing reservoir management strategies especially for reservoirs with multiple purposes such as flood mitigation, energy generation and water supply.

The second speaker, Blandine Ouikotan, talked about challenges of flood risk management in West African coastal cities. She identified the lack of flood insurance, data availability and early warning systems among the main problems associated with flood risk management. Current adaptation capacity exists only at individual and household level and Ouikotan suggested that the government should work on developing integrated flood risk management strategies in addition to developing and implementing emergency measures.

Early warning systems for floods also need development in El Salvador, as described by Adriana Erazo. She explained how transit times between hydrologic stations located in the same basin are analyzed here as well as how water depths from upstream to downstream are determined. Based on the results of this analysis and historical observations, different warning levels (i.e. monitoring, early warning, warning, alert and emergency) are assigned within the whole basin, but further development is needed.

The fourth speaker, Sydney Weyand from Texas A&M University, presented on the application of sociohydrology to predict long-term effects of the Alberta Drainage Project on flood risk in Texas. Sociohydrology is defined as the science of people and water, a new science that is aimed at understanding the dynamics and co-evolution of coupled human-water systems. Within the proposed methodology, various scenarios/policies are developed based on the parameterization obtained for human population characteristics, sociopolitical characteristics, and land use/land cover properties. Topography and hydrological models with these characteristics are used to generate hydrological responses of the basin from flooding events. She concluded that the results of the fairly new sociohydrological analysis will assist local leaders with policymaking decisions.

Finally, So Kazama of Tohoku University, Sendai, talked about the adaptation effects for floods in Japan. He stated that precipitation is expected to increase in Japan in the future and this may lead to more floods. Thus, in his study the goal was to investigate necessary adaptation and how to decrease associated damage costs. This was accomplished by using flood and inundation simulation results together with damage-cost estimation. He concluded that if proper adaptation measures are implemented, the damage costs of floods may be decreased in the future.

The threat of floods is prevalent in many parts of the world, and there should be collaboration in finding effective solutions to manage the risk from these events. The presentations given during this session shared various needs and lessons from Japan, West Africa, El Salvador and the United States, concluding that local and large-scale management of flood adaptation using methods such as environmental monitoring and early warning systems should be implemented. 



RS 29 - Water Security in a Changing World: Mexico - US Border

TIME AND ROOM: 31 May 2017, 17:20 - 18:50; Cozumel 5

SPEAKERS: Maria Elena Giner, Wayne Belzer, Felipe Vazquez, Suzanne Tillery

SESSION SUMMARY

This session highlighted the difficulties specific to Mexico and the United States.

The case of Mexico and the United States has a long common history. Wayne Belzer, from the International Boundary and Water Commission (IBWC), related the record of the treaties signed between both parties in order to agree on management of the Rio Grande, on which the Eastern border is based. Because it is a binational water body, it is more difficult to address water accounting and management in the region. The question that was raised by Belzer is how to apply a legal framework on the river, when each half is owned by each country. In order to work together and collaborate on growing concerns caused by growing population and increasing water pollution, all the agencies within the IBWC signed terms of reference. This contract serves as a framework to meet a series of common goals:

- Address current and future water quality issues
- Implement management procedures
- Evaluate current wastewater discharge infrastructure and management strategies
- Evaluate new mechanisms and strategies for system operations that could improve ambient water quality and address border sanitation concerns

To achieve these goals, the IBWC put together a pilot proposal. The first step in the pilot was to review the historical data that various water agencies from both countries have combined in order to compare it and identify the needs for future management. The proposal is currently in its second phase, producing expanded water sampling along with the river flow tests and comparing results. The future step consists in combining the entire process to develop a binational watershed protection plan to be completed by 2018.


On a more technical note, there has been research on water accounting in order to provide water adjustments in reservoirs along the river. This can be accomplished through various ways, as explains Suzanne Tillery. Because there is a strong water deficit in water cycles in the region, the goal of delivery adjustments is to use reservoirs to balance the water needs and hit delivery targets. It also plays an important role in water quality management. The difficulties in this practice lay in the collection of data and in making scenarios in order not to contribute to a greater deficit.

Overall, data collection seems to be a central issue

when managing binational watersheds. However, there are programs that allow assessments in order to be aware of the water waste treatment infrastructure. The example of Baja California, presented by Felipe Vazquez, showed a successful model when in possession of data. Indeed, through the use of Geographic Information Systems (GIS), the program was able to map where the needs of water treatment were greater. After conducting surveys within the communities, the overall results showed a good level of satisfaction and a global change of quality of life of communities, particularly thanks to the reduction in outside latrines in rural areas.

Maria Elena Giner also focused on the quality of life of communities and presented the project of Urban Green Infrastructure led by the Border Environment Cooperation Commission. In urban areas and at the border between the United States and Mexico, the main issue is storm water that is flowing between two shared water bodies. One of the action principle of the Commission is to suggest preventive solutions rather than resolving shocks caused by heavy stormwater floods. To do so, the project of Urban Green Infrastructure consists in developing soft engineering to enhance green surfaces in urban or dirt areas, for water to be infiltrated into the soil rather than flowing and accumulating. Not only does this project help capture water in a region that suffers from severe drought, Urban Green Infrastructure also helps on improving water quality.

Since 2014, the regulation of the project has improved and is now part of a municipal code. By adopting the code, it helps bridge science to policy because it automatically creates a legal framework through the guidelines and contract. Overall, Urban Green Infrastructure seems like a project that can improve the quality of life of communities while increasing water management at a local scale.

To conclude on this session, it has proven to show that the US - Mexico border is a complicated space that shares similar issues and is in need of a strong binational management. If there are already existing programs, they seem to be efficient at a local scale only. In order to bring this issue to higher governmental scales, it needs to be included in regulation frameworks for federal agencies to work together. The long and common history that both countries are sharing is a sign that cooperation is necessary, especially when sharing watersheds. 

SS 18 - Understanding Water Security in Cities: Empirical Evidence and Policy Implications

TIME AND ROOM: 29 May 2017, 17:20 - 18:50; Cozumel 5

CHAIR: Victor Arroyo

SPEAKERS: Jose Carrera, Abel Meja, Andrea Erickson-Quiraz

HOSTING INSTITUTION: CAF-Development Bank of Latin America

SESSION SUMMARY

There is a perception that Latin America has a lot of water, but water security plays an important role in managing this water. Since 80% of the population of Latin America lives in urban areas, this session highlighted the need to learn and obtain data regarding supply and demand in these cities. There has been a rapid increase in water scarcity so it is important to determine what should be done and what policies should be implemented. The most important components of sustaining water security include improving water quality, predicting results of climate change, predicting the future of supply and demand, reducing waste through investment in infrastructure operation and maintenance, and optimizing demand. With this information, special cases of water risk, like the water crisis in Sao Paulo, can be managed with greater success. Two thirds of cities in Latin America struggle with adequate drinking water and there are huge levels of water degradation in cities. The most important issue to understand is how the water network is used, so it should be determined what the water supply and demand is and their projections in the future, as well as understanding the high loss rates and capacity to trunk infrastructure to supply 'potable' water from reservoirs.


It was noted that hydrology would be sufficient 95% of the time for water demand by 2050. Freshwater is the most critical and it is important to understand and predict the consequences of climate change. Groundwater supply is key but since coastal cities are affected by sea level rise and salinity, it is difficult to protect the seemingly invisible source. Because of this, planning and policies are important in order

to optimise demand and overcome maintenance. Additionally, we should first think of the poorest and most vulnerable regions.

One major point noted in the session was that better water policy depends on better science, achieved with improved data and communication. Data will give information and choices, which allows decisions to be made with greater knowledge of the system by policymakers. Information is important in order to derive good policy.

Still, there are many barriers regarding access to water in Latin America as well as in the rest of the world. Policy and people are constrained by supply, institutions and money. Policymakers should determine the total quantity of water available and strive to improve efficiency of water distribution since there is no additional supply of water resources. Good science and data collection is essential for this purpose, as you cannot create sound policies without sound science.

Additionally, aging financial systems, institutions and regulations should be improved. There are three important questions to ask and explore in order to improve these components for ensuring water security: how will the climate change, how is the economy designed and how should we use the available technology?

Finally, it was agreed that communication between countries and cities should be improved in Latin America in order to sustain water security in the region. 



SS 21(A/B) - Water Security and Global Change Adaptation: Bridging Science and Policy

TIME AND ROOM: 31 May 2017, 15:30 - 18:50; Isla Mujeres

HOSTING INSTITUTIONS: El Colegio de Sonora; Inter- American Institute for Global Change Research;

Collaborative Research Networks

KEY MESSAGES

- **Climate change is exacerbating the existing water challenges from countries.**
- **Increasing participation from private sector is helping to enhance positive solutions.**
- **There was a recall for more involvement of the decision makers.**


SESSION SUMMARY

Global change has uneven effects on different areas in the American continent. This double session explored the different approaches developed in 6 countries of the region and England to address the water security currently under threat.

The Americas will be subject to decrements between 10-30% on annual rainfall depending on rising temperatures, changes on inflows, and seasonality. This situation will promote changes on crop yields and the maturity process. In terms of urban water, the challenges also arise from growing demands and the threat of increasing inequality if important actions are not taken on green infrastructure. Successful case studies were explored on how institutions could improve their performance on wastewater treatment, desalination, rainwater harvesting, and drought monitoring. This session shared great insights of multidisciplinary work on behalf of securing resources and what actions can be done from different places in

the arid Americas. The experts shared their learned lessons of projects despite the success of their implementation.

Valuable examples of bridging science to policy in arid America were exposed. Case studies from locations in Sonora Mexico, Mendoza Argentina, Peru, Central Valley Chile, Northeast of Brazil, and two states in the United States- California and Arizona- demonstrated experiences on how to address challenges implementing technology. It was determined that active participation and involvement from linked research institutions can generate positive spillovers to overcome the already existing problems exacerbated by rising temperatures. Inclusive work from the academic sector along with policymakers and stakeholders could really make a difference and provide insightful examples for interdisciplinary work. Water security becomes vulnerable from inaction in particular from inflexible institution and obsolete legislation.

An important lesson learned from this session was that water security is threatened by inaction, especially from inflexible institutions and obsolete legislation. To conclude, addressing water security in the Americas requires greater involvement from decision makers and participation from private sectors to enhance positive solutions. 



SS 26 - Reflecting on Regulating Water Security for Unconventional Gas and Oil

TIME AND ROOM: 31 May 2017, 9:00 - 10:30; Cozumel 2

HOSTING INSTITUTE: Baker Institute for Public Policy, Rice University

SESSION SUMMARY

This session sought to advance understanding of regulatory and policy regimes around the world in relation to the use of water for shale oil and gas production. Regulatory and policy issues surrounding the water use for hydraulic fracturing are present at every stage of operations, requiring operators to understand the legal, political, and hydrological context of their surroundings. Speakers examined who is fracking and where, water allocation, managing wastewater, and other water impacts, including public acceptance. Some of the research presented will be included in an edited book on water security in the context of shale production, currently in preparation.

Interview with Professor Jennifer McKay, Professor of Business Law, University of South Australia School of Law

What is the best way to protect water resources while still allowing hydraulic fracturing?

"The best way is to have a regional water plan that is legally enforceable and addresses point source environmental pollution. It is really back to the '70's in a way. That makes it easier to regulate, because these chemicals are toxic and easy to find. Some of them are, and some of them might not be, but on the balance of probabilities, you should be able to ultimately attach liability. So the best way is to have a regional water plan that has police powers and standards for the wells. There are international standards for well casing and they need to be policed

and enforced. These companies will not have enough money to pay for the damages anyway, and [so money] is not the solution anymore. The solution is for them to not make the mistake. Hundreds of industries work that way. It is possible to gain a higher standard if you are going to allow [hydraulic fracturing], which is what you need."

Are the reactions from local communities missing the mark on water resources as it relates to fracking?

"No, what we are seeing is community activism in Australia, and in the US too in parts of California. But in Australia, we are seeing very unusual people getting in bed together. [For example], farmers and environmentalists are united. The epistemic communities who normally do not cooperate are cooperating against this mining. That is a good thing, as long as you are in a democracy."

What are some of the legal unknowns with water and fracking?

"You can't sue [violators]. Even if they cause damage, no one will have enough money to remediate. You potentially destroy an aquifer and a whole farming community for 100 years, or whatever the half-life of these chemicals are, which is probably more than that. It is a very serious business and we would be using the precautionary principle, because we are not sure [of the risks]. We should be saying, ok we don't do it because we are not sure."



SS 36 - Water Stress and Demographic Dynamics

TIME AND ROOM: 1 June 2017, 10:50 - 12:20; Salon Xcaret

SPEAKERS: Boris Graizbord, Jesus Arroyo, Ismael Aguilar, Jose Luis Gonzalez Granillo, Richard Paisley

HOSTING INSTITUTIONS: El Colegio de México; Colmex, UdeG and ITESM

SESSION SUMMARY


This Special Session focused on the issue of coping with water governance while facing demographic stress. The speakers mostly delivered case studies from Mexico and focused on various river basins in that country. The river basins suffering from water stress are often located at the border with the United States. Shared water bodies bring about challenges in water governance and water distribution. Indeed, it is difficult to define what country should benefit from water reservoirs and how to evenly share transboundary waters. In the case of the United States and Mexico, they share the Colorado and Tijuana Rivers and the Rio Bravo Basin, a basin which provides water to around 12 million people in Mexico. In order to manage groundwater in the region, both countries signed the 1944 Treaty which has been of great value for Mexico to outline its economic purpose. Before signing the treaty, the basin was owned by the United States, thus the 1944 Treaty allowed for better water management for the water supply of Monterrey, the third largest urban metropolitan zone in Mexico. Both signing countries proposed regulation agreements on how to fill reservoirs downstream for Mexico with supply water deriving from upstream in the United States. In spite of the treaty, Mexico is still experiencing water stress due to urban growth, climate variability and political negotiations.

Another demographic stress to water supplies that was explored in this session was of human migration. As a consequence of climate change, researcher Boris Graizbord studied the impact of migratory dynamics on water resources and water services. Climate change is increasing the variability in weather, creating more extreme events, from tougher droughts to stronger storms. As such, Mexicans have been migrating to safer places within their country. To cope with this migration, Graizbord recommended that there needs to be a policy that adapts water supply to demand and

adapts infrastructure to water provisions. A case study of the metropolitan zone of Guadalajara showed the lack of water infrastructure and its impact on water management. Considering the location of the city, at the edge of a canyon, it is difficult to treat sewage that is discharged into the river which then increases river water contamination. The water supply for the city is from Lake Chapala, and water prices have been increasing due to water contamination and scarcity in times of drought. The main problems that the case of Guadalajara highlighted include:

- deficits in water provisions
- an uneven distribution of drinkable water, partly due to the lack of infrastructure
- insufficient treatment leading to greater water contamination
- the propensity for flooding due to inadequate infrastructure and vulnerable population settlements

Overall, the lack of governance is echoed in poor water management. In the metropolitan zone of Guadalajara, the local water authority (SIAPA — System Intermunicipal de los Servicios de Agua Potable y Alcantarillado) is leading surveys in order to understand the uneven nature of the water distribution.

To conclude on this session, Richard Paisley gave his insight on the situation between the United States and Canada. Considering the fact that 90% of the Canadian population lives within 200 km of the American border, compounded by stressors of climate change, urban sprawl and development, the share of water bodies at the border has also been a crucial issue. The 1909 Boundary Waters Treaty between Canada and the United States established an agreement on the share of energy and water provision. At the end of the session, speakers agreed that Mexico and Canada should work cooperatively to better manage the water bodies of North America. 



SS 38 - Water Security Issues for Developing Countries in a Changing Environment

TIME AND ROOM: 1 June 2017, 17:20 – 18:50; Salon Xcaret

SPEAKERS: Shaofeng Jia, Qianjin Dong, Dunzian She, Tianbao Qin

HOSTING INSTITUTION: Institute of Geographic Sciences and Natural Resources Research (China)

KEY MESSAGES


The technology and policy research presented in this session addressed water security as related to China; however its implications for reform of the DRI, risk assessment models and for a call for action to improve public interest litigation may be applied to all developing countries facing water security issues. The session presented both science and policy solutions for securing water in developing countries, namely China.

SESSION SUMMARY

The theme of the Congress “Bridging Science to Policy” was well represented in this session over water security in China. The first three presentations highlighted scientific models for measuring water security, and also for mitigating drought -- a major contributor to water insecurity in China. From a law perspective, Tianbao Qin wrapped up the session giving insight on how China is aiming to protect water through environmental public interest litigation and to present a call for action.

Shaofeng Jia from the Chinese Academy of Sciences, offered insight on how to measure water security. Through the development of a Water Security Indicators System, five criteria have been found to be of significance including: water quantity, water quality, sustainability, affordability and flood security. Qianjin Dong from Wuhan University called for an

action to redesign the drought resistance index (DRI), as the status of water security during drought periods in the Haihe River Basin has become very severed. Dunzian She presented on risk assessment models for concurrent drought events occurring in regions of China's water diversion projects. As the trend of extreme droughts continues to rise in the Haihe region, this model will be significant in aiding the debate between the regions as the possibility of conflict will increase as well. Giving the policy and law perspective, Dr. Tianbao Qin, professor of Law at Wuhan University, presented on protecting water through environmental public interest litigation of China. In order to improve water and environmental litigation, Dr. Qin made a call to action: to increase funding for water and environmental public interest litigation, and to better coordinate protection between the public interest and private interest groups.

As water security issues increase in all parts of the world, they are most severe in developing regions. China represents one of these cases, especially as it has the largest populations in the world, with thereby a largely stressed water supply. The technology and policy research presented in this session addresses water security as related to China, however its implications for reform of the DRI, risk assessment models and for a call for action to improve public interest litigation may be applied to all developing countries facing water security issues. 



SS 41(A/B) - Water Security in the Americas

TIME AND ROOM: 30 May, 2017, 15:30 - 18:50; Cozumel 4

HOSTING INSTITUTION: El Colegio de México and the consortium of the Hemispheric Observatory of Water Security

SESSION SUMMARY

Water security is a fundamental factor for peace, social cohesion and poverty reduction. This is the main reason why the UNESCO definition is the only one that gained global agreement. Dr. Blanca Jimenez reflected on the definition of water scarcity claiming that the UNESCO has the only definition that is globally accepted. The alternatives proposed by UN-Water were not signed by all member countries since it includes the conditions of political stability and peace as a requirement.


The idea that water security is an outcome of water governance drove the session. To achieve water security, the Americas ought to consider integrated management and strengthening their institutions. In many countries, the legislation is obsolete and fragmented and there is a general lack of access to financial mechanisms to improve management. A key message from the session was that water security is a geostrategic commodity.

Although Latin America and the Caribbean (LAC) is an extensive region with very heterogeneous climate conditions; the region is quite homogeneous in terms of the current state of water security. There are sufficient resources but they are generally poorly managed, which is a pity for a region that demonstrated the capability to meet and exceed the Millennium Development Goals (MDGs).

It became quite clear that there is a need for a Hemispheric Observatory on Water Security: a multilateral nourishing observatory with an integral vision to analyze and suggest strategies for the

protection and conservation of water resources for sustainable management. This observatory will rely on information from many countries for the development of strategic decisions with a long-term perspective. There were also discussions for the observatory to develop an integrated water security index that would help to foster transparency and improve the understanding of government decisions. Transparency of water governance would allow access to information in the media, which could be impactful for decision making as many politicians are more reactive to news than to actual research studies.

In general, water governance in the Americas should include policy design with accurate information to avoid undesirable effects. The region must also acknowledge the unsatisfied demand for water resources from different sectors including energy and agriculture.

The second part of the session showcased integrative platforms of digital information on open access from the Instituto Panamericano de Geografía e Historia (IPGH) and the Inter-American Development Bank (IADB). These digital tools provide information for quantitative simulation of hydrology and climate change in LAC for assessing the potential impacts of climate change on water flows and infrastructure. This information is free, publicly available and includes real-time data to support the design of adaptive projects and strategies. The technology are remarkable platforms that could drive in greater involvement from stakeholders and decision makers since they include information from different sources and are an excellent example of capacity building in Central and South America. 



SS 44 - Sustainable Watersheds: Emerging Economic Instruments for Water Security

TIME AND ROOM: 2 June 2017, 10:50 – 12:20; Salon Xcaret

CHAIR: Heidi Asbjornsen

SPEAKERS: Monica Altamirano, Dolores Rey, Alex Mayer, Roy Brouwer

HOSTING INSTITUTION: University of New Hampshire

SESSION SUMMARY

A 'Water Future Initiative' has been taken by a collaboration of nearly 400 working groups. Funded by the National Science Foundation, this session presented some emerging economic and financial instruments for enhancing water security worldwide through the lens of this project. Emphasis was placed on understanding the challenges and opportunities of developing effective economic instruments for improving water resource management. Specific initiatives addressed included national assurance schemes, water abstraction licenses, and payment for watershed services programs. Successful application of these instruments requires a deep understanding of the interactions and feedbacks between the human and natural systems that determine watershed sustainability.

The 'Water Future Initiative' aims to enhance water security and sees the diversification of economic and financial instruments as key for helping sustain our watersheds for the future. To accomplish this, the initiative takes on four main actions;

- 1) Conduct innovative research and knowledge for synthesis,
- 2) Find solutions to complex problems through stakeholder collaboration,
- 3) Future-proof our water system through a comprehensive assessment of our global water system,
- 4) Influence policy-making through capacity building outreach.


Representatives collaborating from various countries presented their research on these main actions. Dr. Roy Brouwer, Professor of Economics at the University

of Waterloo, presented research that accounted for behavioral change when assessing institutional and economic factors that explain environmental performance of payments for watershed services.

Dr. Dolores Rey, a water markets specialist from Cranfield University, called to action to reform water allocation systems. Suggested reforms included bonus water during periods of high flow and hand-off flows that switch gradually on and off to help respond to high stress periods. As explained by Dr. Rey, these types of reformations of water allocation systems will provide greater flexibility and sustainability.

Dr. Alex Mayer, Director of Water and Society at Michigan Technology University, answered a very important question--How do we model complex linkages between decision-making, land use and management, and ecosystem services? Through the development of a tested "toy" model, Dr. Mayer aimed to address the aforementioned question by simulating impacts of different social scenarios on ecosystems service benefits as well as trade-offs.

Another new institutional perspective on environmental issues was provided by Dr. Monica Altamirano, a specialist in public-private partnerships. She proposed that a financing framework for water security would serve as a guideline for local governments to "engineer" an implementation agreement, simultaneously fulfilling SDG 17- developing partnerships for the goals.

As economic and social drivers are most closely linked to policy change, these economic, financial and social instruments presented by the initiative, provided key innovations for helping secure water worldwide. 



SS 54 - Water Futures and Solutions (WFaS) – A Regional Initiative for the Americas

TIME AND ROOM: 1 June 2017, 9:00 – 10:30; Salon Xcaret


SPEAKER: Simon Langan

HOSTING INSTITUTION: International Institute for Applied Systems Analysis (IIASA)

SESSION SUMMARY

Where are we going to be in 2050 in terms of water demand and supply? Driven by this question, the International Institute for Applied Systems Analysis (IIASA) initiated a cross-sector collaborative global project called 'Water Futures and Solutions' (WFaS) in 2013. A regional initiative for the Americas, the project aims to progressively reduce the risk of water stress in the future. Since 2013, it has conducted integrated research and modeling towards a water knowledge hub of regional and global frameworks. These will guide policies and practices to ensure water security, through coalitions between scientists and other stakeholders. Frameworks are designed specifically considering how water demand and supply change over time in different geographical locations. The projections from WFaS estimate up to 2 billion additional people living in the world in 2050 and great increases in water demands in multiple sectors, such as agriculture and industry, considering productivity, irrigation efficiency, water pricing, household use and other components. The successful first phase of the project produced frameworks which help visualize the water scarcity scenario for multiple countries.

It was also noted that the Water Futures and Solutions project aims to address environmental issues more directly than the current Energy –Water – Food nexus. It examines where the opportunities and constraints to water security are and if countries and localities have interest in a shared/node framework for their geography. This thinking is then able to be scaled up to global perspectives.

In the discussions of this special session, the participants introduced regional cases as pathways for generating solutions with the WFaS project. These focused on Latin America and community-level initiatives that enhanced water communication, education and empowerment. Key considerations include how to finance solutions, maintenance of sustainable water infrastructure, the key role of partnerships among multiple stakeholders, the need to establish links with other SDGs, as well as the importance of thinking strategically about the role of women, youth and groups outside the water box in water management. 



SS 65 - Water Security and Climate Change – Challenges and Opportunities for Asia

TIME AND ROOM: 31 May 2017, 9:00 – 12:50; Isla Mujeres Room

HOSTING INSTITUTIONS: Asian Institute of Technology, Thailand); TUBS (Technische Universität Braunschweig, Germany), and THK (Technische Hochschule Köln, Germany)

SESSION SUMMARY


Asia is home to 4.4 billion people, or more than 60 percent of the world's population. The continent is facing serious water challenges in terms of both quality and quantity due to climate change, urbanization and population growth, which are issues that South America is facing as well. Through this lens, water security and climate change is raised as one of the urgent topics of the session.

The purpose of the session was for sharing data, and to present and share the main outcomes of the previous conference - "Water Security and Climate Change – Challenges and Opportunities for Asia" - that was attended by over 150 scientists from Asia in November 2016.

First, Prof. Mukand S. Babel raised an interesting topic on the definition of water security. One of the widely accepted notions is that "Water security is the capacity of a population to safeguard sustainable access to adequate quantities of and acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring

protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability". Prof. Rabi H. Mohtar then gave the outlook of the Water-Food-Energy-Nexus that is "achieving water, energy and food security; harmonizing humans with nature, and implementing integrated solutions require holistic and systems level thinking".

Finally Dr. Victor R. Shinde presented the framework for a city-scale assessment of water security for sustainable water management. Technically it is a great tool to convey surveys and share data on water security at the city scale in Asia. Even though this theme is usually covered by national government, local problems need to be addressed by more adapted institutions using city data.

At the end of the session, a roundtable discussion allowed for questions and answers. Overall, a key result taken from the general discussion was on the relevance of the science agenda for SDGs and Paris Agreement implementation. 



SS 74 - Getting to a Water Security Framework: Breaking it Down to Build it Up

TIME AND ROOM: 1 June 2017, 17:20 - 18:50; Cozumel 1

SPEAKERS: Alexandra Campbell-Ferrari, Luke Wilson, Clive Lipchin

HOSTING INSTITUTION: Center for Water Security and Cooperation

KEY MESSAGES


Water security is a growing field. It is still not clear within the literature whether water security operates as the umbrella concept, with IWRM as a tool to achieve water security, or whether water security is separate from IWRM concepts. This was an interestingly interactive discussion, where audience expertise added dramatically to the overarching goal of picking apart the concept of water security to identify a way forward.

SESSION SUMMARY

For this special session, the speakers decided to change up the structure of the session by gathering all audience members into a large circle for a group discussion. It was a refreshing change of pace for the end of the Congress. While the discussion was partially led by the speakers, it was equally steered by audience participants. Alexandra Campbell-Ferrari set the tone for the discussion by highlighting her opinion that international water law has no clear vision or goal, with seemingly ad hoc approaches to litigating water. In their new report through the Center for Water Security and Cooperation, Luke Wilson and Alexandra Campbell-Ferrari discussed their new definition for water security and highlighted ten corresponding nexus topics. The authors defined water security as "the ability to safeguard an availability of water sufficient to sustain lives and livelihoods and protect against threats to and from water." The participants then defined the meaning of 'availability' to include not only quantity, but also access and quality. Audience members challenged the necessity of creating a new definition in a rich literature space, where water security has already been defined multiple times. The authors defended their new definition by asserting that their definition operationalized water security to include lives and livelihoods, which was not sufficiently defined in previous definitions.

The conversation then shifted to the importance of operationalizing water security studies to better understand how and when water is managed adequately. The Asian Development Bank Water Security Framework was brought up as an example, but participants agreed that the massive index was difficult to apply, particularly in areas where data was sparse. At this point, Clive Lipchin identified the four components to water security that he thought were most important: governance, financing, capacity, and information. Wilson asserted that the nexuses identified in their report are a way to highlight the interlinkages between those components, which provide a structure for having conversations about difficult interconnections. Lipchin underscored the growing need to use a benefit sharing approach to generate effective cooperation built on interdependency. Lipchin outlined the example of Israel and Jordan, where Israelis realized that in order to keep the refugee crisis out of Israel it needed to continue providing Jordan access to drinking water. This is an ideal example of countries operating in their mutual self-interest through water.

How does the session feed into the theme "Bridging Science and Policy"?

This session was a very interesting discussion where speakers and audience members collaborated to break apart the idea of water security as a concept. It was a round-table style conversation, without the table. This session worked on identifying the best way forward for operationalizing the concept of water security into something that can be understood and measured in a consistent and collaborative way. Currently, water security literature is somewhat divergent, without a clear path forward for building on scientific understanding. The discussion attempted to move the concept forward into something more cohesive, whereby scientists and policymakers can have a strong foundation on which to build. 



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RS 13 - Water Policy and Governance: Economics of Governance

TIME AND ROOM: 30 May 2017, 17:20 - 18:50; Cozumel 3

CHAIR: Jim Nickum

SPEAKERS: Ina Thome Picoli, Rodolpho Delgadillo, Felipe Vasquez, and Rebecca Farnum

SESSION SUMMARY

This session focused on the pricing of water and highlighted areas in which we need to invest for successful water management. One presentation focused on a case study of Sao Paulo, Brazil. Currently, Brazil holds eleven percent of the world's drinking water which is enough to satiate its 208 million population, but seventy percent of that water is available only to seven percent of the population. The lack of water availability in Brazil is a result of spacing of the population. The Amazon has much of the water and a very sparse population while Sao Paulo has twenty million people, yet this area is plagued by serious water scarcity. In order to alleviate this problem, four water management tools have been developed:

- (1) Granting the right to use water (water allocation);
- (2) Charging for water use;
- (3) Framing of water bodies in classes of use; and
- (4) National system information on water resources (SNIRH).

Focusing on the second tool, it is important to note that users who change the water quality and quantity of a river basin are subject to charges. Ninety regions in Sao Paulo have now implemented charging for water which has improved water management. The State Water Resources Plan determined that billions of dollars are needed for successful water management in Brazil. Additionally, Brazil suffers from extreme weather events. Brazil needs to use funds from water charges to invest in the minimization and adaption to extreme weather events in the country.

The next presentation discussed water supply systems in Mexico, where water is also not distributed well. Most of the water is concentrated in the south and southeast of the country, with the highest levels of precipitation occurring in July and September. Therefore, intermittent water supply is normal in Mexico. Pressure peaks during the heavy rain months can lead to water main damage and high water losses due to leaks from this damage, which in turn leads to a higher volume of water needed. A further issue is that main damage also introduces pollutant intrusion. Due to water losses, coping measures such as rooftop tanks and bottled water are used. In fact, Mexico has the highest bottled water consumption in the world- thirty percent higher than the next highest consumer, Italy.

Utilities in Mexico depend on subsidies from the State, and as such, the State is in control. Pachuca, Mexico is an area which has a population of 512,000, high water tariffs, and receives water from an underground

overexploited aquifer shared with Mexico City. In a study focusing on personal interviews, Mexican citizens were found willing to pay for improved and continuous access to water. Most of the people who said they would pay more were women or from the youngest sector of the population. People are willing to pay more for improvement and are not willing to pay more for maintenance. Furthermore, in theory, the citizens in this region are currently paying enough to receive good service, however corruption means that this is not realised. They are informed and aware that corruption due to State control over water utilities contributes to the poor quality of water service in the country.

The next section of the session focused on the effect of the functional form on the residential water demand under block tariffs: an estimation using discrete-continuous choice models. Block tariffs in water consumption mean that you pay more for your marginal level of consumption. There are six functional forms for water demands, which take into account that water is a functional good: Logarithmic, Full logarithmic, Logarithmic-quadratic, Semi-logarithmic, Linear and Stone-Geary. It was recommended to estimate water values based on several functional forms and to report ranges of values for both expected water consumption and price elasticity.

The final speaker discussed the water pricing debate within a Moroccan fog-harvesting NGO in a critical endorsement of water pricing in specific situations. Southwest Morocco has no steady source of water, only intermittent rainfall, and as such, a NGO introduced fog harvesting as a new source for water in the region. Water has always been paid for in this region, previously with women's time-- in hours of travel and waiting, but now it is paid for with money. It is the women in the area who determine the pricing of water. As the cultural suppliers of water, it was important to keep them involved in providing water to their villages and included in the discussion of fog water systems.

Ultimately, this session focused on water economies of management. Water pricing is sometimes necessary, but deciding on a price is fraught with moral questions regarding a human right to water. Additionally, the session focused on an inability to share water even throughout the same country. In Brazil and in Mexico, some areas have more water than others and simply being able to disseminate water throughout one country is expensive and requires extensive infrastructure. Investment into water management is necessary and it may be necessary to change the way different countries are pricing water. 💧

RS 14 - Water Policy and Governance: Economics of Water Governance

TIME AND ROOM: 31 May 2017, 9:00 – 10:30; Salon Isla Mujeres

SPEAKERS: José Bento Da Rocha, Kleverton Melo de Carvalho, Adam Loch, Alfonso Exposito, Alex Godoy-Faúdez


SESSION SUMMARY

The session on economics of water governance included discussions on the water markets in various regions of the world. Projects in Peru, Brazil, Australia, Spain and Chile explored aspects of water markets and their strengths and challenges. In Peru, the Pipiripau Project “Water Producer in the Pipiripau River Basin, Federal District, Brazil” aims at improving soil and water conservation in the region by providing benefits to farmers through payment for ecosystem services (PES). Through partnerships with 18 organisations who work to make contracts with farmers, José Bento Da Rocha of ADASA explained how the project has been successful in its objectives to increase water quality and quantity, with the added benefit of farmer satisfaction with the project and willingness to extend contracts.

It was established that it is important to consider trade in water security around the world, and as such, virtual water in international water markets needs to be addressed. A research study in Brazil focused on tracking virtual water in Global Value Chains (GVCs) for internationally traded exports such as mangos and grapes which consume large quantities of water in their production. Kleverton Melo de Carvalho, a researcher in this topic, explained that international trade of virtual water is significant and has not yet been properly examined for good management. The study examined the inclusion of ‘water’ in Free Trade Agreements, finding a significant portion of these agreements do indeed consider water in some capacity. Various terms, such as “agriculture” and “energy” were found to be statistically linked with water, expressing the nexus between water, food and energy.

In terms of involvement from governments, it was expressed that poor institutional arrangements will hinder progress for sustainability, and so governments need to reduce transaction costs. A study on tracking transaction costs of salt intersection schemes in the Murray Darling Basin of Australia displayed a downward trend over time, suggesting flexible institutions with strengthening markets. In the future, greater use of transaction costs data could be useful for policy evaluations.

Examining water decision-making in Southern Spain, Alfonso Exposito explained how surveys of farmers on olive groves showed that farmers apply an irrigation dose far smaller than permitted by their water rights. This microeconomic analysis proves that water pricing policies lose effectiveness in water scarce regions such as this, where deficit irrigation is prevalent.

To finish off this session on economics in water governance, the water conflicts in Chile were explored. Alex Godoy- Faúdez explained how these conflicts stem from water scarcity and large-scale copper production. The cost of extracting water is increasing and solar mining has been proposed as a response to this issue. Other potential options including trade, hydroelectricity, storage systems and other renewables were discussed, however each has its own limitations. The audience participation featured a discussion of ideas on how to manage the water markets and shortages in Chile, with problems arising from legal rights to water and political obstacles blocking transboundary water transfers. 



RS 17 - Water Policy and Governance

TIME AND ROOM: 30 May 2017, 17:20 - 18:50; Xcaret

SPEAKERS: Barbara Moreto Fim, Daniel Gilmour, Viviane Vargas Franco, Stijn Speelman

KEY MESSAGES

Changes in policy have an impact on people, their welfare, and how they perceive the environment around them.

SESSION SUMMARY

Micro to macro issues are addressed by science and policy every day. Utilizing evidence-based research leads to better decision making, but the focus and input of the research cannot only be data and decisions, it must involve stakeholders as well. Understanding what drives individuals to make decisions will enhance policy construction because these changes are influenced by the same drivers influencing the individual. This means that environmental policies cannot stand alone. Instead these policies need to be married to, or supplemental to, policies focused on building financial security in stakeholders. This will better enable those stakeholders to engage in sustainable initiatives because they would have relief in areas of their livelihoods that they prioritize over environmental security.


Governments can utilize private organizations, such as Scotland's Centre of Expertise for Waters (CREW), to help develop policy around specific issues. In Scotland, when an issue arises or becomes apparent in a community, the government uses an outside agency (CREW) to help quickly develop different ranges of policy options dedicated to addressing the issue at hand. Artificial intelligence and models can also be used to mimic human decision-making.

Although similar policy issues may arise in different regions of government, the possible policy options addressing that issue might change. Policymakers

need to recognize local needs, and while the process for developing policy is transferrable, the data differentiates on local levels. This means there is likely not a one-size-fits-all option for policymakers. Instead they must rely on scientific evidence to tailor their policy options to particular local issues. This works vice-versa as well. Some differing local issues are addressed with only one policy and not every issue needs its own tailored policy. One policy can address many differing issues. This is why it is important for science and policy to reach across sectors to compile a menu of possible policy options. Additionally, each policy change will have an impact on communities, and science needs to follow up on how these changes occur.

The messages of this session stressed how social, economic, and environmental issues need to work cohesively together. Every policy has an effect on each of these pillars. Scientists can impact these processes by working with individual policymakers, and scientific institutions can achieve these goals through working broadly with differing scales of governments.

How does the session feed into the theme "Bridging Science and Policy"?:

It is important for scientists to get involved and follow up on policy issues. Real change happens when individual scientists create relationships with individual policymakers. 



RS 18 - Water Policy and Governance

TIME AND ROOM: 31 May 2017, 17:20 – 18:50 ; Cozumel 1

SPEAKERS: Harris Kuemmerle, Luis Alberto Labra Hernandez, Ronald Kaiser, Zhuping Sheng, Antti Belinskij

SESSION SUMMARY

Regular Session 18 on Water Policy and Governance featured five speakers. The overall focus was on water law, policy, and planning at different scales, ranging from local to international and processes to gain information on societal preferences on alternative strategies. While regions and geographic scales of focus differed, the importance of identifying local, regional, and state-level opportunities to improve water conditions was a common theme. The final speaker brought things full circle by positing that international water law must be seen as a means of addressing local livelihoods.

Two graduate students led off the session. Harris Kuemmerle, a Ph.D. candidate in both the War Studies and Geography departments at King's College London and the Editor-in-Chief of Strife Journal and Blog, spoke about Pakistani hydropolitics. His fieldwork and studies reveal that Pakistan's interests with respect to India are socially constructed and emergent from a subnational level. In Pakistan, the provinces (or states) are the main players; there is no national policy involving water. The Indus River system is a basin with competing sovereign entities. He emphasized that the unit of analysis should be no higher than the province.

Luis Alberto Labra Hernández, a student of Political Sciences and Public Administration at the Autonomous University of the State of Hidalgo, Mexico, spoke about use and management of water resources. He looked at linking levels of government from the bottom up and top down, with the geographic focus being three relatively poor municipalities in Hidalgo, where much of the water use is by agriculture. His study of national, state, and municipality plans and his analysis of strengths, weaknesses, opportunities, and threats revealed that, despite the number of developments by the national and state plans, there is a lot left to do. There are gaps in financial and regulation capacity. Coordinating the different levels of the government to make sure services are delivered to the residents will be key to address the water challenges. His main take-away is the need for participation of the civil society – the bottom up approach.

Texas A&M University Professor of Water Law and Management Ron Kaiser followed with a presentation of his work on use of preference-feasibility framework to enhance water planning/decision-making. The process is designed to identify areas of agreement

on water strategies and options. Parties are brought together to rank their preferences and the acceptability of the alternative management options. It is a value-based process where people first rate their preferences and then get to feasibility, considering economics, technology, etc. Professor Kaiser showed how the results of several applications in different geographic regions of the USA states of Texas and Louisiana using the Preference-Feasibility Grid. He explained how Texas state planning moved from a top-down approach to a bottom-up approach whereby plans are developed by 16 regions within the State. He reported that the different regions prioritized options differently. His take-away messages related to finding the opportunities to coalesce around projects when parties agree and then use the points of disagreement as points of departure for further discussion and exploration.


Professor Zhuping Sheng from Texas A&M University at El Paso also spoke about top down versus bottom up water resources planning. He presented results from a study of the long-term water plans for the megacities of Houston, Texas USA and Shanghai, China. Both are experiencing population growth and are concerned about adequate water supplies. He examined the planning issues and identified similarities and differences, with a focus on demand versus supply strategies. Like the previous speaker, Professor Sheng noted that Texas water resource planning moved to a bottom-up approach in 1997. In Houston, the focus is on water shortages for the next 50 years; there they plan for drought and update the plan every five years. The main concern is water quantity. Shanghai, on the other hand, engages in top down planning for a 20-year period, with irregular updates. The major concern relates to adequate water supplies from a water quality perspective to meet the water needs of the population. Water conservation is an important strategy in both cities, but other water priorities differ. Groundwater, climate, and environmental constraints are important to both regions. Professor Sheng closed by noting the importance of sharing and exchanging advances in science and technology.

The final speaker of the session was Antti Belinskij, who is a Senior Researcher of Environmental Law at the University of Eastern Finland Law School. His presentation focused on the premise that local needs are at the heart of global water governance. Considering the science-law-policy nexus and the



RS 18 - Water Policy and Governance

mass migration of individuals, he poses the question: Does water law further water security? Half of the workforce globally depends on water and natural resource-dependent industries for jobs. His work considers local livelihoods and working opportunities in rural areas. Population growth will result in rural poverty and rural push to urbanization. Economic stagnation can result, with an associated increasing education gap increasing, insufficient investment, and environmental degradation. Is there a way that international water law can promote water security? He discussed the 1997 UN Watercourses Convention

and the call for equitable and reasonable utilization, with special regard to the requirements of vital human needs – the human right to water. This specifically means drinking water and water for food production to prevent starvation. The SDGs call for more, namely sustainable water management for all. Local livelihoods are broader than the human rights issues. As for the role of global water law, he argues for reconciliation of international and national water law since international watercourses serve more than 40% of the world's people and sees local livelihoods at the heart of global water governance. 

RS 19 - Water Policy and Governance: Transboundary Aquifers Law and Policy

TIME AND ROOM: 30 May 2017, 15:30 – 17:00; Salon Isla Mujeres

CHAIR: Götz Reichert

SPEAKERS: Pauline Robert, Bertram John Swartz, Malcom Gander, Raya Marina Stephan

KEY MESSAGES

It is recommended to provide templates for general guidelines to apply when managing aquifers between transboundary states.


SESSION SUMMARY

This session reinforced the strong need that exists to translate the technical science of groundwater management and hydrogeology applications to policymakers over transboundary aquifers. The development of best management practices are relatively new, and shared aquifer management adds a more complicated approach to groundwater management. Aquifer management between shared borders will require special attention by policymakers. To do so, the scientific community must simplify messages related to groundwater resources. This session provided key guidelines to both simplify the process and manage aquifers between transboundary states. Legal, hydrogeologic, and policy perspectives were presented.

When making decisions over shared aquifers, the following benefits must be considered: equitable utilization, reasonable utilization, and the duty by both countries to protect. Seven key hydrogeological principles were considered. These factors include shared data between nations and recharge basin protection.

Mr. Berran Swartz provided insight into a Basin Management Committee approach. This approach has been a beneficial framework for groundwater regulation in the Stampriet Transboundary Aquifer System (STAT). Furthermore, a unique perspective was provided by Ms. Pauline Roberts over transboundary resources, where she shared the difficult process for indigenous people to secure their rights and lands of natural resources. While little policy standards and framework have been developed for developed countries, those standards by which indigenous people may claim rights amongst shared borders is even more limited. These principles and guidelines presented were key in the discussion of developing a framework by which transboundary aquifers might be managed in the near future. The key to developing this framework will be for countries sharing an aquifer to share data, and to make technological information that is applied to aquifer management digestible for policymakers.

How does the session feed into the theme “Bridging Science and Policy”?

A strong need exists to translate groundwater management and hydrogeology applications of managing aquifers to policymakers. Aquifers between shared borders will require special attention by policymakers. Thus, simplifying messages of the scientific community as related to underground water resources is vital. 



RS 21 - Water Policy and Governance: Transboundary Aquifers on the Mexico-US Border

TIME AND ROOM: 31 May 2017, 9:00 - 10:30; Coba

SPEAKERS: Alfonso Rivera, Rosario Sanchez, Jessica Foster, Lindsay Swanson, Luke Wilson

KEY MESSAGES

Three key messages arose from the morning session on transboundary aquifers on the Mexico-US Border as it relates to water policy and governance.

Trust

Throughout all 5 speakers, a common theme was trust. Before nations can manage transboundary aquifers, there must be transparent communication between all parties and more importantly, the parties must trust one another for the communication to be effective. This is applicable to all transboundary aquifers worldwide, but it is extremely crucial with US and Mexico who are experiencing a sensitive environment with the latest US election.

Accessible Information

It is clear that there needs to be more information on aquifer health/status and water usage. However, disseminating the information to the public and policymakers is just as crucial as gathering information. This will not only allow policymakers to create policies that reflect accurate science, but it also allows the public to understand their individual responsibilities and gives the public an investment in the aquifer.

Bring Stakeholders Together

This solution is a common theme throughout the entire Congress—to build trust and make information accessible we have to unite all the stakeholders. Stakeholders include more than scientists and more than the two nations' governments. The local communities have a stake in the outcome of transboundary aquifer management, which means they need to be represented at the table. Water is primarily a local resource and in Mexico, there is a human right to water which suggests local utility owners need to be at the table with policymakers, scientists, and lawyers. Unfortunately, many panelists have agreed that it will take a serious crisis to bring everyone together to discuss a solution.

SESSION SUMMARY

The following is a breakdown of the five presentations concerning Mexico-US transboundary governance of water resources.

Alfonso Rivera spoke on approaches to implement the Regional Strategy of the Transboundary Aquifers of the Americas. The mission is to “increase the generation and exchange of knowledge regarding transboundary aquifers, develop communication pathways, cooperation and joint work between participating ISARM Americas countries.” Sustainable groundwater development in transboundary aquifers will require a balancing act of aquifer storage with social, economic, and environmental requirements. The main challenge in a majority of countries is the lack of information which results in an inaccurate public perception and fragmented water policies. To achieve greater access to information, it will require cooperation and the sharing of information and data among individuals and nations. To begin the information exchange process, there needs to be trust between countries who share these aquifers. Additionally, research and development is expensive which means there must be a public investment for research and development in developing countries.

Rosario Sanchez suggests a new approach for transboundary aquifer sharing: transboundariness, which is an approach that seeks to explain why some aquifers receive more attention than others. This approach suggests an aquifer's transboundariness relies on more than simply the physical size. The approach seeks to recognize an aquifer's value in the context of economic, environmental, social, cultural, and legal institutions. The criteria to determine an aquifer's transboundariness include:

- population,
- groundwater dependency,
- water quantity/quality challenges,
- data/research availability,
- political recognition as transboundary,
- cooperation effects, and
- other issues governing the agenda.

Using the criteria above, the three top aquifers are ranked as follows:

1. Hueco Bolson
2. Mesilla Bolson
3. Edwards Trinity

Next, Jessica Foster discussed the legal frameworks governing groundwater in Mexico and Texas. The two legal institutions are extremely different which



RS 21 - Water Policy and Governance: Transboundary Aquifers on the Mexico-US Border

leads to frustration in managing a shared resource. Groundwater in Mexico is governed by the federal government, while in the US it is governed by individual states. In Mexico, groundwater has a usufructuary right (the right to use, not a property right). In contrast, Texas recognizes groundwater as a property right that can be severed from the land, and the right is that of the rule of capture. This means an overlying landowner may pump in excess, regardless of the effect on the aquifer, subject to a few minor exceptions like malicious intent. In contrast, Mexico can limit groundwater pumping in emergency situations by refusing to grant new water rights, but cannot limit existing water rights holders pumping.

In addition to the contrasting legal institutions, there is limited cooperation among the stakeholders in Mexico and Texas. This has an effect on the information available about the aquifer itself and the water usage, which in turn, limits cooperation because there is no information to discuss. Possible solutions proposed by Foster were to require groundwater conservation districts in Texas, rather than on a voluntary basis. This would create a power to limit pumping where there is not that power now. Additionally, Foster proposed creating a tax to give users an actual investment in the resource so they feel connected and responsible to the aquifer. Lastly, Foster proposed an echo of what many panelists have discussed—there needs to have an investment in the management of the entire aquifer.

Lindsay Swanson used the Hueco Bolson as a case for Improved Transboundary Aquifer Management. Transboundary water cooperation at the local level can be very difficult to achieve but the municipalities of El Paso and Ciudad Juarez have worked together to preserve the shared Hueco Bolson aquifer. To advance this cause, a Memorandum of Understanding (MOU) was signed in 1999; however, a lack of transparency makes it unclear how this MOU has been implemented. Sansom proposed three policy options for the future of this aquifer, discussing the strengths and weaknesses of each. Policy 1 would be to maintain the status quo.

While the institutional structures are already in place, the US does not have state support to incorporate groundwater into additional minutes under the 1944 Water Treaty. Policy 2 is the Bellagio Draft Treaty, which was customized for equitable transboundary aquifer sharing specifically along this international border. The treaty does not engage key players and it has a rigid framework that is not politically feasible. Policy option 3 is an informal regional agreement. The regional scope brings focus on municipal cooperation, provides a model for equitable water sharing, is flexible without infringing on sovereignty issues, and is more politically feasible. Sansom proposed that the sister cities broaden the scope of the MOU and create more transparency for cooperation so that water managers can improve long-term sustainability of the shared aquifer.

Finally, Luke Wilson discussed many options for ensuring a conflict-friendly future for US-Mexico groundwater regulation on the international level and the local level. For the local level, Wilson gave two policy options: informal memorandums of understanding and interstate compacts. At the international level, Wilson gave five policy options and discussed the applicability of each:

1. IBWC – treaty based on Min 242
2. A separate agreement
3. Arbitration
4. International Courts of Justice
5. Negotiations



RS 25 - Water Policy and Governance: Integrated Water Management

TIME AND ROOM: 1 June 2017; 10:50 - 12:20; Cozumel 2

CHAIR: John Tracy

SPEAKERS: Pierre Alain Roche, Fabian Drenkhan, Martin Quinger, Nathalie Richards

KEY MESSAGES

International support is fundamental for achieving the sustainable goals in emerging countries.

SESSION SUMMARY

This session highlighted the efforts that need to be made at national and international levels to meet International Water Resources Management for Sustainable Development Goal 6.5. The case studies presented during the session illustrated the type of efforts that are required. As such, challenges faced by France, Peru, Tanzania and Namibia were addressed.


Aiming to help environmental and governance problems such as scarcity, hydroclimate variability, glacier hazards and conflict over water resources, a technological solution - integrative water balance model: RS MINERVE - has been developed by both French research center CREALP and engineering office Hydrocosmos as well as two universities (École Polytechnique Fédérale de Lausanne and Universitat Politècnica de València) and Hydro10 Association. This has an efficient structure and domination land cover. The platform simulates the rainfall-runoff processes and streamflow routing. It allows hydrologic and hydraulic modeling and takes hydraulic control elements into consideration. Thus, it serves as a tool to comprehend water flows and model them in order to put adaptable strategies in place.

In Tanzania, there is a competition for water access between improved versus traditional irrigation systems. Small-scale farmers have to struggle to access water, while the large-scale farmers have

better access by using formalized channels due to private sector advantages. Moreover, institutions have a crucial role in helping small-scale farmers to have a voice. In addition, Basin authority must regulate institutions so that they have a stronger say in catchment committees to balance small commercial farmers.

Due to the support from German organizations, actions toward a better integrated water management are taking place in Northern Namibia. Four management committees on Sub-Basin level in the Namibian Cuvelai-Etosha Basin were established, which are supported by the commission of the transboundary waterbody between Angola and Namibia. It is strongly recognized that the groundwater systems interacts with the surface water. As conclusions, it was raised that groundwater can be considered as secure supply option for the region if developed accordingly as well as the protection and sustainable use of resource requires careful monitoring and very close cooperation with all stakeholders. Finally, a sound legal framework must be in place to control any development of the system.

How does the session feed into the theme “Bridging Science and Policy”:

Developed countries must provide technology to help the governance in developing countries. 



RS 26 - Water Policy and Governance: Regional and International Law

TIME AND ROOM: 31 May 2017, 10:50 - 12:20; Cozumel 3

SPEAKERS: Götz Reichert, Brett Miller, Andreas Wendl, Deborah Curran, Mara Tignino

SESSION SUMMARY

Water policy is rightly aspirational. But water law should be formulated and implemented to facilitate concrete measures to achieve those aspirations. Götz Reichert, the head of the Department of Environment, Energy, and Climate at the Center for European Policy, noted in his presentation that the European Water Framework Directive provides a multi-dimensional water management regime with coordination between national governments, the EU, EU member states, and non-EU member states sharing transboundary waters with EU members. While Dr. Reichert's "reality check" of this framework noted its shortcomings, he stated his optimism regarding this adaptive, science-based approach to ecosystem-level water management. The procedural framework alone, despite its failures in some substantive respects, represents a concrete step forward in European water policy.


Brett Miller, an attorney from Texas specializing in water law, similarly suggested concrete approaches to securing the aspirations of the human right to water. Mr. Miller suggested that properly regulated engagement of private equity firms provides a Pareto-optimal approach to advancing water security in developing nations. Mr. Miller's theoretical approach noted that the language of international human right to water instruments frequently include explicit reference to economic concepts, making the economic analysis of the legal approaches to the human right to water an effective lens through which to evaluate and reform efforts to expand access to clean water.

Andreas Wendl, an attorney from Germany focusing on emissions trading regimes, focused on the challenges of a particular developing country - South Sudan. Mr. Wendl argued that South Sudan is bound under customary international law and the Vienna Convention to the 1959 agreement regarding

apportionment of the Nile between Sudan and Egypt. Given the ongoing civil war in South Sudan, and despite the arguable obsolescence of the 1959 treaty and the aspirational nature of the current Cooperative Framework Agreement on the apportionment of the Nile, Mr. Wendl suggested concrete measures for South Sudan to honor obligations under the 1959 treaty, while still advancing toward the aspirations of the Cooperative Framework Agreement.

Professor Deborah Curran, the acting director of the Environmental Law Center at the University of Victoria, noted concrete steps that indigenous communities in Canada have taken to secure influence in water management. While some indigenous communities have found success in securing property rights, many have made meaningful advances in achieving the aspirations of indigenous water rights through consultation requirements for government permits and participation in collaborative watershed management.

Dr. Mara Tignino, Senior Lecturer and Coordinator of the Platform for International Water Law at the University of Geneva, also focused her presentation on concrete measures to implementing an aspiration right to water for indigenous peoples. Dr. Tignino noted that the UN Sustainable Development Goal targets frequently use language directly or indirectly integrating concerns of indigenous peoples with respect to water, and that these targets might be more meaningfully achieved by integrating indigenous rights to water with the concept of "vital human needs" embodied in international water allocation law.

The regional and international examples and proposed measures in each presentation demonstrated the challenge for the law to achieve water policy aspirations, but also suggested optimism in making incremental and concrete reforms. 



RS 27 - Water Policy and Governance: Law

TIME AND ROOM: 1 June 2017, 9:00 – 10:30; Cozumel 3

CHAIR: Raya Stephan

SPEAKERS: Jane Cohen, Mauricio Carvajal, Laura Movilaa Paterio, Alexandra Campbell-Ferrari

KEY MESSAGES

- **Even after legal settlements, there can still be long-term public health and environmental effects. These effects haunt society long after the general public has forgotten about the litigation.**
- **Case-law is needed to flesh out the legal parameters of water law.**
- **Water Markets are not necessarily good or bad, but some regulation is needed to protect those most vulnerable.**
- **There is a need to construct and maintain water infrastructure, but not many ways to currently pay for it in the U.S. States need to ensure that water fees are going towards water infrastructure and not the general fund of a state. Currently consumers do not pay enough but many people would not be able to afford the true price of water.**
- **What is proper; the human right to source water or the human right to tap water? How will human rights and environmental issues influence laws in the future?**

SESSION SUMMARY

This session's speakers discussed a variety of legal issues regarding water, from contamination litigation to the future influences on law such as the right to water. On litigation, chemical contamination of the Ohio River was discussed. Many people suffered serious medical conditions and alleged that those conditions were caused by chemical dumps into the river, which was a drinking water source. The court appointed a panel of experts to determine actual causation; to determine whether Dupont's chemicals resulted in the health effects at issue. While the defendant, Dupont Chemicals, eventually settled the case after a long and drawn out lawsuit, the problems associated with the contamination still persist. This case is an example of how government and the legal system failed to protect public health now and in the future. The question was posed: Are companies and the public ever going to face the problems at hand, or do we need a future time traveler to warn us and fix the problem?

The topic of case-law and how it influences the way that water is managed was also discussed. In Spain, new developments are required to prove their water sustainability in the future. While this report was

required, it was unclear whether it was binding. Case-law, including at Spain's highest court, eventually came to the conclusion that sustainability reports are, in fact, binding. When making case-law, courts must seek out expert knowledge and data, and adhere to the constitutional principles of their jurisdictions.

Water markets were discussed as well. No determination was made as to whether water markets are necessarily good or bad, but the economic, philosophical, and moral debates were mentioned. While water markets can bring benefits to countries that need economically efficient water allocation, there need to be regulations that ensure the poor and vulnerable are not left out. With regulations and clear laws, legal action can be used as a tool to help those who need protection. Artificial intelligence can be used to analyze legal arguments and success rates and determine how the law works within a country with water markets.

Water infrastructure was another important topic that was discussed in this session. In the U.S., nearly one billion dollars needs to be spent on water infrastructure by 2030. This is a large expense, and U.S. states are not spending nearly enough to keep infrastructure up to date. Maintenance is another important, but costly, aspect of water infrastructure. Additionally, water fees do not always go towards water infrastructure, as no states require that fees fund infrastructure. Often, these fees go to the general fund of a city or state.

The future of water law will be influenced by a variety of trends and factors. The human right to water is gaining popularity with many countries, but its implications are not clear. Environmental rights are also gaining traction in some legal systems. These rights include legal personification of rivers or lakes and recognizing the Earth as having prior rights in relation to human water rights and needs.

How does the session feed into the theme of "Bridging Science and Policy":

Courts and policymakers need scientific data to create or interpret laws and to determine causation in litigation.



RS 28 - Water Policy and Governance: Law

TIME AND ROOM: 1 June 2017, 17:20 - 18:50; Isla Mujeres

CHAIR: Lilian del Castillo-Laborde

SPEAKERS: Deborah Curran, Marcella Nanni, Niko Soininen, Rhett Larson, Stefano Burchi

SESSION SUMMARY

This session focused on countries that desperately need legal reform in order to promote water management and environmental sustainability. From Africa to North America and Finland, water law is still a work in progress around the globe.

To start, Deborah Curran, professor of Environmental Law at the University of Victoria, spoke about the legal water situation in Canada. Seven percent of the world's fresh water flows out of Canadian rivers, but a vast amount of this water flows to the north while a majority of Canada's population is located in the South. Although there is not a lack of water there is an issue of water allocation to citizens. Additionally, there is a procedural problem as the provinces of Canada follow different water laws. The Western provinces follow prior appropriation, while the Eastern provinces follow permitting and riparian law. Interestingly, there is no constitutionally protected right to water in Canada, so there is no taking if water allocation is changed. Water is viewed as a use right, not as a property right, so the government is able to enforce significant regulations on water management. Scientifically, Canada is behind in water management, as there are no monitoring and reporting requirements for farmland water withdrawals and the country has only just implemented groundwater permitting. Finally, in light of climate change, there is less available water in the watershed and policymakers must adapt licenses. The only current Canadian legal provisions allowing adaptation of licensure include: no adaptation allowed; holdback with water transfer; hold under plans or comprehensive review; or in the public interest. Canadian provisions need to catch up with climate change and water allocation issues and allow for more change in flexibility or it will become increasingly difficult to deliver water to the Canadian population.

The next presentation, given by Marcella Nanni, focused on the Greater Horn of Africa. Nanni stated that a lack of implementation of legislation is often due to a lack of political will. The greater horn of Africa includes: Djibouti, Ethiopia, Kenya, Somalia, S. Sudan, Sudan, and Uganda. These countries tend to have or are developing comprehensive water policies and legislation that cover all types of resource management. Many transboundary water resources

exist in this area, so the legislative trend is to harmonize legislation and consider specific characteristics of the different countries. Currently, the countries adopt the same water principles, and legislation in support of integrated water resources management.

There are many barriers to implementation of good water policy in the Great Horn of Africa. Specifically, there are five implementation issues: (1) social, (2) economic, (3) institutional, (4) capacity, and (5) awareness. Concerning social implementation issues, legislation does not always recognize traditional water right systems and conflict resolution mechanisms. Ethiopia in particular has legislation that does not recognize traditions and the rights of their communities should be integrated into new or amended legislation. Within economic issues, there are unrealistic water fees specifically in Djibouti, Ethiopia, and Uganda. The structure and purpose of fees does not include transparency and financing mechanisms are not fully functional. For example, in Djibouti, enacted legislation is not actually implemented. There are also conflicting legislative enactments and a lack of or outdated water regulations. Additionally, in these countries, there are large gaps in water laws such as for groundwater management, wastewater reuse, flood risk management, and management of local infrastructure. Focusing on the institutional implementation issue, there is a lack of coordination between water institutions and other institutions. Stakeholder participation is not clearly provided for and there is no integration of customary institutions into a legal/institutional framework. There is weak institutional capacity at all levels: forming legislation, implementing a permit system, river basin planning, management information systems, and monitoring of compliance. Finally, there is a lack of awareness with regard to the content of policies and legislation in all Greater horn of Africa countries. As Nanni demonstrated, there is significant room for improvement in this region for good water policies.

Turning to a very different situation in Finland, Niko Soininen of the University of Finland School of Law presented information on hydropower permitting in Finland. Hydropower dams have a huge effect on the flow of a river and migratory fish, salmon and trout, have been lost in Finland due to these dams. Almost all large Finnish rivers flowing to the Baltic



RS 28 - Water Policy and Governance: Law

Sea have been dammed for hydropower production. This was initiated when the Finnish Government promised permanent hydropower permitting following the economic downturn of World War II, allowing the country little ability to change private permits. Currently, in Finland, hydropower permits are permanent with no time limit; it is impossible to cancel existing permits. There are limited possibilities to change permit conditions because hydropower is private property, i.e. a loss of hydropower must be compensated to plant owners. However, for the sake of environmental sustainability, river flows should not be seen as private property. Soininen concluded that Finland needs to change its laws in order to promote water efficiency in the country and to bring back a large source of food, migratory fish.


The next presentation focused on the benefits and costs of forestry management in Ecuador, in the Paute Basin, and the Verde Basin of Arizona. In these basins, the relationship between forestry management, including activities such as removing small scrub brush and invasive species, and water supply is important. There are potential benefits of forestry management such as to impact the runoff and water quality. Despite the similarities in population and basin size of the Paute Basin in Ecuador and the Verde Basin in Arizona, they are governed very differently. The 2008 Constitution in Ecuador was based on Sumak Kawsay- Incan concept of the good life which links nature and people. There is a Constitutional right to water in Ecuador following the 2008 Constitution and a rule against privatization. Water juntas are political organizations of indigenous groups, the only organizations that can collect member fees to finance water projects. Juntas have been a huge help in water management in the area. Meanwhile in Arizona, the rule is prior appropriation: first in time (beneficial use), first in right. If you do not use water beneficially for 5 years, it is forfeited and general stream adjudications resolve any water issue in the state. Groundwater is heavily regulated and bifurcated from surface water. A key difference in the water-forestry management in the two basins is the oversight for incentivizing keeping forests intact. Fonapa is a publicly operated water fund in Ecuador which pays farmers to protect forests instead of removing forestry. Improving forests can liberate water from the river basin upon removal of invasive species. But, in Arizona, this process creates salvaged water and therefore belongs to the State, not the person who invested in improving the forest.

The session finished with a look back at Africa and the Nubian Sandstone Aquifer System ("NSAS"). NSAS is located in Africa and is shared by Libya, Egypt, Sudan, and Chad. It is an enormous freshwater reserve, 40 billion km³ is extracted by Egypt and Libya mainly for irrigation and drinking water supply projects. The importance of protecting transboundary aquifers from over-exploitation and from pollution, and the importance of cooperation to this end, has led the four countries to put in place some agreements from the 1900s to the present.

Four objectives concur to the achievement of the project goal by the four NSAS countries:

1. Identify priority transboundary threats and root causes
2. Fill gaps of data necessary to make strategic planning decisions
3. Prepare Strategic Action Plan (SAP)
4. An institutional structure for the implementation of SAP

The ultimate goal is to enable, through appropriate legal and institutional procedures, transboundary cooperation and integration of aquifer dependent socio-economic activities.

An equitable agreement between the four countries is crucial. The NSAS agreements on record are only about procedural norms of inter-NSAS State behavior. The cooperation from agreements is a work in progress attesting to the will of the parties to embark on a cooperation path. The need for a legally binding agreement, providing substantive and procedural norms of inter-state behavior and norms for settlement of disputes is readily apparent. 



SS 8 - Charges vs. Buyback: Who Pays for Water Ecosystems Restoration?

TIME AND ROOM: 1 June 2017, 17:20 - 18:50; Cozumel 4

CHAIR: Carlos Mario Gómez

SPEAKERS: Adam Loch, David Adamson, C. Dionisio Pérez-Blanco, Alvar Escrivá-Bou

HOSTING INSTITUTION: University of Adelaide

SESSION SUMMARY

Even though water systems may be separated geographically and economically, there are underlying similarities that many water scarce regions share. The caveat to this is that there is no one policy or economic solution to solve every water scarcity problem. This panel was focused on economic incentives to help in solving these water scarcity issues.

To begin, it is important to understand the legal framework in the locality experiencing the water scarcity issues. Some regions do not charge for the environmental and natural resource costs associated with using the water, and only charge for the actual costs of acquiring and transporting the water to the user, through infrastructure development and maintenance. This leaves a gap in the cost of water as a commodity and what the end user is actually paying for in the use of the water. Removing that gap would be one step in moving towards pricing water at a price which represents the actual economic value of the resource. For example, when a raw material is pulled from its source, such as minerals containing diamond, the costs associated with buying a diamond include not only the costs to remove and transport the diamond, but also the cost of the diamond itself as a resource, per its weight and quality. If the quality of the diamond is lower, its value will be less, and accordingly if the diamond has a better quality, its value will be greater.

Two other regulatory methods acting as economic incentives for reducing water usage are (1) a buyback

program and (2) investments in efficiency, which can be used in conjunction with one another or as singular programs. First, the buyback program enables the purchase of water from consumptive users to give to another user, usually the environment for base flows of surface water. When a buyback program is used to increase the base flow of a riparian stream, the buyback program should have a goal to ensure optimum use of the water through ecological functions as a habitat, such as a wetland. That ultimate goal is usually securing a minimum flow value. Another economic incentive for reducing water usage is investments into efficiency through modernizing irrigation methods. This, in turn, increases the ratio of yield to units of water used, and leaves more water for other uses while not affecting the original user's needs. Both methods have downsides; buyback programs have a problem with measuring the actual environmental benefits received and efficiency investments tend to reward poor performing farmers while penalizing users who have already invested in efficiency equipment.

Each of these methods has been utilized throughout the world, sometimes in tandem and sometimes standing alone. Again, it is important to understand the needs and gaps of a locality before implementing a blanket strategy to correct any deficiency.

To conclude the session, it was established that there is no economic incentive "silver bullet" that will fill all water scarcity needs. Instead, economic incentives are only some of the tools available to policymakers.💧



SS 13 - Towards a Special Issue of Water International on the OECD Principles on Water Governance

TIME AND ROOM: 29 May 2017, 15:30 - 17:00; Cozumel 2

SPEAKERS: Delphine Clavreul, Aziza Akhmouch, Jim Nickum, Sharon Megdal, and Pierre-Alain Roche

HOSTING INSTITUTION: Organisation for Economic Co-operation and Development (OECD)

SESSION SUMMARY

This session highlighted the need to share the responsibility of water governance and to look across scales and across sectors. The Organisation of Economic Co-Operation and Development (OECD) began the session with a discussion on an upcoming special issue article in the Journal of Water International on the OECD Principles on Water Governance. The OECD Principles on Water Governance is a multi-stakeholder driven process backed by the Ministries at the OECD Ministerial Council Meeting, and endorsed by 42 countries and 140+ major stakeholder groups. These principles aim to bridge science and policy through working with governments and ministries, with the goal of achieving good governance. The special session highlighted the benefit and need for water practitioners to publish their lessons learned from using the OECD principles. This necessary practice takes policy lessons to the academic platform to provide a necessary dialogue for water governance.

The special issue article on the OECD Principles on Water Governance is a two-part edition that gives stakeholders the opportunity to share their anecdotes on water governance in the framework of these principles.

The articles in this issue aim to

- foster the science-policy interface in practice
- provide a tangible output for closer cooperation between IWRM and the Water Governance Initiatives (WGI) and
- provide a scientific-base to the principles

The first section allows authors to discuss the stakeholder engagement in science-policy processes. Articles cover the implementation gap in water services, economic incentives for water governance, and water governance as social learning. The second section gives lessons from the practice of OECD principles on flood protection, existing frameworks in Europe, Asia-Pacific, Africa, and the Americas, and water governance in France. As an example, during the session an article was presented by Pierre-Alain Roche. He evaluated water governance in France and milestones to IWRM from 1964-2016, in which he believed that "France failed by progressing a lot". Water governance in France was driven by the decentralization of water and changing periods of concerns.

Discussions following the session considered IWRM as an appropriate concept that considered not only governance but management, especially when considering the process of engaging the public. Other topics include the need to be flexible with the means to good governance and the idea that often the top down approach does not work within water governance. 💧



SS 16(A/B) - What Next for Water and Policy? Recent Developments, Future Challenges and Potential Opportunities

TIME AND ROOM: 31 May 2017, 15:30 - 1700, 17:20 - 18:50; Xcaret

CHAIR: Alistair Rieu-Clarke

SPEAKERS: Melissa K Scanlan, Delphine Clavreul, Paula Pacheco Mollinedo, Owen McIntyre, Gabriel Eckstein, Rebecca Farnum

HOSTING INSTITUTION: Northumbria University Newcastle

SESSION SUMMARY

The Purpose of this special session was to capture some of the most recent trends and developments in water law and policy, both at a national, transboundary, regional and global levels; and to consider how water law and policy might have to evolve in order to address future water-related challenges or respond to advances in scientific knowledge and understanding.

To start talking about where we are going, we have to know where we currently stand. Many common law systems recognize the public trust doctrine, an ancient doctrine that prioritizes water resources as a public purpose rather than a private interest, while other systems have a civil framework that recognizes similar protections. Legally, in many areas, there is a presumption against privatizing natural resources to include water resources. The extent the public trust doctrine, and concepts like it, are variable among countries, but recognized widely internationally. We see this type of inherent protection of natural resources in some recent legal decisions giving rights to rivers as a living organism.

Through the public trust doctrine, the public is the stakeholder of their water resources. It is important to get the stakeholder involved in effective policy construction so they have a say in how water resources are prioritized. Utilizing stakeholder engagement helps to eliminate a top-down solution process, and instead develop policies based on the needs of local groups and individuals. Although the needs are local, all levels of governments can address these issues. This is most important when the water resource transcends the boundary of governments, to include sovereign nations. Therefore, stakeholders should be involved in each level of policy development.

On the international level, there are the two traditional substantive principles of international water law: (1) equitable and reasonable utilization of transboundary water resources and (2) a duty to prevent significant transboundary harm. Beyond these principles, the UN Water Courses Convention also recognizes two

additional principles to work with in the future: (1) environmental protection and (2) a duty to cooperate. This recognizes that water resources have a transboundary effect not only on individual human welfare, but also on ecosystems as a whole. In addition, through a duty to cooperate, there is a represented dedication to peacefully create a healthy and productive conversation centered on water policy, focused on considering the situation of others (within neighboring nations).

These principles are even more important when the conversation turns to aquifers because it is a resource that people cannot see or touch, making it more contentious and abstract. Although this resource is not visible, it is just as important, if not more important than other mineral resources that cross international borders. There are tertiary agreements relating to transboundary aquifers, with a few agreements and procedural rules directly relating to transboundary aquifers. The state of international law surrounding these aquifers is "in its infancy" and a point of future international law development.

While negotiating these new transboundary agreements, it is important to remember the different methods of political capital between sovereign nations. The reality is, those nations with greater economic and military capacity have a leg up. This is where the two traditional substantive principles of international water law (equity and reasonable use, and duty to prevent significant harm), can be utilized best by those stakeholders trying to protect natural resources affecting local issues.

How does the session feed into the theme "Bridging Science and Policy"?:

Stakeholder engagement is important to policy development and the OECD has worked to find indicators showing when localities are ready to move forward on water policy initiatives.

Further, even when science may not have initiated a policy, its use surrounding the development of that policy in integral.



SS 27 - Case Studies in the Challenges of Water Sharing Between “Upstreamers” and “Downstreamers”

TIME AND ROOM: 30 May 2017, 15:30 - 17:00; Xcaret

SPEAKERS: Charles Porter, Marianne Dwight, Dee Smith, Steve Daupin

HOST INSTITUTION: St. Edward's University

KEY MESSAGE

The ethics of sharing water resources is important and proper negotiations for the fair distribution of water need to be found and supported. Science must inform public policymakers; the only fair and reasonable public water policy is scientifically-based following integrated water management concepts


SESSION SUMMARY

How do you share water in a fair manner? This is an important and difficult question to answer, and posed as the point of discussion in this session. Firstly, three water resources were clarified: groundwater in which private landowners have ownership rights, surface water where state holds ownership rights and free surface water. Municipalities have rights over the lower reservoirs, and irrigation water.

This special session discussed issues in water security in general, analyzed an international case study of the Rio Grande's waters between the United States and Mexico, and dissected an intra-national case study of Pecos River and Rio Grande River waters between New Mexico and Texas. Furthermore, the session

included an examination of water sharing issues in the conjunctive interface of water, agriculture, and energy from a local perspective.

One presentation focused on mega civilizations, like Mayans, whose land and livelihoods were destroyed by droughts. Mega droughts have effects on climate change as well, prompting us to think through what will happen to our food and water in the future. Populations are increasing and parallel to this, climate vulnerability is increasing. There is a strong pressure on food resources to keep up with the increasing population (every year 2% more food should be produced) and this puts additional pressure on water resources.

To combat these issues, presenters in the session highlighted the importance of helping people understand the significance of water. Water always flows downhill, instead of uphill and energy is transferred downstream with the water as well. Every county is trying to secure its local communities right to water. As such, sound global ethics is very important in integrated water management. 



SS 45 - Water in the World We Want - Policy and Planning for Accelerated SDG Success

TIME AND ROOM: 29 May 2017, 15:30 - 17:00; Salon Coba

SPEAKERS: Vladimir Smakhtin; Lisa Guppy; Olfa Mahjoub; Felix Addo-Yobo

HOSTING INSTITUTIONS: United Nations University; Korean Environment Corporation, the Ministry of Environment, Republic of Korea, and the United Nations Office for Sustainable Development


SESSION SUMMARY

Water is a key to sustainable development and will serve as a foundation for the achievement of many of the 17 Sustainable Development Goals (SDGs). Lessons learned from the United Nations Millennium Development Goals era suggest that SDG success related to water must be won at the national level and that properly aligned policy and planning in these early years of the 2030 Agenda for Sustainable Development will be critical to final SDG success.

The session recognized various realities about policy-making. First, many countries have critical gaps in their policy-making environment and in resourcing better policy and planning, which can limit early progress of water-related SDGs. Secondly, different UN and Member State initiatives, tools and platforms built to enable SDG 6 on "Clean Water and Sanitation" and WASH-related (Water, Sanitation and Hygiene) policy could possibly become fragmented, overlapped, or unsustainable. Third, innovations that enable more integrated, effective and aligned policy, and a higher priority for water solutions are urgently required to accelerate SDG success around water.

The panel can be summarized in 3 points. First, at national level, a multi-agency and cross-sector enabling environment can be strengthened by a systematic, evidence-based, and collaborative approach. Second, collaboration around policy-making and planning for implementation by 2030 will be reinforced by national level agreement on each component that has been proposed. These components involve the following

themes: Capacity, Finance, Policy & Institutions, Gender, Disaster Risk Reduction Program, and Integrity. These elements need to be assessed, progressed and tracked, alongside SDG 6 indicators and targets. Third, putting together international tools into a common policy device will allow for synergy as well as participate in the making of sustainable policy-making. A thought from Vladimir Smakhtin (Director at The United Nations University Institute for Water, Environment and Health (UNU-INWEH) from the panel, sums up the discussion: "It is hoped that links between science, policy and implementation are high on the agenda of international and national bodies, such that an evidence-based enabling environment could accelerate SDG 6 progress in these critical early year".

The session referred to two main gaps between science and policy. The first gap is between the aspirations captured in SDG 6 Targets and the deliverable articulated in the indicators against which a country will be tracked. The second gap is between what is measured and the sustainable achievement of a country. For example: a country wants to build its institutional and legislative strength for water-related sustainability, but it is not recognized. As a solution, SDG Policy Support System (PSS) supports national enabling environments. SDG PSS is focused on SDG 6 and the six aforementioned components (Capacity, Finance, Policy & Institutions, Gender, Disaster Risk Reduction Program, and Integrity) that are critical for sustainability, but can be expanded to other goals and other areas critical to national sustainable development. 



SS 48 - Two Countries, Nine States: Colorado River Cooperation in a Complex System

TIME AND ROOM: 31 May 2017, 15:30 - 17:00; Cozumel 5

CHAIR: Sally Spener

SPEAKERS: Roberto Salmon, Edward Drusina, Victor Alococer Yamanaka, Thomas Buschatzke, Carlos de la Parra, Jennifer McCloskey

HOSTING INSTITUTION: International Boundary and Water Commission, United States and Mexico Sections

KEY MESSAGE

The Colorado River Basin in the United States and Mexico covers 632,000 square kilometers and provides water to more than 2 million hectares of farmland and more than 40 million residents. After years of water scarcity, diverse interests in the basin reached agreement in 2012 on a 5-year pilot program under the auspices of the International Boundary and Water Commission, United States and Mexico, to address the challenges. A panel of scientists and policymakers explained how that effort has laid the groundwork for a longer-term agreement.

SESSION SUMMARY

Twelve million inhabitants along the U.S. – Mexico border are reliant on shared water resources. Management is vital across borders to ensure human health, economic development, and environmental sustainability. Within this area, the Colorado River not only offers a spectacular management challenge by crossing nine states and two countries, but also a stunning example of successful binational cooperation. During this special panel, high-level policymakers from both countries gathered to talk about the success of Minute 319 under the 1944 Water Treaty and the ongoing negotiation of Minute 32X for the joint management of the Colorado River Delta.

This incredible feat of binational cooperation has been evolving since 2000, when the U.S. International Boundary and Water Commission (IBWC) and its Mexican counterpart, Comisión Internacional de Límites y Aguas (CILA) first committed to studying the negative impacts on the environment. Panelists described the evolution of this cooperative effort by highlighting all that has been accomplished since the implementation of Minute 319. This agreement created a joint management structure, allowing for more flexible storage of water allocations and timing of pulse flows. As a result, both countries built in strategic drought contingency planning, which has heightened resilience to water stress, while also allocating water for the Colorado River Delta. Most notably, this is the first global example of two countries agreeing to allocate shared water for the environment.

The Special Session Panelists all highlighted the importance of building upon a mutual understanding of a complex system to find an ideal arrangement for binational cooperation and management for the Colorado River. Without fully integrating a shared understanding, via all the scientific models and tools available, the two countries would not have been able to reach this landmark agreement. This is the first transboundary water sharing agreement in the world that also allocates water for the environment. Success in this river basin will undoubtedly be used as a shining example of success when science and policy come together.

CILA Commissioner Roberto Salmon described the process for management of the Colorado, the Rio Grande, and the Tijuana Rivers, as prescribed under the 1944 Water Treaty between the U.S. and Mexico. For the purpose of the discussion, Commissioner Salmon used the Colorado River to highlight examples of how the International Boundary and Water Commission (IBWC/CILA) manages water and adds amendments to the treaty via the minute system. Commissioner Salmon highlighted the complexities associated with managing an international, transboundary river and commended the 1944 Treaty, and minute system for its flexibility and adaptability in the face of change.

IBWC Commissioner Edward Drusina (Commissioner Salmon's American counterpart) continued the discussion by examining the events leading up to Minute 319. He described in detail the negotiation of Minute 32X, which is the extension of Minute 319. Minute 32X is currently being negotiated, but is nearing completion. This new minute will build on cooperative efforts achieved under Minute 319 and will be in effect from 2017 to 2026. It creates four new working groups: Salinity, Projects, Environmental, and Hydrology. It also creates a mechanism for developing a Binational Water Security Contingency Plan. This new minute will solidify and provide guidance for how best to continue the historical cooperative efforts over regulating the flow of the Colorado River.




SS 48 - Two Countries, Nine States: Colorado River Cooperation in a Complex System

Subdirector General Técnico for CONAGUA, Victor Alococer Yamanaka praised the great cooperative efforts between the U.S. and Mexico over the Colorado River. Mr. Yamanaka built upon Commissioner Drusina's description of Minute 32X to provide additional detail into how the new minute will be structured. He also reaffirmed Mexico's desire to continue to seek mutually beneficial cooperative arrangements with the U.S., despite recent changes in U.S. leadership. Mr. Yamanaka highlighted the importance of signing Minute 32X as soon as possible, particularly given the fact that Minute 319 expires at the end of the year on December 31st 2017.

Tom Buschatzke, the Director of the Arizona Department of Water Resources, provided a slightly different perspective by highlighting the importance of drought contingency planning, from a U.S. Basin State perspective. This presentation was more technical and described the current water storage system in Lake Mead, which is fed by the Colorado River. In his presentation, Mr. Buschatzke detailed just how vital Minute 319 has been in keeping Lake Mead from reaching critically low levels. By partnering with Mexican counterparts, the U.S. has been able to successfully find a mutually beneficial arrangement that depends on careful timing of water flow releases. From a technical perspective, he highlighted how vital it is for water managers to have the flexibility in times of excess to manage more successfully during times of drought.

As a faculty member at El Colegio de la Frontera Norte (COLEF), Dr. Carlos de la Parra was able to provide an academic perspective on the evolution of conflict and cooperation over the Colorado River between the U.S. and Mexico. He focused mostly on the conservation aspects of Minute 319 and the incredible situations that led to the successful implementation of Minute 319's overarching goals. Offering a slightly different perspective, Dr. de la Parra provided a detailed account of, not only the environmental degradation, but also the level of social advocacy, which came in the form of citizen diplomacy and was vital in the initiation of formal cooperation between the two countries. He highlighted the massive environmental, diplomatic, and social success of Minute 319 and the importance of signing Minute 32X.

As the Deputy Regional Director of the Bureau of Reclamation's Lower Colorado Region, Ms. McCloskey provided a deeper insight into the evolution of formal and informal cooperation between State, Federal, International, and NGO organizations to build consensus on managing the Colorado River. She placed special emphasis on the role that science, academia, civil society, and NGOs played in initiating conversations between the U.S. and Mexico. To summarize the session, Ms. McCloskey highlighted the four most important cornerstones of cooperation: Trust, Commitment, Technical transparency, and Innovation. 



SS 49(A/B) - Presentation of the Online Training Course on the Greening of Water Law: Implementing Environment-friendly Principles in Contemporary Water Treaties and Laws

TIME AND ROOM: 29 May 2017, 15:30 – 17:00, 17:20 – 18:50; Cozumel 4

SPEAKER: Ariella D'Ánolrea

HOSTING INSTITUTION: International Association for Water Law (AIDA)

SESSION SUMMARY

During the Presentation of the Online Training Course on the Greening of Water Law: Implementing Environment-friendly Principles in Contemporary Water Treaties and Laws, three of five modules were explored. This online training was organized as a result of The First International Environment Forum for Basin Organizations organized in 2014 by UN Environment (formerly UNEP) in Nairobi 2014. This training is composed of 5 modules (A/B/C/D/E): 1 introduction and 4 core modules addressing the 3 water laws. The materials and exercises were developed by the International Association for Water Law (AIDA) and include PowerPoint presentations, lecture manuals, and many group exercises. More information can be found at www.aida-waterlaw.org.

Module A: Water Law and the Environment

The module covers the “Greening of Waterlaw”, including the trends and risks involved. This includes competition and conflicts over shared freshwater resources (60% of freshwater is situated in internationally shared waters). Only 5 countries have some kind of treaty for sharing the water. The module also covers International Water Law (IWL). International water law includes laws regarding the non-navigational uses of international watercourses. There are two main global treaties: The 1997 UN convention and 1992 UNECE convention. IWL has a duty to use and manage an international watercourse in an equitable and reasonable manner vis-à-vis its co-riparians States. The module also includes United Nations Watercourses Convention (UNWC) history from 1970 to 2014, including basic obligations. There are general obligations to cooperate, share information, and protect ecosystems.

The principal objective is to avoid transboundary problems regarding groundwater. One example is that of water pollution control. With cooperation, some solutions emerge, such as the Multi Environment Agreements (MEA's) which influence domestic water pollution control laws. Another example is the Mediterranean Protocol in 1983, based on the

Barcelona declaration of 1973. A session participant, Dominique Alhetiere (of AIDA) explained that this convention was focused on the basins and not only on the coasts, which is crucial to control water pollution.

Module E: Protection of Groundwater systems – Regulation of the Environment

This module answers the question: What is groundwater, and how does it function? It includes some legal mechanisms which can help protect groundwater and its resources. The module is very specific about technical points of groundwater and one lesson is that many countries feel uncomfortable to share groundwater with others, which can create conflict.


Second part of the session: Exercise Simulation on a Map

Each simulation is based on specific situations. Unfortunately, the session format didn't allow a real simulation because the simulation requires two hours. However, it demonstrated the specificity of the exercise.

Module C: Significant Harm, Transboundary Impact, and Pollution Control

There is an obligation to prevent, reduce, and control pollution in international law. An example of implementation at the national level is the ENECE Water Convention.

Group Exercises

The group exercises of the training course are based on the basin agreements. The exercise requires eight participants. During the exercise, two participants work on a country, two work on another country, two work on indigenous communities, and two work on behalf of the fact-finding commission. The exercises involve drafting recommendations to solve the disputes after learning about the water law in the region. It brings to light the sources of problems, which include a lack of communication with the local communities and lack of respect for the national laws. 



SS 52 - Offshore Aquifers Why Should We Care?

TIME AND ROOM: 1 June 2017, 17:20 - 19:00; Cozumel 2

SPEAKERS: Mark Person, Renee Martin-Nagle, Marguerite De Chaisemartin

HOSTING INSTITUTIONS: UNESCO-IHP and University of Strathclyde

SESSION SUMMARY

In a 2013 Nature magazine article, scientists highlighted the presence of major reserves of fresh and brackish water in continental shelves around the world, with reserves that could amount to 100 times the volume of water extracted from the Earth's subsurface since 1900. If confirmed, this phenomenon may potentially help addressing the "global water crisis". Vast offshore freshwater reserves raises complex issues regarding applicable legal regime(s), exploration, resource preservation, extraction, transportation, treatment. This session discussed the science of offshore aquifers, which type of law should govern these aquifers, and the application of the transboundary oil and gas concept unitization to govern transboundary aquifers. UNESCO-IHP and the University of Strathclyde co-organized the session to raise awareness of the existence and accompanying challenges of this potentially vast reservoir of freshwater.

When the sea level was vastly lower than today, the continental shelf was exposed to meteoric recharge. Scientists believe the water was trapped as sea level rose again and this is what created the offshore freshwater aquifers. For every 1km of coastline, there is an average of 2.5km³ of fresh to brackish water trapped below. Marine magnetotelluric devices can detect offshore aquifers. Ownership of aquifers can be determined by using the Law of the Sea. Twelve miles from the shore line is considered a country's territory. Twenty-four miles beyond the coastline is the contiguous zone and two hundred miles from the coast line is the exclusive economic zone. All of this is considered a country's sovereign area. However, sometimes these areas overlap and natural resources are found straddling two countries' lines. When that happens, the law of the sea is silent and the customary law is unitization. Unitization treats a transboundary

unit as one single reservoir. Rather than competing for the resource, the countries develop the field as a single unit. This type of collaborative development is customary in offshore oil and gas reservoirs and is suggested to be the solution to freshwater aquifers that straddle territorial lines.

Interview with Mark Person

Mark Person; Professor and Hydrology Program Head at New Mexico Institute of Mining & Technology

Has an offshore aquifer been developed?

There has not been an offshore aquifer developed as of now, but it is inevitable with population growth. This is not a new idea. The Phoenicians discovered offshore freshwater around 3,000 years ago.

Will offshore aquifers relieve the "water crisis"?

They represent a backup system for coastal systems in times of drought. While there are huge volumes of offshore freshwater, the production of them will not be sustainable because they are not rechargeable. Additionally, development is very costly.

What are the greatest challenges to offshore aquifer drilling?

The greatest challenges concern the economics and legal aspects. Developing offshore freshwater is very costly. We are working on a drilling permit right now for three exploratory wells and it will cost \$9 million. Then you have to run a pipeline to the shore and you may have to build a desalination plant.

Once offshore aquifers are developed and the water is pumped to land, the federal government will want to regulate it. There is also the issue of who owns the freshwater. If the oil industry begins developing freshwater aquifers, there may be a tension with the coastal cities who will likely want the water. 💧



SS 53 - The Draft Articles on the Law of Transboundary Aquifers – Moving Forward until the next UN General Assembly Session

TIME AND ROOM: 31 May 2017, 10:50 - 12:20; Salon Coba

HOSTING INSTITUTIONS: UNESCO, AIDA, and IAH Commission on Transboundary Aquifers

SESSION SUMMARY

While the sustainable and efficient management of the 592 transboundary aquifers identified to date is recognized as critical for the success of the 2030 Agenda for Sustainable Development, still only six arrangements are specifically dedicated to transboundary aquifers. One critical tool in bridging the gap between science and policy-making and supporting states in setting appropriate arrangements for the management of their transboundary aquifers is the Draft Articles on the Law of Transboundary Aquifers. This session organized by UNESCO-IHP, IAH and AIDA brings together the science, law, and policy-making to address the crucial interlinkages that can allow good governance of transboundary aquifers.

Gabriel Eckstein from Texas A&M University School of Law and the Chair of the International Scientific Committee gave the opening remarks of the session. The panel consisted of highly distinguished speakers. This included:

- Alfonso Rivera, Chief Hydrogeologist of the Geological Survey of Canada, Natural Resources Canada, Government of Canada & IAH Commission on Governance of Transboundary Aquifers – Bridging the gap between science and policy-making, a historical perspective on transboundary aquifers and their management through ISARM Americas
- Raya Stephan, expert in International Water Law – The Draft Articles on the Law of Transboundary Aquifers, a joint scientific and legal effort
- Stefano Burchi, International Association for Water Law (AIDA) – From the Draft Articles to groundwater governance at the domestic level
- Marguerite de Chaisemartin, UNESCO's International Hydrological Program (IHP) – The Draft Articles and transboundary aquifer cooperative frameworks.

Alfonso Rivera gave an historical perspective of the growing global interest in transboundary aquifers, but noted that this interest really started moving only in the past two or three decades. He emphasized the challenges of integrating science into the development of legal regimes for transboundary aquifers, and noted that policymakers tend to be reactive, suggesting that rather than general research into transboundary aquifers, we need more issue-driven studies in order to respond to existing needs. Lastly, he explained that


the notion of managing water is, in reality, an effort to manage people, and that we need to ensure constant interaction between scientists and policymakers

Raya Stephan discussed the development of the UNILC Draft Articles on Transboundary Aquifers (DAs) noting that the process of developing the DAs included both scientists and legal experts.

Raya also noted that the development of the DAs by the UNILC was heavily influenced by hydrogeologists. This influence is shown by the following examples of what UNILC accomplished:

- achieved a compromise over the legal definition of “aquifer” in the DAs that placed the scientific conception of aquifers within a viable legal structure;
- dropped the misnomer “confined” in describing aquifers that were unrelated to surface waters;
- refocused its efforts from “groundwater” to “aquifers” in order to encompass within the DAs the aquifer matrix and land use activities that could impact groundwater;
- incorporated groundwater-specific factors on the factors developed for the proposed principle of “equitable but reasonable utilization”; and
- included a separate Draft Article on the recharge and discharge zones.

Stefano Burchi discussed the need to convert and implement international obligations into domestic laws, noting that this is not an automatic process. The process typically requires formal action by a nation's legislature. He also discussed the interactions between international and domestic law, and provided examples in which nations implemented domestic laws in order to come into compliance with international obligations related to transboundary waters.

Finally, Marguerite de Chaisemartin discussed the cooperative framework structure of the DAs and discussed the role that UNESCO took in advising the UNILC in the formulation of the DAs, as well as UNESCO's ongoing role in explaining the DAs to nations and international organizations. She also discussed UNESCO's current activities related to transboundary aquifers in various parts of the world that integrate development of scientific data with development of governance and policy mechanisms. 



SS 55(A/B/C) - Shared Water of North America: Policies and Issues on Transboundary Water Resources

TIME AND ROOM: 30 May 2017; 9:00 - 10:30, 15:30 - 17:00, 17:20 - 18:50; Cozumel 2

SPEAKERS: Alfonso Rivera, Antonio Rascón, Rosario Sanchez, Zhuping Sheng, Sam Fernald, Norman Grannemann, Gabriel Eckstein, Sharon Megdal, Maria Milanés-Murci, Andrew Teeple, James Callegary, José de Jesús Luévano Grano, Horacio Rubio, Rick Van Schoik, Commissioner Edward Drusina, Commissioner Roberto Fernando Salmón Castelo, and Rubén Chávez Guillén

HOSTING INSTITUTIONS: Natural Resources Canada / Ressources Naturelles Canada; Univ. of Arizona, Water Resources Research Center, Natural Resources Canada; North American Research Partnership; Water Resources Institutes of Texas and New Mexico; and Univ. of Arizona, Water Resources Research Center

KEY MESSAGES

- **Future actions include the desire to exchange more information to develop trust and ensure aquifer protection and water rights.**
- **The importance of aquifer recharge in the future for transboundary aquifers and to mitigate extreme water stress.**
- **There might not be official agreements but nations are cooperating by science, which is a form of collaboration and may represent an agreement by nature.**
- **The importance of the International Joint Commission (IJC) and International Boundary Water Commission (IBWC) as organizers of future events such as a groundwater summits and information sharing for North America.**
- **Future steps include connecting surface water and groundwater resources in North America.**
- **Other major recommendations were the need to create a groundwater treaty between Mexico and the US, to be addressed by IBWC on a case-by-case basis.**

SESSION SUMMARY

The three-part session on transboundary waters in North America highlighted the current cooperative efforts as well as opportunities for future collaboration in science and policy. The session was organized by the Geological Survey of Canada (GSC), University of Arizona Water Resources Research Center (WRRC), New Mexico Water Resources Research Institute (NMWRRI), Texas Water Resources Institute (TWRI), and North American Research Partnership: US-Canada Governance.


Session 1:

The first session highlighted the current technical advances and limitations in hydrogeological modeling for transboundary aquifers on both the US-Mexico and the US-Canada borders. This session also emphasized the need to determine physical relationship between surface water and groundwater resources not only in modeling but in policy and management as well.

Session 2:

As transboundary aquifers continue to be assessed and recognized, there will be an emergence of new hydrologic and political boundaries. This potential conflict may be preemptively reconciled through collaborative binational efforts.

Session 3:

The third session reinforced the theme of congress of "Bridging Science and Policy" by stressing the necessary working relationship between both scientists and policymakers for shared groundwater resources. Information sharing was suggested to be the foundation and bridge for future work in groundwater sharing and management. 



SS 75 - Peace for Water: The Global High Level Panel on Water and Peace's Vision

TIME AND ROOM: 30 May 2017, 9:00 – 10:30; Cozumel 4

SPEAKERS: François Munger, Alvaro Umana, Mara Tignino, Salman M. A. Salman

HOSTING INSTITUTION: Secretariat of the High-Level Panel on Water and Peace

SESSION SUMMARY

This session examined water as a tool for peace and reconciliation. It presented the purpose of the Geneva Water Hub's Global High Level Panel-Secretariat. The Panel addresses transboundary conflicts by identifying legal, economic and institutional mechanisms to promote transboundary cooperation.

François Munger, Director of the Geneva Water Hub Secretariat, took the floor first. He discussed the notion that sustainable and equitable water resources are a major global challenge of the 21st Century, while explaining that water is a tool for peace and cooperation. Indeed, it can be seen as a source of reconstruction after conflicts, like it was in Mossoul after Daesh attacks. He also presented the Geneva Water Hub Secretariat, which many countries are part of: Slovenia, Senegal, Costa Rica and more. The Secretariat operates on transboundary conflicts but on internal issues, by identifying the legal, economic and institutional mechanisms, and promoting effective implementations. The first panel took place in Geneva in 2015, the second in Dakar in 2016, and the third in Jordan in 2017. This panel is independent from any structures and spreads the idea of shared cultures, by the water symphony, as the musicians are from Jordan, Switzerland, Syria, etc.

The second speaker, Alvaro Umana, former minister of Environment in Costa Rica, discussed the 7 themes of the Panel's work:

1. protecting water during conflicts and using it as a reconciliation key
2. water issues linked to immigration and availability for refugees
3. the role of international water law for peace, security and inter-sectoral conflicts
4. water quality in interaction with water availability
5. new mechanisms for hydro-diplomacy
6. financial mechanisms to encourage multi sectoral and transboundary water cooperation
7. hydropolitical data to support evidence based decisions

The strategy is built as architecture. The key message is that all countries should negotiate and implement effective agreements as well as focus on the adaptability of this strategy according to the specificities of a region.

Mara Tignino, Director of the Platform of International Water Law, presented water as a strategic weapon, and then as a protected resource by humanitarian laws. Water is sometimes considered as a strategy of war, considering the fact that the lack of drinking water can have disastrous effects. Mrs. Tignino argued that 50 million people living in urban areas are affected by the lack of access to drinking water. Continuing the comparison to a war weapon, a picture of a destroyed German dam was shown to illustrate bombing consequences. Dam control is essential and strategic. In the case of too little water, the energy production will decrease. In the case of too much water, there is a risk of flooding. The presentation ended with a call for civil society to consider the general principles of international humanitarian law and the necessity of applying human rights related to water during conflicts.

The last speaker was Dr. Salman M. A. Salman, Editor-in-Chief of Brill Research Perspectives, International Water Law. He talked about the difficulty of sharing water, for transboundary bodies as well as internal uses.

The panel and audience came to the conclusion that the most adapted approach is to have a clearer view of the specificities of regions linked to water related conflicts.



6. Water Ecosystems and Physical Regimes

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RS 15 - Water Ecosystems and Physical Regimes

TIME AND ROOM: 1 June 2017, 10:50 – 12:20; Isla Mujeres Room

SPEAKERS: Noriko Uchida, Julio Cesar Quiñonez Basagoitia, Freddy Rey

KEY MESSAGE

An environmental flow is the water regime provided within a river, wetland, or coastal zone to maintain ecosystems and their benefits where there are competing water uses and where flows are regulated. Environmental flows provide critical contributions to river health, economic development and poverty alleviation. Environmental flows ensure the continued availability of the many benefits that healthy river and groundwater systems bring to society.

SESSION SUMMARY

The purpose of this session was for sharing data, presenting and sharing new technology and research, and sharing concepts of water ecosystems in different areas around the idea of environmental flows.

The first presentation, by Noriko Uchida, was on the new concept and technology called eDNA (Environmental DNA). eDNA is DNA extracted from an invertebrate animal body to environment water – pond, sea, lake, and river. It originated from the metabolite of an animal. Uchida also spoke on her conclusion

that correlations between the target eDNA and the wet weight of aquatic insects are not positive.

The second presentation, from Julio Basagoitia, was on hydrological analysis of water resources reduction as arising from deforestation process and land use change in El Salvador. The research carried out is regarding the hydrological analysis to determine the water resources reductions as arising from the deforestation processes in essential water recharge areas that supply tributary rivers and water among mountains, which are also sources of drinking water for local people.

The final presentation, by Dr. Freddy Rey, was on the ecological engineering for reconciling natural hazard control and land ecological restoration in water ecosystems. The focus was on the ecological engineering solutions with the soil method called soil and water bioengineering. The techniques and strategies use plants and their biological and mechanical characteristics for natural hazard mitigation, ecological restoration of depollution lands, and soil and water depollution.



RS 16 - Water Ecosystems and Physical Regimes

TIME AND ROOM: 1 June 2017; 9:00 - 1030; Cozumel 1

SPEAKERS: Judith Ramos-Hernandez, Nathália Pivatto Erberelli


SESSION SUMMARY

Water quality and quantity are two determinative factors in predicting the resilience capacity of regional ecosystems. An increase in ecosystem resiliency decreases the risk of loss in commodities that any given regional ecosystem provides for human consumption. Inversely, a decrease in ecosystem resiliency increases the risk of loss in commodities. Therefore, it is crucial to understand the effects of water quality and quantity on regional ecosystem resiliencies.

The entirety of the water cycle affects ecology in a number of different ways. Being able to predict rainfall is helpful in developing plans for future water works and the quantity of future water availability. Part of that prediction is a water return period. Localities can utilize annual rainfall data to predict the return periods in tailored increments. Gauss's law is used to find a standard deviation after averaging the rainfall data. From this created normal bell curve, a confidence interval can be established for future water availability timelines.

Furthermore, changes in the quality of the water can diminish or enhance an ecosystem's resiliency

capacity. Surface water and aquifers alike are drastically different in water quality. Although aquifers tend to have some capacity to filter contaminants, some aquifers are less capable of doing so. For example, porous limestone aquifers have limited filtration capabilities. These aquifers are more susceptible to contamination. Human activities in these aquifers' recharge have a measurable effect on water quality at aquifer discharge locations. In turn, this diminished water quality will have a negative effect on the regional ecology's resiliency capacity. Some ecosystems are more affected than others depending on the pollutant and the actual biota present at the discharge point. Generally, a decrease in water quality leads to a decrease in resilience capacity.

It is important to understand the entirety of not only the water cycle, but every ecological cycle relying on the water cycle because human activity is dependent upon these ecosystems. Human reliance on any given system is weighed against the risks associated with that system. The variability of water quality and quantity has an effect on ecosystem resiliency, and, therefore, an effect on the risks of utilizing these resources. 



RS 22 - Water Ecosystems and Physical Regimes: Groundwater Resources

TIME AND ROOM: 1 June 2017, 17:20 - 18:50; Cozumel 3

SPEAKERS: Rodrigo Peronico, Laura Rodriguez Lozada, Akira Kawamura

SESSION SUMMARY


The pervasive and seemingly abundant supply of groundwater has led to its indiscriminate and sometimes excessive use. However, this use can have diverse and often wide-ranging effects on the local and regional hydrology and ecology. This session highlighted certain situations with some common problems, unique approaches and applicable solutions that are prevalent in various aquifers worldwide.

The first speaker of the panel, Rodrigo Peronico, explained how heterogeneity effects in soil water transferences process under unsaturated conditions in an alluvial soil in the mesoscale. This was demonstrated using the Capibaribe River Basin as a case study, where the infiltration tests showed the heterogeneity influence on water flow and that cumulative infiltration presents a big difference between them. In addition, the Hydrus simulation helped to demonstrate a high influence of the soil heterogeneity in the water flow caused by the differences between the soil hydrodynamic properties and the existing materials in the available profile. The GPR (Ground Penetrating Radar) mapping showed 4 different geological units on the profile. The study also reveals that GPR technique can become a tool with a good level of precision if it is used in conjunction with other forms of soil physical characterization.

According to Laura Rodriguez Lozada (Texas A&M University), the Allende-Piedras Negras aquifer between Texas and Mexico has been identified as transboundary but has not been recognized officially by both countries or at international level. During the initial modeling assessment of this aquifer, she aimed to demonstrate hydrogeological linkages of this aquifer at the transboundary level to offer new information that could support its identification and recognition at international level. The main objectives

of the research were to understand how groundwater flows across and near border regions and to determine significant variables of change. Remote sensing data was used to recognize the droughts described by Mexican institutions during past years where combined parameters helped to identify dry and wet periods. Furthermore, the study concluded that infiltration takes around 2 to 4 weeks to be reflected in the water table depending on the lithology of the aquifer which can be an important feature to explain aquifer vulnerability to droughts and recovery rates.

Lastly, the presenter Akira Kawamura (Tokyo Metropolitan University) mentioned the clustering fluctuation patterns of groundwater levels in Tokyo caused by the Great East Japan earthquake using self-organizing maps. The Great East Japan Earthquake occurred at 14:46 JST on March 11, 2011, which was the strongest earthquake on record in Japan. When the earthquake occurred, large fluctuations of groundwater levels were observed in 102 observation wells in Tokyo, although Tokyo is located around 400 km away from the epicenter. In this study, he investigated and clustered the fluctuation patterns of hourly groundwater levels using self-organizing maps. As a result, the fluctuation patterns of the groundwater levels could be classified into 8 clusters. The study clarified that the trend of groundwater level fluctuation could be shown more objectively using SOMs (Self-Organizing Maps) than subjective classification techniques.

As a conclusion, this session highlighted that the concerned stakeholders, like technical officials, water practitioners, policymakers, and local water users, need to cooperate and understand their mutual need and responsibilities to develop strong, locally-appropriate, and sustainable management practices for groundwater resources. 



RS 23 - Water Ecosystems and Physical Regimes: Groundwater Resources

TIME AND ROOM: 30 May 2017, 9:00 – 10:30; Isla Mujeres


SPEAKERS: Camilo Lesmes Fabian, Eric Garner, Lili Yu

SESSION SUMMARY

Groundwater, because of its hidden nature, is one of the most over exploited and under-appreciated resources on earth. During this panel, speakers highlighted challenges that are pervasive in many aquifers across the globe.

According to Lili Yu, in China groundwater over-exploitation has led to land subsidence, sea water intrusion, vegetation deterioration, and desertification. While these groundwater issues are occurring throughout the country, the Chinese government has developed a pilot program to try to address over-exploitation in the Hebei Province, where aquifer mining is the worst. This pilot program attempts to use an integrated, multipronged approach to management by coordinating across ministries to address the problem holistically. As part of this multifaceted approach, Chinese officials reformed water use rights and pricing structures, worked with farmers to provide incentives for reducing cropping areas and altering cropping patterns, and supported instillation of water efficient irrigation technology. With the success of this program, it has shown promise for reducing groundwater extraction in other parts of the country as well.

Another region experiencing rapid groundwater exploitation is California, a region known for orange groves, drought, and poor groundwater management. In fact, Elinor Ostrom used California's Central Valley aquifers as an ideal example of how poor groundwater management leads to over-exploitation. In the Central Valley, there is massive over-pumping and land subsidence, which is further exacerbated by rapid population growth. However, presenter Eric Garner argued that California also has good examples of sustainable groundwater management in Southern California's aquifers. During his talk, he compared ideal versus poor aquifer management and argued that ideal groundwater management is more likely when a safe yield has been identified, the aquifer size is small, the population has shared values, and when supplemental water is available.

Moving forward, this session highlighted the need for water practitioners, policymakers, and water users to come together to develop strong, locally-appropriate management for groundwater resources in order to avoid the dangers of aquifer mining and over-exploitation. 



RS 32 - Water Ecosystems and Physical Regimes

TIME AND ROOM: 31 May 2017, 17:20 – 18:50; Cozumel 3

SPEAKERS: Luis Manuel Martinez Rivera, Rebeca Gonzalez-Villela, Yang Fang, Mariela Yevenes, and Pilar Saldaña

SESSION SUMMARY

This session discussed the pollution in two Mexican lakes and two watersheds, one in Chile and one on the lower Rio Bravo/Grande along the Mexico/USA border. Key threads of the session included spatial and temporal analysis of water pollution in Cajititlan Lake, Jalisco, Mexico, holistic approaches to catchment management, conservation and recuperation of freshwaters, water environmental governance for tidal lakes based on water ecology model, seasonal impacts of a mega-drought (2010-2015) on the water quality of Biobío River, Central Chile, and managing water quality in transboundary rivers.

Luis Manuel Martinez Rivera, Professor at Universidad de Guadalajara, provided a very detailed description of the catastrophic pollution of Cajititlan Lake located in the state of Jalisco. According to Prof. Martinez Rivera, the Cajititlan Lake has been severely impacted for many years by various anthropogenic pressures as a result of bad water management practices regarding irrigation and discharge of untreated sewage into rivers and streams that feed into the lake. In 2014, a massive death of fish of almost 200 tonnes was observed. Extensive sampling and monitoring revealed that the pollution around the lake had both point and non-point sources. It was concluded that rapid wastewater discharges into the lake drastically reduced oxygen, which killed the fish.

Rebeca Gonzalez-Villela, from Mexican Institute of Water Technology (IMTA), discussed a very similar situation in Tuxpan Lake, which is located in the state of Guerrero. In this case, a multidisciplinary approach to watershed management was applied for freshwater conservation and rehabilitation of the lake. Using a watershed model, she showed how she was able to determine the causes, levels, and degree of environmental pollution of the lake. She revealed nitrogen and phosphorous contamination in the lake, as well as erosion and deforestation along the hillsides. Her two main recommendations are to control the erosion of hillsides and to reforest the river corridor to regulate the natural flow of the river and its water quality. Rebeca Gonzalez-Villela also suggested

rechanneling the river, adding that control of human invasion into river corridors and the associated contamination is necessary.

In Chile and Latin America in general, information on how the water quality of high flow rivers may be linked to droughts is scarce. Mariela Yevenes, a PhD student at the University of Twente, investigated the effects of an unprecedented mega-drought (2010-2015) on the water quality of the Biobío River, Central Chile. She found that a greater reduction in nutrient concentrations is associated with decreased flow in the summer and autumn. The low flow rates associated with the drought also decreased pH and suspended solids and nutrients and increase trace metals. She mentioned that the linkages between droughts and the water quality of rivers will increase because of climate change and advocated for increased research in other regions of Latin America.

The last speaker, Pilar Saldaña from IMTA, Mexico, presented on the water quality in the Lower Rio Grande. Dr. Saldaña's research aimed to generate a bi-national scientific cooperation and eventual joint mechanism to decrease pollution in this transboundary river. Potential contaminants come from fertilizers applied by irrigation districts on the Mexican side of the border, as well as from treatment plants, which still contain pollutants when they discharge, on the U.S. side of the river. The results enabled zoning of the main sections of the river that receive inputs of pollutants in order to indicate where management actions are necessary to control pollution. For the management to be effective, it must include the participation of the United States. Thus, a joint watershed restoration will be proposed.

Overall, this session highlighted the need for more water protection from contamination in lakes and watersheds and the impacts of anthropogenic activities as well as natural causes. Developing locally tailored management for water resources, as well as the need for collaboration from stakeholders in the affected regions is a pre-requisite for the adoption of best management practices.



SS 33 - Resilience of Coastal Watersheds in Latin America and the Caribbean

TIME AND ROOM: 1 June 2017, 9:00 - 10:30, 10:50 - 12:20; Cozumel 5

HOSTING INSTITUTION: Tropical Agricultural Research and Higher Education Center

KEY MESSAGE

Accurate data is needed for evidence-based solutions and policy-making.

SESSION SUMMARY

Resilience assessment has been methodologically addressed, but we still lack specific tools that are proved and quantified. This session analyzed the theoretical basis and science-policy bridge of resilience assessment. With this purpose, methodologies were presented to assess vulnerability and ecosystem services for resilience analysis applied in coastal watersheds, but able to be used at any territorial scale. This followed by a discussion on how to create good watershed management practices for mitigation and adaptation to climate change, as well as for productive purposes, contributing to building socio-ecological resilience of local communities in coastal zones.


An introduction was given by Dr. Leonardo Piccinetti, who stressed the importance of collaborative work in Watershed and Coastal Management in the context of Climate Change in Latin America and the Caribbean (Waterclima LAC) projects. Resilience Assessment has been methodically addressed and has proven to be attractive partly because it provides another way of addressing longstanding and important challenges. These challenges include those related to sustainable development, climate change adaptation, and addressing vulnerability. Resilience Assessment also offers a way to bring different disciplines and perspectives under a single conceptual umbrella.

The second speaker, Dr. Aldo Ramirez, shared his experiences assessing water resource vulnerability in Baja California Sur, Mexico. He stated that water vulnerability should be addressed, and that we should investigate how water vulnerability will be

exacerbated by climate change. He concluded that the scientific consensus on climate change should induce urgent action across the world. However, various uncertainties regarding climate change make water management difficult.

Claudia Galleguillos, from the non-profit Fundación Chile, presented several case studies of threatened ecosystem services in coastal Latin America. She also presented the perspective of Fundación Chile regarding the valuation of environmental services. Private sector participation should compensate the ecosystem services that are affected by the agricultural sector, especially in regards to forestry. Fundación Chile aims to construct a conceptual model of the ecosystem by identifying functions and processes, local problems, and existing management tools. Greater focus should be placed on the identification of natural and human pressures and adaptation measures.

Dr. Laura Benegas, of El Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), presented on the topic of operational resilience and medium term planning in Haiti. Good water management and climate change prediction were some of the topics that were addressed. In Haiti, local stakeholders agreed on the perception and prediction of the effects of climate change. Dr. Benegas also presented CATIE's ongoing work on a Coastal Management Plan (CMP) that will contribute to better social, environmental and economic resource management from local stakeholders.

The session concluded with an emphasis on the importance of cooperative work based on evidence that seeks to strengthen local communities. It is expected that current work will inspire similar projects in the future. 



SS 46 - Building a Green Infrastructure Agenda for the Latin American Water Sector

TIME AND ROOM: 30 May 2017, 17:20 - 18:50; Cozumel 5

CHAIR: Gena Gammie

SPEAKERS: Torgny Holmgreen, Daniela Torres, Carlos Herrera, Yuri Pinto, Adrien Tieche, George Van Hotvem, Roberto Olivares

HOSTING INSTITUTION: Forest Trends

KEY MESSAGE

Green infrastructure is essential to improving Latin American resilience, especially for cities in a water paradox.

SESSION SUMMARY

This session addressed the following questions: Why is green infrastructure important? How is green infrastructure being implemented in Latin America? What are the key gaps in opportunities to implementing green infrastructure? How can we work together to address these gaps?

Implementation of “green” and “blue” infrastructure is essential to improve the resilience of cities and redefine the relationship between citizens and water. Green infrastructure includes forest conservation, river bank protection, sustainable agricultural practices, and wetland and glacier protection. Green infrastructure projects can substitute conventional infrastructure in some cases and complement it in others.


Several cities in Latin America face a water paradox, which means that those cities are threatened by both an excess of water and a lack of water. One example of this is Mexico City. The government of Mexico City is developing a strategy to improve the city’s resilience through a network called 100 Resilient Cities (100RC). In 2013, Mexico City was chosen to be a member of the 100RC network and in 2016 they began to develop projects along with other 100RC. In accordance with these projects, the Mexico City government has focused on developing space transformation. Space

transformation is an improvement, through the implementation of green infrastructure, of public spaces with the objective of mitigating floods, raising collective consciousness, and increasing infiltration. The first step in project development is identifying the problems, followed by an identification and selection of feasible solutions. Once solutions are developed, it is possible to estimate the impacts and generate possible future scenarios. A set of indicators must be established in order to monitor progress. All those actions will affect the city’s water culture and promote a new relationship between the people and their water.

To meet adaptive transformation and sustainable development, it is necessary to strengthen corporate policies to increase efficiency of water operators, management capacities for rural and local water operators, and civil society participation. In addition, contributions for water resources protection from other water users such as agricultural and energy activities need to be expanded. Finally, inter-cities’ models are extremely important to collect, treat and reuse water.

Overall, the key message that this special session delivered is that policies need to guarantee the implementation of science and technology for green and blue structure.

How does the session feed into the theme “Bridging Science and Policy”?:

Network building is important to organize resources and logistics in order to address problems. 



SS 63(A/B) - The National Water Reserves Program in Mexico: Allocation of Water for the Environment and Accomplishment of Multiple SDG

TIME AND ROOM: 29 May 2017, 15:30 – 17:00, 17:20 – 18:50; Salon Xcaret

SPEAKERS: Victor Alcocer-Yamanaka, Alejandro del Mazo, Jorge Rickards, J Eugenio Barrios

Ordóñez, Jesús Reyes Heoles, Karin Krchnak, John Matthews, Jose Carrera, Abel Mejía

HOST INSTITUTIONS: CONAGUA, WWF-Mexico

KEY MESSAGE

There is a strong need for a baseline to determine the development of a reserve.

SESSION SUMMARY

In 2005, the Alliance between WWF – Fundación Gonzalo Río Arronte was created to propose new water management models in Mexico. In developing a new model, the Alliance aimed to address the following question: how will we strengthen Integrated Water Resources Management (IWRM) in order to avoid water scarcity and other conflicts in Mexico? The approach aims to develop water reserves in order to provide water for future generations. A water reserve is a volume of the total water availability that can be allocated in a basin restricted for a specific purpose. The National Water Reserves Program is Mexico strives to develop sustainable water resources for future generations. Recognizing that public policy does not typically consider ecological flow, an objective of developing the new model was to acknowledge environmental science when considering protecting water for the future. This approach incorporates the 'environmental dimension' in the water management process which is imperative in order to safeguard ecological functionality and effective adaptation to climate change.

Karin Krchnak, director of Freshwater from the World Wildlife Fund, reminded the audience that this environmental approach has been discussed heavily, including at World Water Day in Rio de Janeiro 2017, but has been limited in its application. Krchnak acknowledged that the World Wildlife Fund would like to adopt a similar water reserves approach in other parts of meso-America where major work to preserve


water is necessary. Economic benefits will follow from these environmental considerations.

Currently, Mexico has selected three river basins as models in the National Water Reserves Program, representing main challenges and opportunities in the country to understand and build solutions. These basins include: San Pedro Mezquital River, Conchos River, and Copalita River. While nearly 331 hydrological basins are part of the National Program, these three basins are the most recent to be decreed as a national water reserve in the country. In the near future, the other basins will have the capacity to be decreed as reserves once preliminary research has been completed.

A major obstacle in developing new water reserves is the processes of getting basin bans removed in order to enable continued work and make new titles. Removing these bans is important in order to work on public and environmental use projects.

Mexico's National Water Reserves Program aligns with national water programs and will aim to have 189 river basins with a decree published for them by 2018. Furthermore, this approach helps form the strategic objective of the Federal Government's 'Water Agenda 2030'.

How does the session feed into the theme "Bridging Science and Policy"?

Ecological flow has not been usually a part of public policy consideration. This gap is expected to be filled and justified in other parts of the world through Mexico's National Water Reserves Program. 



7. Water and Sustainable Growth

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RS 24 - Water and Sustainable Growth: Irrigation

TIME AND ROOM: 31 May 2017, 9:00 - 10:30; Cozumel 4

SPEAKERS: Gül Özerol, Sebastian Riera, Amy Uyen Truong

KEY MESSAGES

- **Evidence-based cases of drip irrigation alternatives can overcome climate variability and risks.**
- **Assessments of technical efficiency of agricultural water allows for estimations of the intrinsic economic value of the water resource.**
- **Drip irrigation and water efficiency should be promoted to the public with data on the watering requirements of plants.**

SESSION SUMMARY


This session focused on the sustainable use of irrigation schemes and featured researchers from Argentina, Turkey and the United States. From policy reform to evidence-based strategies, interesting cases of water management and effective conservation were exposed.

Dr. Gül Özerol provided a review of the irrigation reforms in Mexico and Turkey. The author showed how the science-policy interface can find similarities on policy reforms in two countries despite their differences on the political settings, cultural backgrounds and existing water management infrastructure.

From a closer perspective in Mendoza Argentina, water is a key resource for development but there

are increasing concerns regarding the viability of current irrigation practices and future resource availability. Sebastian Riera, research associate from the University of Gottingen, explained how agricultural potential relies on irrigation and measuring the efficiency of producers could alleviate pressure on water resources, improving the design of policy tools.

Considering urban water challenges, Amy Uyen Truong from Texas A&M University, presented research with integrative irrigation techniques in drought-prone areas. This study analyzed 97 ornamental landscape species under four different irrigation treatments to educate consumers on how to reduce over-irrigation and properly manage their landscape. The results revealed a maximum threshold for landscape irrigation and a selection of plants that could truly be considered drought tolerant.

This session reflected on the challenges of the irrigation systems to address current and future threats on water availability. It is expected that more science-based results are considered in the design of policy tools, integrative irrigation planning and consumer communication. Tailoring water policies in accordance with evidence results can result in significant water savings. 



RS 39 - Water and Sustainable Growth: Water-Energy Nexus

TIME AND ROOM: 29 May 2017, 17:30 - 18:50; Cozumel 3

CHAIR: Chris Scott

SPEAKERS: Carlos Galdeano, Douglas Aitken, Kendra Sharp, Gina S. Warren, Sebastian Riera, Fernando Ortiz

SESSION SUMMARY

The session began with a presentation on hydraulic fracturing in Mexico by Carlos Galdeano, PhD student at Texas University. He particularly discussed the multi-layer spatial analysis of water availability for shale resource development in Mexico. The three layers in the multilayer analysis are: (1) surface water, (2) ground water, and (3) shale resources. Furthermore, there are three scenarios for water usage: using all water available (not recommended), leaving watersheds and aquifers in Zone 3, or leaving watersheds and aquifers in Zone 4. Water availability varies across the various shale basins of Mexico:

- Sabinas shale basin: greatest available groundwater of up to 300 wells/year
- Tampico shale basin: mostly surface water
- Tuxpan shale basin: fewer shale resources and greater surface water
- Veracruz shale basin: great water availability but fewer shared resources (such as oil and gas)


The difficulty lies in where there are great shale resources, water is not available. The areas closer to the Gulf of Mexico possess more of this resource. In order to increase water availability in regions overlaying shale resources areas, different strategies need to be analyzed and implemented.

The second speaker, Douglas Aitken, Facultad de Ingeniería at the Universidad del Desarrollo, spoke on the decreasing water availability for mining regions in Chile. Water management and mining is crucial in Latin America as 11-12% of Chilean GDP comes from copper mining and 1/3 of the world's copper production comes from Chile. There have been billion dollar projects put on hold in Latin America because of social unrest around mining resulting in poor water quality. Water stress is already high in the region due to low rainfall and the region is extracting fossil water with low recharge rates and worse expectations in a near future. Lower rainfall, climate change and higher industrial use all contribute to declining water availability. As such, Chile is now looking toward seawater to meet mining needs. Aitken presented an analysis on the cost differences between using desalinated, raw, or seawater precipitated with lime (removal of magnesium ions). Combining seawater use with tailings filtration or tailings thickening is a technique that can save water. For low elevation mines, thickening tailings is favored. For higher elevation mines, filtering tailings is preferable in order to use less sea water. This water saving analysis can also be implemented in other mining countries. The environmental impacts of mining being high, there is a strong need for regulation.

Kendra Sharp & Gina Warren, respectively from Oregon State University and Texas A&M University, discussed the UN's SDG #7: "Energy access for all". Currently, 1.3 billion people globally still do not have access to power. In rural Northern Pakistan, 54% of the population does not have power. This is why the speakers examined hydropower, where natural resources such as rivers can be used to provide electricity without contributing to water scarcity. However, Pakistan is a data sparse environment. Accurate estimates lead to better planning and stability in regions, but it requires data collection. The speakers use their toolbox of technical analysis as well as policy and legal information. Data mapping is needed in order to implement power structures. To do so, it is important to consider:

- local licensing- subsidiarity,
- tariff design- incentivizing investment,
- educated/knowledgeable workforce,
- Need for local workers/participation, community involvement.

The session then changed focus to energy and water policies in Mendoza, Argentina. Sebastian Riera, PhD student at the University of Gottingen discussed how "water scarcity increases pressure to improve productivity and efficiency of water use." Currently, the agricultural sector accounts for 70% of water use. Overuse of groundwater in agriculture has led to water quality degradation, soil and groundwater salinization. The need to pump for deeper water leads to higher pumping costs and increased use of energy subsidies with lower yields. The General Irrigation Department (DGI) is a major player in Argentinian water policy. Water organizations are clear about resource administration, but are lagging on quality programs for groundwater. Improving groundwater management can leverage profits enhancing environmental trade-offs. Energy policies may improve targeting beneficiaries and slowly update water technology.

Finally, Fernando Ortiz, representing the Border Environment Cooperation Commission, discussed energy efficiency as a method to improve water management practices at the local level. He focused on water utilities in Mexico stating that physical efficiency results in only 50-65% of water getting to the consumer and commercial efficiency resulting in 60-80%. Energy accounts for 40% of water utility expenses, so decreasing the use of energy can lower costs and promote increased investment in water saving policies at the local level. 

RS 40 - Water and Sustainable Growth: Water-Food-Energy Nexus

TIME AND ROOM: 2 June 2017, 10:50 - 12:20; Cozumel 1

CHAIR: Renee Martin-Nagle

SPEAKERS: Bassel Daher, Liber Martin, Man Yang, Dorice Agol

SESSION SUMMARY

There are many global challenges that must be faced in the near future: a projected 9 billion population by 2050; 10-30% less precipitation than in 1980-1999 in most sub-tropical regions; and by 2050 we will need 55% more water, 60% more food, and 80% more energy. Currently we lack adequate communication across disciplines (such as between scientists and policymakers). Bassel Daher presented a model for the Water-Energy-Food (WEF) nexus with a 7-question guideline to address this problem. The model begins with a critical question for the region, and includes: stakeholders, data, assessment, communication/ stakeholder involvement, scale, and system definition. Daher stressed the importance of combining physical resource interactions and trade-offs with interactions among different players and stakeholders governing those resources.

A Qatar case study was presented and its critical question concerned food security. Qatar is oil and gas rich with an arid climate. Its water source is almost solely from desalination, with limited agriculture due to low water quantity and quality, unsuitable soil, and other climatic conditions. These elements result in the need to import 90% of food products into the country. Thus, the critical question in Qatar is: what is an appropriate level of local food production in Qatar? The stakeholders include the Qatar National Food Security Programme. The next step in the model is to define the system of systems: water [rainfall, households, agriculture], food [soil], energy [carbon, diesel, solar, wind]. A WEF nexus studies the user, tool, sustainability index, and local characteristics. Resource constraints did not allow for huge increases in food production in Qatar so lower food increases were discussed.

In Latin America and the Caribbean (LAC), the WEF nexus has been recognized in the law for many years. The order of priority is drinking water, agriculture, and energy. However energy is the most powerful component and it is important for planning, and so it should be the first priority. Latin America has a strong and committed international human rights agreement with a right to water, energy, and food recognized in treaties. The main obstacles in identifying priority interconnections for the WEF nexus in Latin America include a lack of information, high heterogeneity, and weak governance. Martin acknowledged that it is very difficult to identify priority interconnections

for such diverse regions of LAC, but they include priority interconnections between: Water-Energy (hydropower, hydrocarbons, mining), Energy-Water (water abstraction, use and desalination), Water-Food (agriculture), and Water-Energy-Food (biofuels and irrigation modernization).

In order to find success in Latin America and the Caribbean, the WEF approach needs to consider serious regional obstacles and specificities and cannot be reduced to technical and efficiency aspects in the Latin American region. While a global approach to the WEF nexus may not exist, the WEF nexus constitutes a great opportunity to change and revise current unsustainable development model patterns in the LAC region.

A change of geography to South-East Asia examines the WEF nexus in the Mekong river basin. The Mekong river basin covers 6 countries and is the 7th longest river in Asia, serving a significant population size and contributing to economic growth in the region. Water risks include high agricultural withdrawal and variable water resources while there is also a climate change risk from uncertain rainfall levels. Urbanization is causing a decrease in agricultural land size, contributing to food insecurity. The third element of the WEF nexus- energy- has a strong focus on hydropower in the basin with no policies for renewable energy. Man Yang explained how these competing demands between water, energy, and food are especially prevalent in large river basins, such as this one. In such large transboundary river basins, such as the Mekong, a risk/resilience index can be used to aid policymakers in making more sustainable policies. Using input from WEF nexus and a system dynamics model, a sustainable development policy can be created for the Mekong river basin.

Finally, Lake Victoria basin was examined by Dorice Agol to identify how the WEF nexus could aid water management in this region. Lake Victoria's uses include water, food through fisheries and agriculture, and energy from hydropower and renewable sources. In Uganda, 90% of their hydropower depends on Lake Victoria but Uganda may fail to comply with water release policy.


While the Lake Victoria area has many policies in place, they often lack scientific data. Transboundary policies include the promotion of equitable sharing of the Lake's resources, sustainable management and

RS 40 - Water and Sustainable Growth: Water-Food-Energy Nexus

utilization of the Lake's resources, conflict resolution of transboundary issues, and regional cooperation and integration. Key policy issues concerning the WEF nexus are on water supplies, water for energy (hydropower) and water for food.

We have great scientific tools, but findings need to end up in policy through institutional arrangements. In order to bridge this interface there needs to be the following improvements in the region: an alignment of multiple research interventions in transboundary

countries, regional collaborative research, resolutions of conflicting scientific knowledge, an alignment of research priorities with donor and a shortened bureaucratic process.

The biggest problem with the water-energy-food nexus is proper coordination due to different priorities of transboundary regions, making the nexus policy slow, complex and requiring a deep understanding of the science-policy interface in each region. 

RS 41 - Water and Sustainable Growth: Water-Food-Energy Nexus

TIME AND ROOM: 31 May 2017, 10:50 - 12:20; Salon Isla Mujeres

CHAIR: Li Yuanyuan

SPEAKERS: D.L. Marrin; Clive Lipchin; Tamee Albrecht; Daniel Gilmour

KEY MESSAGES

The nexus framework and methodology is a good way to determine equitable solutions in water management with a focus on specific regions.

Simply having one vegan meal per day would save a lot of water. Animal based foods require more land, energy, and water than plant based foods. If a community could collectively lower animal based food demand, water would be saved at very high rates. Supply-side solutions such as producing more water by desalinization are more acceptable than demand-side solutions, but are less effective for short-term drought challenges. Residents must voluntarily shift food habits to conserve local water resources because it will have a far greater impact than reduced household water and energy use.

SESSION SUMMARY

Evaluating alternatives for conserving water resources via use of the water-energy-food nexus

In California, the drought cannot be addressed solely by supply-side solutions (i.e. producing more water). California requires a supply of 25-40% more water. Drought effects cannot be addressed by supply-side factors alone if 40% reduction is necessary even with desalinization technology. Because there is no way to produce 40% more water in California, there must be water conservation in the agricultural region in order to survive. Reductions in water use should be facilitated in the agricultural sector because irrigation is one of the greatest users of blue water (water contained in aquifers that is readily available for consumption and irrigation).

One of the best ways to conserve water in California would be through the reduction of agriculture. California is essentially a desert with a very large population, providing a lot of fruits and vegetables to the rest of America. The most effective demand-side action by residents for conserving scarce local water resources is having a plant-based diet as opposed to a meat-based diet. This conserves water because plant diets require less water; animal-based foods require more land, energy, and water than plant-based foods. Residents of industrialized nations consume animal protein at 2 to 3 times recommended or needed for human health. California's total water footprint is 46% food (plant-based); 47% food (animal based); 4% household and office; and 3% other products and services. Most water conservation efforts are focused on household and office use, not because it's the most effective, but because it is the most politically acceptable. We have to educate the consumer about the water-food nexus to really see a change in California's water footprint. But consumer food choices are unlikely to be mandated because there are social, political, and legal taboos connected with doing so. In regards to local blue water allocations, 45% is consumed or wasted locally and 55% is exported. Food waste is also difficult to control due to safety issues. Supply-side solutions are more acceptable than demand-side solutions, but less effective for short-term drought challenges. A far greater impact for the reduction of water usage and aiding in water conservation is for residents to voluntarily shift food habits rather than focusing on reducing household water and energy use.



RS 41 - Water and Sustainable Growth: Water-Food-Energy Nexus

Solutions for off grid food-energy-water in Israel, the West Bank and Jordan

Sustainable development requires access to clean water, sanitation and electricity, however, off grid communities lack reliable access to clean water, wastewater treatment, or energy. 1.3 billion people live in these types of situations, with a larger portion of these people living in rural or semi-rural communities due to limited infrastructure.

Along the West Bank and Jordan, this is a large problem. Around 70% of the Palestinian population in the West Bank is "off-grid" as well as 30% of the Jordanian population and 50% of the Bedouin population in Negev, Israel. The need for off grid solutions is growing, as evidenced by recent Syrian refugee camps which lack wastewater treatment. In Israel, there is now an increase in treated wastewater being used for irrigation and in Palestine, if wastewater is not treated, it flows into Israel and contributes to transboundary tension. In off-grid communities, all wastewater enters back into the environment and is not treated. Therefore, we must improve the situation in the Palestinian area in order to improve water issues downstream in Israel.

Greywater is a water stream that can be effectively treated locally and returned for small scale farming. In an average household, about 70% of wastewater can be treated and then used for local agriculture. Black water, which comes from toilets, is more difficult to treat locally.

Transboundary wastewater can increase tensions between communities. It was announced that children are our best advocates in dealing with the environment and water conservation because they share ideas with their families. The biggest off grid challenges in implementing greywater saving and drip irrigation is water quality monitoring. The answer lies now in expensive technology.

Water, energy, and food security: a comprehensive review of nexus methods


The nexus is a complex issue and one single approach will not work in every situation. The concept is radically expanding, but methods used to evaluate the nexus have been moving slowly. The nexus aims to increase the synergy between water-food-energy sectors by increasing efficiency and decreasing environmental issues. Issues are exemplified with population growth and climate change, but these things can be mitigated and it is key to strive for sustainability.

Ideal nexus assessments include: relationships, interactions, and feedbacks; effective implementation; political and social aspects; and method accessibility. Collaboration between stakeholders is also very important. Stakeholder participation/engagement and understanding the needs of community are both necessary aspects to include in nexus evaluation. Therefore, there is a need for site specific studies. Quantitative and qualitative methods are the most popular, but we must also address social and political dimensions, which are somewhat infrequently included in a nexus. The next step is to use the best options and practices to inspire collaboration and more interdisciplinary methods in nexus studies.

Decision support tools for understanding and managing the water energy food nexus

"WEF Nexus: models and DSTs"

In order to bridge science and policy, we must link nexus models with decision makers.

The nexus must explore food, water, and energy provision systems at a range of scales, to identify low impact, secure, and equitable systems. We need a dynamic global context so that we can learn from each other on how to get communities and stakeholders engaged in the process. Nexus models predominately focus on biophysical models, sustainability assessment models, and social simulation—including policy driven and human disaggregated decision making. Challenges include complexity, data availability, and communication of model findings. Communicating complex nexus models with policymakers can be very difficult. The nexus method depends on the aim, whether the aim is to understand, govern, or enhance the nexus. Additionally, stakeholder engagement will be key in creating a nexus model--no one discipline can build a NEXUS model. Visualization will be a key tool in conveying and understanding the complexity of the issues. 



RS 42 - Water and Sustainable Growth

TIME AND ROOM: 2 June 2017, 10:50 - 12:20; Cozumel 3

CHAIR: Torkil Jønych Clausen

SPEAKERS: Ioannis Chronis, Manisha Deb Sarkar, Feng Hu, Tugce Yildirim, Temur Khujazarov


SESSION SUMMARY

The session covered topics of water management in Greek, Indian, Chinese, Uzbekistani and Turkish river basins. The first speaker, Ioannis Chronis, discussed the hydromorphology in a Greek river as a case study, in order to provide a methodological tool that identifies the critical fluvial process affected by human pressures. The water quality is based on fluvial processes and the water frame directive guidance is used, applied and evaluated. The Morphological Quality Index for establishing water quality contains three main steps; functionality, artificiality and channel adjustments. In this case study, analysis delineation and characterization were made, resulting in the conclusion that it is important to make measurable, realizable goals and to clearly identify pressures on hydromorphology.

Next, Manisha Deb Sarkar presented on a dying river, Adi Ganga River, in Kolkoto Metropolis. The main reason for the extinction of this river is pollution, primarily by humans. River degeneration is from tidal water and it is responsible for heavy siltation in the river bed. She concluded her speech by identifying that population changes attitudes and the environment.

Focusing on China, Feng Hu talked about the Yangze River and the non-profit organization Chinawater Risk. Chinawater Risk assesses business in environmental risks and brings attention of growth in China, and how it will continue in terms of water footprints. It hopes for China, a low water footprint trader and with a low GDP, to increase its GDP without also increasing its water footprint. He finished his talk with reminding the audience that there is improving water quality in the Yangtze River.

Temur Khujazarov presented on Uzbekistan's water problems and its connection to the major water use through irrigation in the country. Water shortages in Uzbekistan will be noted in the future due to increasing temperature and evaporation.

Finally Tugce Yildirim talked about the Southeastern Anatolia Project in the context of sustainable development. She explained the history of the project including the project's goals and outcomes. 



SS 10 - Smart Water Management (SWM): the technological innovation needed for “Water for all”

TIME AND ROOM: 30 May, 2017; 9:00 – 10 :30; Salon Coba

HOSTING INSTITUTION: Korea Water Resources Corporation

SESSION SUMMARY

This special session was chaired by Callum Clench, Executive Director of IWRA and included Seong Han Kim, President of K-Water and Guy Fradin, Treasurer of the World Water Council. They emphasized the contribution of Smart Water Management (SWM) to new approaches in policy-making. SWM is an innovative concept that needs to be considered by policymakers in order to adapt and to resolve future water and energy crises. The word Smart seems to be a key word from the 21st century, and the aim is to find effective ways to use water resources. Not only is SWM a technological innovation, it is also a way to face future challenges while coping with communication issues. The goal is for the results from research and work on SWM to be presented during the 8th World Water Forum that will take place in Brasilia, in March 2018.

The presentations highlighted different uses of Smart Water Management and speakers presented various examples of SWM in Asia. One of the case studies presented by Ryu Mun Huyn, who is part of the Water Economy Team for K-Water, illustrated how the Pilot Project of Seosan City could be implemented. The water cycle in the city is monitored, and data is collected through pipe pressure. The data helps to understand the amount of water that is used, as well as when and where it is being used, in order to provide a more adapted service to people. The direct outcomes of such a service are a rapid detection of leakage points and constant flow analysis. Moreover, the community is also involved in SWM. An App is available for people to provide their information on consumption and requirements. Overall, it serves as a useful tool for policymakers and water agencies to adapt to actual needs while promoting effective water consumption.

A second example of the implementation of SWM in Asia was presented by Yangwen Jia, from the Chinese Institute of Water Resources and Hydropower Research, who explained the concept of a Sponge City within SWM. Sponge Cities use the urban rain island effects to extract water resources, through storing rainwater, purifying and then reusing this water, rather than using water resources through conventional sources. As such, they are a top priority in urban planning. The difficulties for Sponge Cities lay in the differences in weather conditions, degree of urbanization as well as drainage system in place. The best way to make Sponge Cities work efficiently is through a construction, management and evaluation program. According to Yangwen Jia, the concept of Sponge City is also a way to bridge science to policy, through the publication of technical specifications

and training of government representatives.

A more local example of SWM was presented by Patricia Garrera, who spoke for Carlos Eduardo Mariano Romero, from the Mexican Institute of Water Technology (IMTA). IMTA developed Programa de Indicadores de Gestión de Organismos Operadores (PIGOO) which collects data on drinkable water, irrigation dams and other critical water indicators. The data is open to the public, in order to provide transparency and efficiency for water distribution.

Overall, the three examples presented in this special session showed various aspects of what can constitute Smart Water Management. Not only is it a way to monitor water distribution, consumption and quality, but it is also a way to work towards the implementation of Sustainable Development Goal 6. The system of collecting data and monitoring water management will allow more effective water consumption that eventually leads to a better reactive response in cases of water shocks such as droughts or floods. It entails adapted infrastructure to enable the system and implement smart water strategies. Pierre-Alain Roche, President of the ASTEE (French Scientific and Technic Association for Water and Environment) importantly mentioned that not only should we consider SWM for single territories but also as communication tools to contribute to solidarities between territories. Indeed, SWM should be a way to serve public interest and operate a drift from innovation to progress.

The conclusion to the session was opened by a discussion from the panel constituted by Cecilia Tortajada (Senior Research Fellow at the Institute of Water Management, Lee Kuan Yew School of Public Policy), Philip Gichuki (Managing Director of Nairobi Water Company), Gabriel Eckstein (Chair of the International Scientific Committee) and Peter Gleick (President of the Pacific Institute). Overall, the session highlighted the need for a smarter governance of water in order to change the way water is managed. However, the implementation needs to be carefully planned with a strong legal framework in order to set up a structure for SWM. Gabriel Eckstein recommended a bottom-up implementation approach to the framework, in order to adapt the strategies to territories. The ultimate limit to SWM lays in communication possibilities, which excludes some rural areas in developing parts of the world. In the developed world, the difficulties lay in the infrastructural gap that can exist in rural areas, where even though water facilities are efficient, they cannot be adapted to the newest technologies. 

SS 43 - Hydropower Development and Reservoir Operation

TIME AND ROOM: 1 June 2017, 10:50 - 12:20; Cozumel 4

SPEAKERS: Ignacio Guisández, Elçin Kentel, Tor Haakon Bakken

HOSTING INSTITUTION: Middle East Technical University

KEY MESSAGES

- **Effectively and sustainably managed hydropower is a reliable and beneficial source of renewable energy for many nations, especially developing countries. The negative effects of reservoirs and hydropower are outweighed by the benefits.**
- **The sustainable use of water resources to maximize their potential benefits is a big challenge and currently hydropower generation constitutes a significant portion of these benefits. Being a domestic and renewable energy source, hydroelectric power has the additional advantage of acting as a large-scale energy storage alternative through pumped storage hydropower plants. Social and environmental objectives, climate change and political issues further complicate development of optimal operating policies.**

SESSION SUMMARY

The objective of this special session was to gather researchers together to share their recent works on hydropower reservoir operation and to highlight challenging problems and future research topics.

Sustainable use of water resources to maximize their potential benefits is a major challenge. Currently, hydropower generation constitutes a significant portion of these benefits, especially for developing countries. Hydropower is a domestic and renewable energy source with less environmental impacts compared to most thermal sources. In this special session, three contributors; Dr. Ignacio Guisández, Dr. Elçin Kentel and Dr. Tor Haakon Bakken delivered talks on various dimensions of hydropower.

First, Dr. Guisández talked in general about the most common environmental constraints of hydropower, such as minimum flows and maximum ramping rates.

He presented this study on the stochastic analysis of the economic effects of environmental constraints on hydropower. He concluded that the transmission system operators, the river basin authorities and the hydropower producers need to reach multilateral agreements regarding the implementation of environmental constraints in order to avoid potential social and legal conflicts.

Dr. Kentel discussed an analysis of pumped-storage in a multi-reservoir hydropower plant system, specifically for a case study in the Çoruh Basin in Turkey. She stated that hydropower is the largest renewable energy contribution to the energy budget of Turkey, which is very important because Turkey is highly dependent on foreign energy sources. She concluded that Turkey will benefit from sustainable and effective operation of pumped hydropower systems.

Dr. Bakken talked about climate change and the need for reduced fossil fuel use and increased renewable energy resource development. He concluded that high water consumption rates from reservoirs in water stressed regions should not disqualify reservoirs from being built, but rather the opposite. The fact that reservoirs store water from the wet to the dry seasons and make water available during dry seasons makes reservoirs needed, and water loss is something we must accept in order to gain reservoirs' more important benefits.

Finally, the potential benefits of hybrid systems, such as floating solar panels at the hydropower reservoirs, were discussed. Advantages of these hybrid systems, such as minimized water loss due to evaporation, and disadvantages, such as deteriorating water quality in the reservoir, were explored together with the audience.



SS 56- Innovative Water Resources Management and Green Development in China

TIME AND ROOM: 29 May 2017, 15:30 – 17:00; Cozumel 5

SPEAKERS: Patrick Lavarde, Chen Mingzhong, Jia Yangwen, Li Yuanyuan

HOSTING INSTITUTION: General Institute of Water Resources and Hydropower

Planning and Design at the Ministry of Water Resources of China

KEY MESSAGES

There has been a change of development mode in China, aiming for integrated development through the adoption of eco-friendly and science-based policies. The central government is prioritizing water conservation by improving control over water consumption and by adopting frameworks such as environmental flows, ecological regulation through water demand management and the joint operation of reservoirs, and ecological compensation with protector-beneficiary compensations, for instance. The orientations for the development of new policies are: Ecological Health, Economic Development, and Water Resources Sustainability. The focus on regulation has led to the enforcement of water permits management, establishment of water drawing quotas, renovation of water pipelines, and water serving tools for water use efficiency. There has been an increase in non-traditional water sources such as reuse, recycled, and desalinated water. The change in the development mode is mirrored in numbers and policies such as:

- **52% increase in water reuse in Beijing;**
- **8 million hectares of farmland with water efficient irrigation developed;**
- **Progressive water pricing for industrial use;**
- **Rewarding system for water saving actions;**
- **Establishment of River Chiefs System for river management and engaging provincial, municipal, county, and township governments with the promotion of information sharing and work supervision. The system aims for “One policy for one river and One policy for one lake” practices.**

SESSION SUMMARY

Patrick Lavarde, President of IWRA, gave an opening speech in which he explained that China is one of the most active chapters of the IWRA network and that IWRA will launch a project on smart water management based on case studies from all over the world (10 to 12 cases). A book will be published on the topic, which will also be addressed at the 8th World Water Forum.

Chen Mingzhong of the Ministry of Water Resources in China presented on the innovative water resources management and development in China and a presentation on eco-environment oriented river management in China was given by Jia Yangwen from the China Institute of Water Resources and

Hydropower Research. The third keynote speaker, Li Yuanyuan of the General Institute of Water Resources and Hydropower Planning and Design went into further detail on the technical and scientific support for water resources management in China.

The speakers highlighted the policies adopted by the Central Government of China to ensure control of water management in the country and promote the country's transition to a sustainable development mode. To justify the change, speakers discussed how China accounts for 20% of water availability in the world, but face several challenges related to:

- Water shortages due to uneven spatial distribution of water resources;
- Water pollution as a result of increased load in the natural resources due to human activities;
- Ecological damage with climate change and increasing water supply;
- Flood and drought; and
- Rivers drying up

Two case studies were presented to demonstrate the change in China's development mode: the Weihe River, which is the biggest tributary of the Yellow River and cradle of Chinese civilization, and the Songhua River. These rivers have been the targets of eco-friendly flow assessment and environmental restoration. At the Weihe River, water diversion for power generation stops now in dry season to ensure environmental flow and 94 reservoirs have been defined.

How does the session feed into the theme “Bridging Science and Policy”?

The Keynote Speaker, Li Yuanyuan, argued that China has adopted policies based on scientific knowledge, which directly addresses the bridge of science and policy. He explained how China is bridging science and policy by showcasing that, for the past 10 years, the country has developed National Water Resources Assessments taking into account water quantity, quality, and availability (the Assessment is now in its third round). Some of the major projects to build this bridge have been the balancing of water resource assets (surface and groundwater), the evaluation of water resources carrying capacity, water allocation based on river basin, the defining of aquatic eco-space and “redlines” in rivers through careful study of different areas, and classifying and defining the areas to be protected.

SS 61- The Legacy of COP22: Implementing the Global Climate Action Agenda in the Water Sector

TIME AND ROOM: 30 May 2017; 15:30 – 17:00; Cozumel 5

SPEAKERS: Alcocer Yamanaka, Éric Tardieu, Jason Morrison, Jean-Didier Berthault, José Carrera, Miroslava Moran, Antoine Verville, Danielle Gaillard-Picher, Jean-Francois Donzier

HOSTING INSTITUTION: International Network of Basin Organizations

SESSION SUMMARY

Alcocer Yamanaka, representative of International Network of Basin Organisation (INBO) World Presidency, introduced the session and then let the floor to Éric Tardieu, INBO Deputy Secretary General. He presented the Global Alliance for Water and Climate's Incubation platform (GAWACIP): its goal is to select candidates' applications to fund their project. The key projects are monitoring networks or water innovative projects. The first phase of 2017 is to detect the projects and start organizing them in order to get ready for COP 23.

As an example of one of those project, the National Water Information system in Burkina Faso, aims at implementing an efficient strategy to monitor water systems. Another of these projects is experiencing reduction of industrial pollution in the city of Fez, Morocco. Finally, the Diana dam monitoring system project in the Senegal River is also illustrating the process.

Jason Morrison, representing the Business Alliance for Water and Climate, argued that most of the countries that attended COP 21 did not financially support eco-friendly projects. The Global Alliance for Water and Climate created an incubation platform, which helps to provide funds for such projects. It is a tool that helps applying the COP 21 ideas while providing a sound system for projects to be fairly implemented.

Jean-Didier Berthault, from the Megacities Alliance and Vice President of SIAAP (Interdepartmental Syndicate for Paris Region Sanitation), presented the Megacities Alliance for Water and Climate as an initiative from UNESCO. Megacities are defined as recording a population greater than ten million. He shows how the Global Alliance for Water and Climate Incubation Platform is useful by collecting and redistributing information in order to design an efficient strategy. The network is wide and gathers various actors (international organizations, governments, NOGs).

José Carrera, Vice President of the Development Bank of Latin America (CAF), discussed that more than 80% of the Latin American population lives in cities and between 25% and 50% in slums. Cities are the main productive engine in the region. Even though governments intend on reducing inequalities, it is still the most unequal region in the world, mostly due to social exclusion.


Universalization of water systems can help reducing poverty expansion. CAF is acting on pollution reduction and on disaster-risk management. There is an urgent need to protect water at different levels, as climate change intensifies migration and poverty.

Miroslava Moran, Technical Secretary at the National Water Commission in Panama, presented the National Climate Change Plan of Panama, which has five goals and revolves around themes such as agriculture, energy, finance and education.

Antoine Verville, from the North American Basin Organization and the Basin Organization from Quebec, presented a project on cooperative actions between governments, cities, businesses, investors and citizens. Their expertise is on flow management and climate change in Quebec, Canada through sharing responsibility between scientists and communities. They first created a group of leaders in a region and equipped them, which allowed for the community to get involved and increase community building.

Danielle Gaillard-Picher, Director of Policy and Programs at the World Water Council, discussed the importance of water in communities as an essential resource that needs to be preserved. The most important idea raised was that politicians have to integrate water into discussions. There is an urgent need to promote communication and visibility of the water agenda.

Finally, International Office for Water CEO, Jean-Francois Donzier, addressed the audience by saying "not to conclude, but to mobilize you". Focusing on basins rather than coastal areas and working on water quality from basin groundwater is crucial to preserve a high level of water quality. COP 22 was the first event to include freshwater as a topic by itself and it led to the creation of four chapters within the Global Alliance for Water and Climate: basins, megacities, business and desalination alliances.

Speakers came to the conclusion that we must adapt the language to get more people involved, to explore all the sides of water issues. Jean François Donzier, mentioned basins studies as a central part of discussions, while he reminded the audience that the discussions on this topic first started in 1992 in Rio de Janeiro: we must start and multiply the discussions, even if the results can take 20 years to be seen. 

SS 71 - Making Investments in Multi-purpose Water Infrastructure Fit to Finance

TIME AND ROOM: 30 May 2017, 9:00 - 10:30; Cozumel 5

HOSTING INSTITUTIONS: CAF–Development Bank of Latin America, and World Water Council

KEY MESSAGES

- **Multi-purpose Infrastructure (MPI) benefits countries by ensuring reliable stream flows and reliable water supplies.**
- **Latin America has abundant water resources, but there is high variability and water is not always harnessed the most efficiently or most effectively.**
- **Implementing MPI is a very complex process with a wide variety of conflicting interests that must be managed, preferably by states.**
- **There is a need to reduce financial barriers and improve cooperation amongst interests and investors.**
- **Climate change will affect the long term availability of water resources, which makes MPI even more attractive and urgent for developing countries.**
- **MPI needs to improve its return on investment in order to attract more financing and maximize benefits.**

SESSION SUMMARY

Multi-purpose infrastructure (MPI) is very attractive due to the added value of providing energy and water services like water supply, irrigation, flood control, navigation, and others, to harnessing economies of scale and scope. Nevertheless, this type of water infrastructure poses formidable policy and operational challenges. Finance, governance, and proper care of environmental and social concerns are cornerstones of MPI development. The seminar discussed case studies focusing on project cycle of large-scale projects under climate change and innovative financial mechanisms for MPI. A panel of experts discussed their implications from the public policy perspective, exploring both the benefits of Multi-purpose infrastructure (MPI) as well as the obstacles to planning, designing, and executing MPI.

MPI involves dams and related infrastructure to store and use water resources for multiple purposes. MPI is important because water is essential to growth, but without sufficient infrastructure or a reliable supply, growth will not occur. While regions like Latin American possess many water resources, those resources are highly variable and are not always managed for reliability. MPI aims to control river flows and reduce fluctuations in water supplies. With reliable supplies, various sectors can grow and develop better than they could before. As the name implies, MPI also serves multiple purposes aside from storage. Dams

can generate electricity, and reservoirs can provide recreational opportunities.

MPI is also important to adapt to climate change. Some effects of climate change are already locked in, which increases the urgency of controlling supply variability. Climate change will likely not only increase variability in precipitation for some regions, it will also intensify meteorological extremes. Therefore, water resource planning must prepare for these changes, and MPI can play a vital role.

While MPI benefits regions and nations, it can come at a cost to communities and the environment. Reservoirs created by dams displace locals, flood farmland, and disrupt ecosystems.

MPIs face a variety of obstacles to implementation and construction. MPIs must overcome complexity, conflicts of interest, high costs, and climate change. The process of implementing MPI plans is very complex due to the high number of varied stakeholders involved and differing government processes. The larger the proposed project is, the more complex it will be to align interests and obtain financing. Interests conflict in almost every project proposal. Energy producers, mining companies, farmers, flood control entities, and cities all need water, but these interests do not always align. Thus, governments must facilitate negotiations or make decisions regarding which sectors receive preferences. In developed countries, it can be difficult to implement MPIs due to already existing agreements and structures, as well as differing priorities. Legal uncertainty can also lead to additional complexity.

High costs also affect MPI implementation. After all, nothing can be done without money. There are a variety of costs, including direct costs, environmental costs, and resource costs. Directly, there are initial financial expenses as well as current and future operating expenses. However environmental costs must also be taken into account. This could include aquifer pollution, wetland destruction, or deforestation. Resource costs are essentially opportunity costs; that is the difference in results from utilizing water resources for one use and not another, such as the difference between using water for irrigation versus using water for hydropower.


All costs need to be covered in order to successfully implement MPI. Costs can be covered through private

SS 71 - Making Investments in Multi-purpose Water Infrastructure Fit to Finance

investment, public-private partnerships (PPPs), or public sector expenditures. In order to attract private sector financing, MPI needs to increase its return on investment. An example of solar panels over a reservoir in China was used to illustrate this point. Planners must find new and efficient ways to utilize MPI to the fullest extent possible. Ultimately, some projects are so large that they can only be funded by the public sector. Costs must continue to be covered into the future in order to make MPI viable in the long term. Continuing costs can and should be covered through “polluter pays” and “user pays” systems, where those who degrade the resource and those who use the resource cover their respective costs. Essentially, water must pay for water.

A final element of MPI planning that was discussed concerned uncertainty- another effect of climate change on MPI. This adds greater complexity in creating an environmental uncertainty on top of legal and often financial uncertainty associated with MPI implementation. Without certainty as to what to expect from an MPI project’s production and viability in the future, investors will be less keen to invest or organize finances. Unfortunately, climate science is very complex and projections are not always completely accurate, especially in the far future. Good science-based plans are needed to project MPI viability in the future.

How does the session feed into the theme “Bridging Science and Policy”?

Policymakers, investors, and planners need good scientific data in order to effectively prepare for future changes in water availability. Planners and designers need good science to place dams in ideal locations, investors need good science in order to know what to expect, and governments need good science to effectively manage competing energy, agricultural, and environmental interests. 



SS 73 - The First Asia International Water Week: Asia Solution for Water

TIME AND ROOM: 30 May 2017, 17:20 – 18:50; Isla Mujeres Room

CHAIR: Neil S.Grigg

SPEAKERS: Horacio Rubio Gutierrez, Sangsoo Park, Glauco Kimura de Freitas, Blanca Jimenez Cisneros

HOSTING INSTITUTION: Asia Water Council

SESSION SUMMARY

The objective of this session was to introduce international water experts who are working to resolve water problems in Asia as well as to announce the first Asia International Water Week (AIWW) where Priority for Implementations (PFI) and Water Projects for the solutions will be discussed.

The first presentation was by Dr. Sang Soo Park on the Climate Change Challenge in Asia. He reminded the audience that Asia is home to 4.4 billion people (more than 60 percent of the world's population) and is facing serious water challenges which were raised by the effects of climate change. For some developing countries where agriculture is the main contribution to the economy, unpredictable weather causes the decrease of harvest productivity and prohibits the development of plants. To find solutions for these challenges, at the end of his presentation Dr. Sang Soo Park encouraged water stakeholders from all over the world to gather again at AIWW. AIWW is a platform to promote cooperation among nations, and to share their insights and experiences for resolving the water problems in Asia. The 1st Asia International Water Week will be held in Gyeongju, Korea in September, 2017. The event will welcome speakers and organizations from around the world to attend and share data, knowledge and solutions on the world water issues with a focus on Asian water issues. Applied solutions will be the main target during the event, in order to work towards practical methods for improving the current problems in Asia.

Next, Mr. Horacio Rubio Gutierrez spoke about the water problems in Latin America. In his presentation, Mr. Horacio Rubio Gutierrez referred to the similar challenges on water resources between both South America and Asia, with the challenges in terms of both quality and quantity due to climate change, urbanization and population growth. Besides these points, he also gave the audience examples of serious situations South America is facing:

- Bolivia declared a national emergency due to drought and flood in 2016
- the Brazilian government admitted that their country was faced with the worst drought since last century

- In South America, 37 million people do not have access to safe drinking water and 110 million people do not have access to sanitation
- One of the latest reports from the Mexican government stated that in 2050, 75% of Mexican cities will have a shortage of clean (high quality) water.

The third presentation was given by Dr. Blanca Jimenez Cisneros – a director of the division of water science and secretary of the International Hydrological Programmed of UNESCO. The aim of her presentation was describing water security action and capacity building in Asia and the Pacific region. She shared the expectation that the purpose of building capacity and water security action should be considered and recommended as the simplest version to understand, easily apply and spread to the local people in not only Asia and the Pacific, but also around the world.

Finally, Sir Glauco Kimura de Freitas - the secretariat of the 8th World Water Forum - introduced the upcoming 8th World Water Forum with the main theme of "Sharing water". This concept will not only be about sharing the transboundary basin but also about sharing new solutions, ideas and successful applications to solve the water problems around the world. Additionally, Sir Kimura stressed that the event will have 5 process commissions covered by 6 regions and 13 sub-regions:

- Political
- Thematic
- Regional
- Citizens Forum
- Sustainability Focus Group

In conclusion, this session highlighted the need for water practitioners, policymakers, and water users to come together to develop strong relationships and resolutions. The session encouraged all speakers and audience members to share insights and experiences for resolving the water problems around the world, which is an important preparation for the upcoming Asia International Water Week and World Water Forum next year.



SS 76 - Towards a Green Infrastructure in Latin America and the Caribbean

TIME AND ROOM: 31 May 2017, 9:00 - 10:30; Cozumel 5

CHAIR: Raul Munoz Castillo

SPEAKERS: Carlos Herrera Amighetti, Thomas L. Crisman, Suzanne Ozment, Julian Carlos Valencia Vargas, Andrea Erickson-Quiraz

HOSTING INSTITUTION: Inter-American Development Bank

SESSION SUMMARY


This session highlighted the importance of green infrastructure in Latin America. Latin America holds an abundance of water resources, but their functionality and governance need to improve. Green infrastructure can complement conventional “gray” infrastructure to increase functionality and adapt to the effects of climate change. Aside from defining what role green infrastructure has, it is also important to note that disaster remediation is more costly than disaster prevention, so Latin American countries should take steps toward planning for the future. More effective land planning, inventory of water resources, water management by basins, risk management against natural disasters and water operations involvement on source degradation and protection should be addressed. Speakers recommended an alliance within international organizations in order to better implement green infrastructure and to gain access to scientific data and knowledge. Effective communication between nations is key to successful green infrastructure projects. In addition, policymakers should gain more financial support from major water users, increase civil society participation, and build a stronger “water culture” in order to achieve rational and efficient water use.

The nexus between food, energy, and water was discussed at the session. This nexus affects all aspects of society, including politics, economics, and health. In addition, good ecological practices are important to manage resources. A key idea espoused at the session was that “good ecology is good business” because good ecological practices can improve ecotourism and maintain ecosystem services. Various societal figures, such as religious leaders, can also spread the message of good water stewardship and management.

Suzanne Ozment, of the World Resources Institute (WRI), explained WRI’s goals and interests related to green infrastructure. WRI is interested in green infrastructure because it can improve water quality, regulate hydrologic cycles, mitigate flow variance, reduce erosion, improve energy security, preserve biodiversity, protect coastlines, and sustain livelihoods.

There are key questions from water sector investors: what are the risks from watershed degradation to water supply, how can we be certain that green infrastructure strategies will address these risks, and what will be the costs?

Juan Carlos Valencia Vargas, Morelos State Governor, discussed the fact that while population is growing, the need for natural resources is also increasing. However, these resources are more and more polluted and water availability is decreasing. Taking the example of Mexico, there are places suffering from too much or too little water. Green infrastructure is needed to improve water quality and water availability in urban areas. In order to implement more effective water governance in the country, the Governor recommends fewer institutions in charge.

Finally, Andrea Erickson-Quiraz, Director of Water Security Department at Nature Conservancy, said that source watersheds are vital infrastructure for water security and provide critical co-benefits. As such, source water protection is important and should benefit from more public support. More communication and public support is the key to bridging science and policy. 



SS 77- Achieving Water and Sanitation SDGs in Latin America and the Caribbean

TIME AND ROOM: 31 May 2017, 10:50 – 12:20; Cozumel 5

CHAIR: Gustavo Mendez

SPEAKERS: Roberto Livares, Fabiola Tavora, Blanca Jimenez-Sisneros, Lupercio Zirolto, Irani Ramos

HOSTING INSTITUTIONS: IADB, UNESCO-IHP, GWP, ANEAS, USWP and Ministry of Integration of Brazil

KEY MESSAGES

Technology can help the decision makers to be more aware of water management.

SESSION SUMMARY

Great progress in Latin America and the Caribbean (LAC) has already been made in water and sanitation provision; however it is necessary to advance. In some areas, different generations face the same problem on sanitation and drinking water, such as regions where it is still necessary to carry and transport water. Currently, only 18% of the water in LAC receives proper treatment. Nineteen million people in the LAC region still don't have access to sanitation. Personal and family financial situations determine whether they have access to sanitation.

In order to achieve sustainable development it is not only necessary to mobilize financial resources, but it is also very important to mobilize technological intervention. To illustrate the LAC situation, Mexico can be used as an example. Only 14% of the population of this country has access to water during 24 hours a day.


Improvements in these areas can only be achieved by strengthening the water governance, modernizing water framework and capacities for data collection, analysis and dissemination. Many efforts have already been completed on the national to international level. Honduras can be considered as an example at the national level, as its government is working strongly to implement the SDG 6. At the international level, UNESCO has been developing WINS (Water Information Networking System), a technology to support decision makers and major stakeholders.

This system is a key tool in the implementation and monitoring of the International Hydrological Programme (IHP) VIII activities. Eradicating poverty and improving the data collection are the main objectives of this Programme. The system is *gratis* and it has diplomatic immunity. All data will be available in agreement with the government, at local, regional and international levels.

Moreover, it is necessary to include water education and skills in building capacity to implement SDG 6 as they are instrumental to successful change. Those building capacity need to be done by all stakeholders in the population, not just decision makers. Aiming to involve all citizens from all possible backgrounds, the population has been engaged through a huge mobilization toward the Citizen Forum, one of the progress commissions of the 8th World Water Forum. The goals of the Citizen Forum are a permanent dialogue among all stakeholders, and one of the main legacies will be an online platform. During the World Water Forum, there will be a Citizen Village, one place open and available to all people.

The efforts presented in this session are towards a sustainable planet and the integration of different people for the purpose of improving WASH in LAC.

How does the session feed into the theme “Bridging Science and Policy”:

The necessary knowledge can be available on online platforms, which promotes knowledge to the decision makers. The technology allows the major stakeholders to be connected, so they can learn with each other and find solutions together. 



8. Bridging Science and Policy

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RS 2 - Bridging Science and Policy

TIME AND ROOM: 29 May 2017, 15:30 – 17:00; Cozumel 3

CHAIR: Asit Biswas

SPEAKERS: Thais Moreira de Classe, Bassel Daher, Angelica Guttieres-Magness, Bryan Jenkins, Christina Fraser

SESSION SUMMARY

This session focused on how to relate sciences to governance. Going through the study of a delegation model, as well as more details on mitigation and strategy-making towards sustainable goals, the session provided various insights to understand the use of sciences within policy-making. A case study on Malawi illustrated the issue of linking research processes to policy-making within a top down approach and different tools were given to implement policies and apprehend case studies.

Thais Classe, a Masters student from Universidade Federal de Juiz de Fora, presented two of those tools that are used to monitor water efficiency. The softwares CROPWAT and CLIMWAT are computer programs that assess crop water and irrigation requirements. CROPWAT is based on soil, climate and crop data. It can also help in developing irrigation schedules and be used by farmers to better manage irrigation and crop performance. CLIMWAT is a climatic database that is used in combination with CROPWAT. Classe discussed the use of these softwares in Brazilian water governance in order to assess water footprints.

Another electronic tool was presented by Angelica Guttieres-Magness, Hydrologist at the National Oceanic and Atmospheric Administration (NOAA). GEO Global Water Sustainability (GEOGLOWS) contributes to the implementation of a framework to mobilize Earth Observation assets and to mitigation

of water challenges. It promotes earth observations and data availability for societal benefit areas as environmental fields of importance. GEOGLOWS can be used to decrease regional tensions and risk of conflicts by ensuring water availability to populations living in water stressed regions due to population and economic growth or climate change. It also participates in greater data accessibility for decision making. Overall, these three electronic tools can be used in policy-making in order to provide adapted policies and mitigate the effects of climate change on water availability by providing more effective water distribution and water use.

A more theoretical tool was proposed by Bassel Daher, Research Associate at Texas A&M University, through the example of the delegation model. This theory considers the status quo as the focal point to illustrate governance. Technical, resource or political shocks may change the status quo and modify the relation to governance for government representatives and environmental agencies. The gap between status quo and agencies or government representatives may decrease or increase during shocks. Depending on the policy that is chosen, the status of the governance gap can be positive or negative.

Other speakers from the session discussed case studies to illustrate the bridging of science into policy. Brian Jenkins, Professor at the University of Canterbury presented his paper: "Translating Science

RS 2 - Bridging Science and Policy

into Policy: setting nutrient limits for agricultural land use” in which he studies the adverse effects of land use intensification and central plain irrigation through four case studies in New Zealand on the following themes: impact of assessment processes, cap-and-trade markets and equity in allocation with reliance on modelling. He stressed the importance of considering policy for development assessment processes.

Another case study was provided by Christina Fraser, PhD student at Strathclyde University. She presented the case of Malawi and the governance of the transboundary aquifers the country shares with Zambia, Tanzania and Mozambique. She suggested the use of typology models that would portray to policymakers the key ideas of transboundary aquifer management. Considering the watershed by systems and cooperating with neighboring countries would be the more adapted way to implement policies in order to mitigate climate change effects and allow for better water availability in the country.

Overall, the importance of assessments was highlighted during the session. Better communication between science and policy and more adapted and sustainable policies are the methods favored to bridge science to policy.

Christina Fraser — Interview

When did you start your PhD?

Six months ago, I just started in October at Strathclyde University in Glasgow. It will last for three years.

You focus on Malawi? Why?

I do, mostly Malawi and its surrounding countries. My supervisor has been really involved in research in Malawi for a few years and I am part of an overall research group that is ultimately trying to help Malawi government achieve sustainable management and integrated resource management. So my PhD is one of three and stands from that.

How do you think that policymakers can get involved in managing transboundary aquifers?

I think it's interesting because a lot of people wouldn't actually think that Malawi as a country would be interested in its groundwater. I think it is a country that wants to be seen as developing and it wants to be seen as being involved in this community so transboundary aquifer management is actually becoming really important for the government there.

Do scientists have a voice with policymakers there?

In Malawi, we are really happy with our research group because we have a lot of connections with the government and we work from top to bottom so we work with water use associations and within the actual villages themselves all the way up to government level. Because our research group has been working in Malawi for so long, the relationships built up and they trust us.

From your experience, how do you think that they should manage the transboundary aquifers?

I think they need to approach it by systems. As I said, there are different transboundary aquifer systems in Malawi because it has quite a range of hydrogeology, they will need to look at specific areas and not consider an overall management of the aquifers.

Do you know how well Malawi and its surrounding countries can communicate on aquifers management?

Relationships between Malawi and Zambia for example are quite good and we are hopeful that cooperation between them will be effective. We're not too sure about Mozambique but all of countries within our case studies are part of the South African community and this community is supposed to work together — including for transboundary aquifers circumstances, so we're hopeful that being part of that community will help establish those connections. 💧



SS 30 - Social Sciences Approach to Supporting Stakeholder Engagement for Water Policy Development

TIME AND ROOM: 31 May 2017; 10:50 - 12:20; Cozumel 2

SPEAKERS : Claire Harpet, Agathe Euzen, Daniel Murillo, Estela Neves, Denise Soares, Fermin Reygadas, Aziza Akhmouch

HOSTING INSTITUTIONS: IWRA, French Water Partnership, French National Center for Scientific Research, French national alliance for environmental research, WGI initiative

SESSION SUMMARY

This session was a social sciences approach to supporting stakeholder engagement for water policy development; towards a greater consideration of human relations to water in the implementation of water domestic use projects


“By always sacrificing the essential for the urgent, we forget the urgency of the essential”. Introducing the session by quoting the sociologist Edgar Morin, the conveners of one of the few Special Sessions focused on social sciences alerted us on the importance of not neglecting an essential parameter in water access projects: the human being, the local culture. This is why a social sciences approach to supporting stakeholders’ engagement for water policy development is more than helpful: it is essential.

This session, co-organized by the IWRA, the French National Scientific Research, Lyon 3 University, and the French Water Partnership, highlighted the importance of human sciences to understand the complexity and diversity of realities through various case studies.

The Latin American continent benefited from nice coverage in this session: Dr Daniel Murillo, working in the Chiapas state of Mexico, addressed the different relationships between population and water, and how symbolic perceptions on water can be revealed through domestic uses. Dr. Fermin Reygadas and Dr. Denise Soares, demonstrated how some projects tried with success to include social participation. “Familia Rural Sustentable” in the Otomí indigenous community in the

state of Querétaro, or the “Agua Segura en Escuelas” developed by NGO Cantaro Azul, Chiapas, resulted in the first case in an empowerment of the women of the community by perpetuating the projects, and in the latter case by creating an environment where water fountains become the playground of children so that they take interest in water quality.

Finally, one considerable challenge was mentioned by Dr. Estela Neves: water is often undertaken by too many institutions. In Brazil, the state responsibility to guarantee drinking water is divided in seven sectors. Following the water crisis in Sao Paulo in 2013, “Alianza pela Agua” launched a communication campaign during the municipal elections to try to commit the candidates to water security strategies.

Those case studies were stimulating as even though they all had different scales and scopes, they were conveying the same message: it is essential not to forget that the human beings are at the center of any policy, with different perceptions and beliefs. This reminder was also made by Aziza Akhmouch, Chair of the Water Governance Initiative at the OECD. She depicted how the 2008 crisis led to a progressive consideration of human sciences into an organization historically specialized in econometrics such as the OECD. The President of IWRA, Mr. Patrick Lavarde, concluded the session announcing that it was only the first step of an original approach that will be continued at COP23 and at the 8th World Water Forum in Brasilia next year. 



SS 35- Multi-disciplinary Perspectives on the Grand Ethiopian Renaissance Dam (GERD) and the Future of Water Resources Management and Development in the Eastern Nile Basin

TIME AND ROOM: 31 May 2017, 9:00 – 10:30, 10:50 – 12:30; Cozumel 5

CHAIR: James Nickam

SPEAKERS: Salman Salman, Zeray Yihdego, Richard Paisley, Evarist Baimu, Kevin Wheeler, Kenneth Strzepek-Braga, Ana Elisa Cascão

HOSTING INSTITUTIONS: Stockholm International Water Institute, Northumbria University, the University of Aberdeen, and International Center for Water Cooperation

KEY MESSAGES

- **There is a duty to negotiate in good faith – upstream states are under obligation of taking care of downstream states' users as well.**
- **Sharing data among states is a key principle in coordinating amongst shared waters, and every situation is judged on its own merits.**
- **Cooperation should shift to risk-based thinking.**

SESSION SUMMARY

The Grand Ethiopian Renaissance Dam (GERD) is located on the Blue Nile River in Ethiopia, and once completed will be the largest hydroelectric dam in Africa—the seventh largest in the world. While the project will provide a significant source of energy to Ethiopia, downstream countries have raised concerns as to how the dam will impact their use of water from the Nile River. Egypt, a country which relies heavily on the waters of the Nile, has in the past requested that Ethiopia cease the construction of the dam. In response, Ethiopia has denied that negative impacts would occur in Egypt upon completion of GERD. Despite this request and other countries' concerns, the completion of GERD is soon expected to happen in 2017. While providing a solution that fully satisfies all parties and special needs was considered in the discussion as “not feasible”, the focus of this special session aimed to address limiting risks, the duty of negotiating in good faith, and the need to develop trust and a platform for sharing data amongst the involved parties.

The first session highlighted the legal framework involved in the history of the dam, as well as future policy principles in addressing issues of the GERD. Salman Salman reported that the Nile Basin Cooperative Framework Agreement (CFA) has been signed by six key countries that the Nile impacts and that future

work of the CFA should aim to develop equality within all Nile states. Zeray Yihdego emphasized the importance for future cooperation among states to negotiate in ‘good faith’, or to seek the benefits of its downstream users as well.

The second session discussed scientific principles for application in risk management as well as identifying action items for cooperation. Researcher Kevin Wheeler presented key findings on reservoir development for multiple countries that are possible with GERD. Furthermore, his perspective was pertinent to the conversation in offering that cooperation of GERD issues must shift to ‘risk-based’ thinking. While risk is an obvious factor when developing such a large infrastructure, the key question that needs to be addressed is – What is an acceptable amount of risk? Panelists affirmed that addressing significant risk or harm was of greatest concern of this transboundary issue. Dr. Evarist Baimu and Richard Paisley called for a need for sharing data and information agreements amongst Nile countries.

The engagement of conversation amongst speakers, panelists and the audience bookmarked this session as a think tank for action items in addressing issues associated with the Grand Ethiopian Renaissance Dam.

How does the session feed into the theme “Bridging Science and Policy”?

While transboundary issues are mainly addressed from legal frameworks, the significance of this special session was its presentation of science on reservoir development and hydrological flow models: providing a fundamental component to inform policy on the risk issues associated with GERD—the perfect bridge between science and policy.



SS 42 (A/B) - The Scientific Underpinnings of Global Water Law Instruments: the UN Watercourses Convention, the UNECE Water Convention, and ILC Draft Articles on Transboundary Aquifers

TIME AND ROOM: 2 June 2017, 9:00 - 12:20; Coba

CHAIRS: Alistair Rieu-Clarke and Lesha Witmer

SPEAKERS: Kevin Wheeler, Roberto Salmón Castelo, Sean Cázares Ahearne, Paula Pacheco, Owen McIntyre, Zaki Shubber, and Salman Salman

HOSTING INSTITUTION: Northumbria University, Newcastle upon Tyne

SESSION SUMMARY

In this double special session, speakers discussed the importance of the scientific underpinnings of international water law and the relationship between scientists and experts in crafting suitable water law. It was established that policymakers and scientists must work together to ensure that science informs the pre-drafting process for developing and codifying international water law. Additionally, all speakers emphasized the diplomatic usefulness of having a clear understanding of the natural and engineered systems in order to negotiate a fair international treaty or agreement.

This entire session was dedicated to understanding the relationship between scientific understanding of complex systems and the negotiation of complex water sharing treaties. Several examples were provided by each speaker; each one built upon the last and accentuated the need to make strong policy or law based on clear scientific understanding.

In keeping with the theme of 'bridging the gap between science and policy,' Kevin Wheeler described the importance of water management models in understanding implications of policy decisions. He described the evolution of water modelling as a tool for management. Wheeler explained the difference between a simulation model, which can run different scenarios, and an optimization model, which can help policymakers find the ideal scenario. To illustrate the usefulness of models in decision-making, Wheeler described a new modelling tool, RiverWare, which is being used by several countries to find equitable water sharing arrangements. He highlighted the example of the Colorado River and the new management regime that has emerged between Mexico and the U.S. over the delta. Minute 319 was a landmark agreement between Mexico and the U.S. over the management of the Colorado, despite tensions surrounding drought in other parts of the border. The modelling tool was a large part of the success in the creation of this agreement because it helped both countries not only

understand the system better, but find a common solution that was mutually beneficial. It is the first agreement between two countries that considers water for environmental flows and not just human allocation. The water management model is such a powerful tool that decision-makers on both sides are looking for ways to use it in the contentious Rio Grande/ Rio Bravo basin.

CILA Commissioner, Roberto Salmón Castelo, underscored the success outlined by Wheeler in the Colorado River Basin by expanding on the evolution of Minute 319 under the 1944 Water Treaty. Commissioner Salmón highlighted the important role of scientists and environmental stakeholder participation in generating a complex understanding of the stressed river basin system. He credits the RiverWare model as a vital tool for providing confidence in binational negotiation and management, finding a balance between the interests in both countries, and, ultimately, a successful way forward for binational cooperation.

To further elaborate the importance in scientific input into the creation of Minute 319, Sean Cázares Ahearne from CONAGUA provided a deeper understanding into the political process of negotiation. Ahearne lauded Min 319 as a feat of 'extraordinary cooperation' between the two countries. He identified conflict resolution mechanisms, strong negotiation with technical expertise, and taking advantage of circumstances, as the key components of success in this case. In reference to the RiverWare model, Ahearne stated that having the technical tool was a useful diplomatic expertise to include in the negotiation process. Mexico, realizing that it was receiving less and less Colorado River allocations, recognized that the moment to negotiate was before a crisis occurred. Ahearne highlighted the fact that sometimes you have to lose in order to win, meaning that sometimes losing in the short-run can lead to larger success in the long-term planning horizon and that a good negotiation arrangement is one that provides long-term benefit to both countries.



SS 42 (A/B) - The Scientific Underpinnings of Global Water Law Instruments: the UN Watercourses Convention, the UNECE Water Convention, and ILC Draft Articles on Transboundary Aquifers


In a change of geography, Paula Pacheco introduced the TDPS hydrologic system in the South American Altiplano, which is comprised of Lake Titicaca, Desaguadero River, Lake Poopo, and the Coipasa Salt Flats. In negotiating the complexities of this system, neighbors Peru, Bolivia, and Chile needed to first understand the needs of the system. For this case study, non-governmental organizations (NGOs) played an important role in identifying the hydro-meteorological information on how climate variability would impact future scenarios for management. This presentation underscored the importance of strengthening local investment plans for climate adaptation and described the important relationship between research, advocacy, and action. Research was done to assess vulnerability, water demand, water rights, and productivity under different management regimes. Advocacy highlighted the importance of recovering traditional knowledge to combine it with modern technology. Finally, action was taken to perform economic analysis on different adaptation options, as well as the construction of a strategic plan for climate change.

In a slight shift from previous presentations, Owen McIntyre discussed the relevance of the Ramsar Convention to managing transboundary waters. He highlighted the emergence of ecosystems as a tool for providing practical, technical guidance on groundwater and surface water protections. In contrast to other international water conventions, the Ramsar Convention offers much more specific language for actual management strategies. In his presentation, McIntyre underscored the connection between ecosystems and wetlands to groundwater sources as a potential new way to manage. This still highlights the key customary international water law doctrines of equitable and reasonable use, prevention of significant harm, general obligation to cooperate, protection and conservation of watercourse ecosystem, and general environmental principles and objectives.

Concerning the tensions between science and politics in international water law, Antti Belinskij used the definition of 'watercourses' as an example of contention in this area. He noted that it was

challenging to find an acceptable, holistic definition of watercourses that was based in science because certain countries exclude aspects of the water system, particularly groundwater. In his presentation, Belinskij discussed the scientific elements of existing international water conventions and gave additional insight into the drafting process required to prepare such conventions. Oftentimes it is necessary to clarify language because in some instances, technical users may have a different interpretation than legal or policy users. In regards to the newest edition, the International Law Commission's Draft Treaties on Transboundary Aquifers required close collaboration between technical and legal perspectives. In order to present the best model provisions, the Draft Articles provide non-binding guidance for implementing transboundary aquifer sharing into potential bilateral treaties. Lessons learned in this process highlight the importance of creating a dynamic treaty regime through many conversations and clarification on interpretation to help countries overcome reluctance.

Zaki Shubber highlighted the significance of scientific evidence in the decisions made within the International Court of Justice (ICJ). From an international adjudication perspective, Shubber emphasized the vital role that scientific evidence can play in the outcome of cases brought before the ICJ. To emphasize her point, Shubber provided specific examples where science played a key role in the outcome of international water law cases, by explaining the Indus Treaty case and the Gabčíkovo-Nagymaros Project. In both cases, it was necessary to explain the scientific underpinnings to provide the courts with a clearer understanding of the complex systems.

Finally Salman M.A. Salman spoke on the World Bank policy for projects on international waterways, highlighting the wealth of World Bank articles that provide incredible detail of case-by-case examples of international collaboration over waterways. He stressed the importance of scientific evidence for the negotiation of these projects. Additionally, he commented on the role that past experiences can provide for projects moving forward. 



SS 64 - Towards an Integrated Water Management by Sub-basin: Mainstreaming of Science and Policy

TIME AND ROOM: 1 June 2017, 17:20 - 18:50; Cozumel 5

SPEAKERS: Jorge A. Morales Novelo, Daniel Revollo Fernandez, Lilia Rodriguez Tapia, Mario Ernesto Suarez Mota

HOSTING INSTITUTIONS: Metropolitan Autonomous University (UAM) - Azcapotzalco


SESSION SUMMARY

Only at the basin level is it possible to establish relationships between water availability and its uses, and this is where different demands and competing uses come together for formulating management alternatives. This special session aimed to work towards better water management by starting at the sub-basin level. The hydrological sub region analysis allows a better understanding of the situation regarding water in any area.

In this context, the panel analyzed alternative methodologies for water availability estimation and water economic valuation by type and use. It discussed advances and challenges in the implementation of the IWRM model in Mexico.

The Mexican case was studied on the water demand in three hydrological sub-basins, in the north, center and south of Mexico. The objective of this study was in

evaluating the relevance and viability of current water management practices in these regions. Research in each studied area was led by fifteen researchers with diversified backgrounds from institutions in the area with the objective of assessing the relative importance of irrigation agriculture in relation to the use of water in sub-basins. Researchers analyzed the natural water availability per region from the sub-basins through working with information such as precipitation and filtration rates in order to acquire useful data. There are several important elements necessary to consider when calculating the ecological flow; hydrological, habitat and holistic components. The next step is to make these studies useful in an economic way, so it can be determined in advance how much agricultural product can be produced in a field.

The session ended with an exercise among session participants, to see how this kind of methodology might function. 



SS 67 - A “ts’ ono’ ot” Cosmovision: Interdisciplinary Science and Policy in the Yucatan Peninsula’s Sinkholes

TIME AND ROOM: 2 June 2017, 10:50 - 12:00; Cozumel 5

HOSTING INSTITUTIONS: Department of Water Sciences at Centro de Investigacion Cientifica de Yucatan and the King’s Water Activity Hub in the Department of Geography at King’s College London

SESSION SUMMARY

In the Yucatan Peninsula more than 90% of water for human consumption in the region comes from underground resources. After many years of work, political instabilities and evidence collection, the Yucatan Peninsula was declared as a Natural Hydrogeological Reserve in 2013.

Interesting hydro-geographical features in the region are cenotes. Cenotes are natural pits or sinkholes which reveal groundwater below and they have different phytoplankton and characteristics directly related with their water flow. They can vary in their openness, climate variations, and locations, and these characteristics determine their ecosystem nutrients. Wide ranges of chlorophyll concentration may lead to an heterogeneous bacterial development within the cenotes in the region. The biggest threat to sustainable water management in the Yucatan Peninsula is the lack of knowledge of the characteristics and functioning of cenotes that could lead to inappropriate solutions.

The Centro de Investigación Científica de Yucatán (CICY) carried out a socio-economic study in the Yucatan Peninsula to diagnose the living standards of nearly 95,000 people under unfavorable conditions.

The access to water is threatened by poor management of the resource and as a result, these communities manage to survive using only 45,000m³ of water annually.

An exploratory analysis detected a positive willingness to pay for cenotes conservation by residents. This willingness to pay was up to 90 Mexican Pesos (MXN) per month per household. This would lead to a large monthly sum of \$137,000 MXN that could lead to better conservation strategies.

Bringing stakeholders together is what is currently needed for improving the living conditions of people in the Yucatan Peninsula. The session discussed the possibility for technical meetings or focus groups that could lead to a better network analysis towards an effective decision making process. Visiting research assistants from King’s College London also focused on the role of cenotes for decision making, and examined if this system (isolated or connected aquifers) could lead to more involvement of stakeholders for better conservation strategies. The conclusion was that basin councils are the best places to make stakeholder-based decisions. Empowering the basin councils to regulate and sanction the human stresses on water is key. 💧



9. Building Capacity

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RS 4 - Building Capacity

TIME AND ROOM: 30 May 2017, 9:00 - 10:30; Cozumel 1

SPEAKERS: Lindsey Aldaco-Manner, Rudolph Rosen, Alejandro Salazar, Pankaj Kumar Sampat, Tom Arsuffi

KEY MESSAGE

There is no one method to ensure regional capacity building for water resources, instead a multi-dimensional approach will be more successful in extending existing water resource capacity.

SESSION SUMMARY

Capacity building has an integral role in extending water resources currently available to the public. There is a perception problem related with water: some people consider Earth as a water abundant place, while in reality, the amount of freshwater available is extremely limited and finite when compared to all the water on Earth. It is anticipated that we are reaching the carrying capacity of our planet due to potable water availability. The more capacity building in water we achieve, the more secure the human population will become.

This panel focused on three capacity-building methodologies: (1) increasing government capacity, (2) educating the public and (3) resource conservation. These three capacity-building methods contribute to extending the existing water resources.


First, government capacity is lacking in many developing countries. Water supply is at the center of urbanization. While cities grow in population, they need to increase their capacity to deliver water to new residents. Traditionally, mapping, measuring, and monitoring are the best ways to increase efficiency. However, there are other methods of increasing efficiency, for example through increasing the capacity of the government itself. This helps to identify financial leaks and correct them before they become more expensive. The structure of the government itself can have positive or negative effects on capacity building. Second, educating the public will help individuals

to realize the limitations of water resources. Some utilities have started to circulate a comparison of household water uses in neighboring areas, leading to a neighborhood competition to reduce wasteful water consumption habits. Education also mobilizes entire generations of people to prioritize water resources, not only in the moment, but also for a lifetime.

Lastly, direct resource conservation initiatives lead to increased capacity building as well. Both increasing the government capacity and educating citizens can indirectly lead to resource conservation, but conservation can be addressed directly as well. Programs that incentivize conservation, like rebates and distribution of efficient water using devices, directly have an impact on water consumption rates.

No one program works universally or exclusively. Rather, a cornucopia of methods needs to be utilized in order to build or maximize the capacity of existing water resources. Governments can work not only on the traditional methods of building physical infrastructure, but also through increasing efficiency within the government programs financially. The public needs a better understanding of water and the nature in order to make capacity building a priority in their daily lives and public policy initiatives. Directly addressing conservation efforts will also have effects, but these effects are limited when standing alone. Indirect and direct methods of capacity building are more effective when implemented simultaneously.

How does the session feed into the theme “Bridging Science and Policy”?:

Although the scientific community understands the importance of capacity building, without developing and implementing a wide range of capacity building approaches, the success of individual programmes will be limited. 



SS 11 - Understanding the Forest-Water Nexus: a New Global Monitoring Framework and Tool


TIME AND ROOM: 2 June 2017, 9:00 - 10:30; Cozumel 4

HOSTING INSTITUTION: Food and Agriculture Organisation of the UN

SESSION SUMMARY

In a special session hosted by the Food and Agriculture Organisation of the UN, the presenters highlighted the differing roles forests have on local communities throughout a watershed and how those communities in turn affect the watershed themselves. Forests play a crucial role in the hydrological cycle, influencing water availability and quality, as well as reducing water-related risks such as landslides, local floods and droughts. Forested watersheds and wetlands supply 75% of the world's accessible freshwater for human and ecological needs. This special session highlighted the need to mainstream an integrated approach to forest and water resources management and policy. The occasion also provided an opportunity

to present a forest-water monitoring framework that is under development.

Participants engaged in a workshop to discuss the benefits of such a framework and how best to implement it. Small groups considered local scientific studies of forest water availability and quality. One notable finding from these studies was the increased groundwater contamination levels of wells located near denser human populations within forests. Explanations for this pattern are still being researched. What is clear is that human populations within a forest community tend to have a negative impact on water quality. How to mitigate that impact on a large scale in these remote forests is still unknown. 



SS 17 - Empowering Young Water Professionals through Engagement in the Global Water Community

TIME AND ROOM: 31 May 2017, 17:20 - 18:50, Cozumel 4

SPEAKERS: Alice Colson, Tung Pham, Amrita Gautam, Robert Sakic Troglic, Tatiana Silva

HOSTING INSTITUTION: World Youth Parliament for Water

SESSION SUMMARY

World Youth Parliament for Water (WYPW) is a worldwide youth momentum to engage and empower young generations in the water and climate change sectors for inclusiveness of youth actions to meet SDGs 6 and 13. WYPW has been organizing youth activities during the XVIth World Water Congress at Cancun Mexico 2017, comprised of a youth session/panel discussion, Young Professional Booths, Signature Campaign, interviews of senior's professionals and as part of the Youth Ambassador rapporteur team. These youth activities are a preparatory series for the 8th World Water Forum in Brazil to ensure capacity building and youth involvement in sustainable water development to ensure the water secured world.

This session began with a Project Officer from the International Water Resources Association (IWRA), Alice Colson, discussing the importance of working together in developing good water policies. To do this, she encouraged everyone to join the young professional's chapter, to be announced later in the year, and attend the IWRA general assembly on Friday June 2. By registering to this conference, each participant gained access to one year membership with IWRA which will allow all the participants to access publications and networks from IWRA.


The importance of providing guidance and support to young professionals was highlighted. The future rests with youth, so their contribution to water policy-making is crucial. Water is an important component of all SDGs and young professionals have the enthusiasm and energy to contribute to the success of these SDGs.

The bulk of the session involved presentations by four young professionals with experiences from different parts of world. Tung Pham talked about impacts of climate change on the Mekong River and the youth leadership camps in this region which have the goal

of raising awareness on water and energy, providing knowledge, and promoting voluntary work for water protection. More than 1000 people have already joined the camp, and his next project is to establish a Mekong Youth Farm Network. The aim of this network is to connect all the groups to work together on education, hydropower, water governance, and climate change.

The second panelist, Amrita Gautam talked about her Masters of Science study on developing a systematic water quality monitoring mechanism which promotes community participation and stakeholder involvement in Brazil. Her future project is to translate the conceptual ideas she developed for Brazil to Nepal. She is planning to use tools like GIS, expert knowledge, remote sensing, surveys, and mobile apps in developing the systematic water quality mechanism.

The third panelist, Robert Sakic Troglic introduced the Water Youth Network and explained the organizational structure. The Water Youth Network strives towards connecting and engaging young people who are implementing SDG 6 and he invited young professionals in the room to join the network. Finally, he mentioned the YouKnoW platform, which is established to put young people working on similar projects in different parts of the world together and give them the chance to exchange ideas.

The last presenter, Tatiana Silva shared her personal story and explained how receiving a scholarship from UNESCO-IHE promoted her involvement in water related issues. She encouraged young people to be part of the process and provide creative solutions for water problems and highlighted the importance of youth perspectives in the World Water Forum. The session proceeded with group discussions on three topics; climate change, WASH, and reducing water disaster. Each group shared their ideas on these topics. 



SS 23(A/B) - Enhancing Irrigation Productivity and Profitability in Small Scale Irrigation Schemes, Lessons from Three Continents

TIME AND ROOM: 2 June 2017; 9:00 – 12:20; Cozumel 2

HOSTING INSTITUTIONS: University of South Australia, Australian Centre for International Agricultural Research (ACIAR), and International Development Research Centre (IDRC Canada)

KEY MESSAGE:

Improvements in irrigation productivity and profitability can be achieved through recommending that local stakeholders use Agricultural Innovation Platforms to improve knowledge of water systems so solutions can be better catered to their needs. Governments should support and listen to local communities to help achieve this shared goal.

SESSION SUMMARY

This special session was about enhancing irrigation productivity and profitability for small-holder farmers, in Mozambique, Tanzania and Zimbabwe, India and Latin America. Soil moisture and nutrient monitoring tools were introduced to farmers in Mozambique, Tanzania, Zimbabwe, and Punjab to improve crop productivity. In the Sub-Saharan countries these measures were introduced in conjunction with the establishment of Agricultural Innovation Platforms (AIP) to connect farmers to markets and overcome other systemic problems. The theoretical underpinning of the tools and the AIPs were outlined with discussions on the research concerning their combined impacts.

The first session was presented by Dr. Nutu Ressa Mziray on how to use the soil monitoring tools for improving crop yields. Besides the better management of irrigation water, soil nutrients and salt, she believes these tools can increase crop yields as well. Furthermore, she introduced the two soil monitoring tools applied commonly in her surveying area in Tanzania. The first tool is called the Chameleon Soil Water Sensor, which is used to measure how difficult

it is for plants to pull water out of the soil. This data is displayed as colored lights. The second tool is the Wetting Front Detector. It helps to observe what is happening in the root zone when you irrigate the soil and requires no wires or batteries. The detector is buried in the root zone and a pop-up indicator shows when the infiltrating water flows past. Additionally, Dr. Nutu Ressa Mziray referred to certain challenges in the application and maintenance of these monitoring tools.

During the remainder of the sessions, the speakers were more focused on how to reduce poverty through water intervention in agriculture. Each speaker shared a project they were involved in, as well as solutions for this topic. Through all the speakers' presentations, there were the following common themes:

- By evaluating and applying Agricultural Innovation Platforms, it is possible to identify and overcome institutional and market barriers for greater water productivity.
- Developing, testing and deploying innovative water platforms and solution monitoring stimulates learning and stepping stones towards greater water productivity.
- Identifying and communicating economic and policy incentive mechanisms can increase water productivity.
- The government needs to decide between irrigation profitability and staple food supply.
- Local communities need to raise their voices and find their own solutions at the local scale (based on the national scale).



SS 58 - Training in Hydro-diplomacy: Legal and Institutional Aspects of Water Resources Governance- from the International to the Domestic Perspective

TIME AND ROOM: 1 June 2017, 9:00 - 10:30, 10:50 - 12:20; Cozumel 2

SPEAKERS: Stefano Burchi, Richard K. Paisley, Gabriel Eckstein

HOSTING INSTITUTIONS: International Association for Water Law (AIDA), UNESCO-IHP

KEY MESSAGE

Transboundary basins are common, and they present complex challenges to water policy.


SESSION SUMMARY

According to UN Water, 148 countries have territory that fall within a transboundary river basin. Negotiating across river basins, with upstream, downstream, or co-riparian water users can be complex and often times includes both conflict and cooperation. Therefore, leaders must be able to conduct adequate hydro-diplomacy to manage water for the present and future.

During this special session, a training series created in partnership with the International Association for Water Law (AIDA) and UNESCO-IHP (International Hydrological Programme) titled "Hydro-diplomacy, Legal and Institutional Aspects of Water Resources Governance – From the International to the Domestic Perspective" (published in 2016, available at <http://unesdoc.unesco.org/images/0024/002452/245262e.pdf>) was illustrated and demonstrated. Mock classes on the Trans-boundary Legal Perspective module of the Manual (chapter 2), Dealing with International Water Law, and on the Bridging Perspective module of the Manual (chapter 3), Linking International Water Law and Domestic Water Law, were conducted by

the chapter authors. Classes consisted of a lecture followed by a group exercise with the session participants.

In further detail, the session outlined the training manual and discussed hydro-diplomacy and governance, guiding participants in discussions on negotiations and international water law theory through practical group exercises. The new training manual is available for negotiators, national leaders, and decision-makers to be able to interpret equitable and reasonable transboundary water treaties. Another goal of the training is to educate water law practitioners on how to translate international transboundary water laws through the domestic legal framework. International water laws are considered customary whereas domestic water laws are codified and enforceable; a key development for proper transboundary water management.

The session ended with a stimulating discussion on the interpretation of transboundary water laws from Zambia, Namibia, and Vietnam. Water lawyers, scientists, and policymakers with an interest in transboundary water negotiations can follow the Programme for more information or any upcoming training opportunities. 



SS 60 - Capacity Building in the Water Sector: Creating and Developing Training Centers for Water Professionals

TIME AND ROOM: 30 May 2017, 9:00 – 10:30; Xcaret

SPEAKERS: Eric Tardieu, Newton de Lima Azevedo, Jean-Didier Berthault, Luis Felipe Espinosa, Diane D'Arras, Fernando Reinas, Jean-François Donzier

HOSTING INSTITUTION: International Network of Water Training Centers

KEY MESSAGES

- **The investments in training may have quick returns. The improved quality of interventions will lead to many benefits, for instance reduced energy consumption, better service provisions and staff motivation. The session also emphasized the importance of reinforcing training investments and facilities. This is because of the alarming WASH situation in many countries, where there is often a considerable waste of funds to regions due to poor training for local professionals.**
- **Capacity building in the water sector must move towards offering local training opportunities, in local languages. This would reduce the costs of developing capacities and it would make training more accessible to the water professionals that need it the most. Training is often the first cut to companies' budgets in times of crises, however, the costs of training should be included in their budget due to its external benefits and it may represent only a small additional cost in the salary of employees.**

SESSION SUMMARY

The speakers overviewed training experiences in different countries, showcasing how training for water professionals is carried out in the private and public sector. Eric Tardieu, Deputy Secretariat of the International Network of Water Training Centres (INWTC), presented the INWTC which counts on 11 countries as co-founders. Tardieu highlighted the structure of the water sector, composed mainly of technicians and not managers. Capacity building should focus on developing the skills of technicians and operators, which correspond to 80% of the water professionals in the water sector, whereas managers and engineers account for only 20%.

Newton de Lima Azevedo of the World Water Council shared his experience in supporting the creation of a training center in Brazil (Hydrus), which positions itself as a service provider in areas of competence linked to the water sector. The business strategy is based on capacity building for demand in the sanitation sector and it offers practical approaches and training based on real situations.

Another example of a working training center for water professionals was provided by Jean-Didier Berthault in the Greater Paris Sanitation Authority (SIAAP). This authority offers training to employees but also external audiences, such as students from around the

world. Staff of the authority are provided with five days per year to invest in the training.

A Mexican case was presented by Luis Felipe Espinosa, Deputy Director of Planning at CONAGUA. It highlighted the country's strategy with the National Water Policy to focus on securing water for agriculture. CONAGUA accounts for 80% of water use in the country, yet focus is not only on providing water services but also water security in the face of climate change.

A further example of professional training in the public sector was given by Fernando Reinas, representing ANEAS (Mexican National Association of Water and Sanitation Utilities). ANEAS exemplified its role in supplying the demand for water training in Mexico, considering the country's challenge of qualifying the operational level, especially due to high costs of training, ad hoc training not found, disrupts in production and personnel making higher wage demands.

In the private sector, Diane D'Arras presented SUEZ's experience in assessing capacity building of the company, and not only of its own employees. The methodology for professional training at SUEZ considers 38 business processes in the company, and evaluates them based on the global vision of the company, the status of the process and the capacity of the people engaged in the process. SUEZ supports planning of the training activities that are most needed to improve the performance of the company.

How does the session feed into the theme "Bridging Science and Policy"?

The session demonstrates that policy-making must take professional training and sharing of scientific knowledge with water professionals at the technical and operational levels into account. This is because of the vast benefits training opportunities present, including the improvement in quality of water services provisions, greater sustainability and higher water-efficient performances in the water sector. Recommendations for sustainable capacity building and vocational training development include training that is funded by taxes, according to the contributions proportional to a company's wage bill and that staff training should be included into companies' accounts, at a minimum of 1% of the total budget. Training centers should take leadership to modernize the water sector and include a business management portfolio in order to increase efficiency and financial sustainability.



SS 72 - Cooperation and Exchange of Experience in Water Resource Management and Adaptation to Climate Change

TIME AND ROOM: 1 June 2017, 9:00 - 10:30; Cozumel 4

HOSTING INSTITUTIONS: Watershed Council of the Valley of Mexico (CCVM), Basin Organization of the Valley of Mexico (OCAVM), Water Agency of Seine Normandy (AESN), Greater Paris Sanitation Authority (SIAAP), International Office for water (OIEAU)


SESSION SUMMARY

Since 2006, water authorities of the Valley of Mexico and Seine Normandy Water Agency have worked together to find solutions for water issues in their basin. This partnership was reactivated on the occasion of COP 21, and deals with urban drainage (rainwater + wastewater) technical exchange in order to develop recommendations designed to strengthen the Drainage Metropolitan Commission of the Valley of Mexico. Moreover, the partnership engages in a comparison of the French and Mexican modes of operation of the two authorities, and seeks to identify strengths and weaknesses in order to reinforce integrated water resources governance. This session shared experiences of water management with a focus on this French and Mexican partnership.

In France, water management is administered by private and governmental entities; however, almost all the management responsibilities are assigned to private institutions. The municipalities manage clean water distribution, treatment, and they can either work together or as independent entities depending on the population density or town location.

Some of the challenges of water management in France have been standardization, transmission, data saving, and interpretation. This system has been working on six main watersheds in France and some transboundary

watersheds such as the Escalada transboundary watershed, shared by Belgium, France, Netherlands, Brussels and Valona region. The regulation is in charge of watershed committees, which, in case of water consumption, would assure the payment and if contamination happens will be involved in guaranteed remediation. Regarding water distribution, this tends to be controlled by public entities, unlike sanitation, which is managed by private institutions. The cost of water covers distribution, consumption, sanitation, and maintenance. In some cases, the water costs are subsidized to people with low incomes.

To illustrate the Mexican resources management system, the case of Mexico Valley watershed was presented. This watershed is located in Mexico City and Mexico State, and it is formed by six sub watersheds. In this region, mitigation plans to water drainage and flooding prevention have been developed. Problems of water depletion, deforestation, and over-exploitation of groundwater, led to subsidence and pollution of water bodies. In order to manage some of the problems, it was necessary to implement the Joined Operation Protocol, where CONAGUA, Aqueduct of Mexico State, and Aqueduct of Mexico City activate the protocol to regulate water levels during flooding periods. CONAGUA delegates the water released downstream to the municipalities mainly for agriculture purposes. 



SS 78 – Introducing the World Water Data Initiative: How Water Data can Help Achieve the Sustainable Development Goals

TIME AND ROOM: 2 June 2017, 10:50 – 12:20; Salon Isla Mujeres

CHAIR: Tony Slatyer

SPEAKERS: Robert Argent, Tom Soo, Youssef Filali-Meknassi, Jean-Francois Donzier, Philippe Guettier

HOSTING INSTITUTION: High Level Panel on Water

SESSION SUMMARY

The United Nations created a High Level Panel to discuss ways in which to fill a gap to increase international political pressure for achieving the Sustainable Development Goals (SDGs). A selected group of world leaders - eleven sitting Heads of State and Government and one Special Adviser - created an action plan specifically to implement SDG 6. The Panel was convened by the United Nations Secretary-General and President of the World Bank Group to provide the leadership required to champion a comprehensive, inclusive and collaborative way of developing and managing water resources, and improving water and sanitation related services.

The Australian Prime Minister undertook the goal of creating a global data development program known as The World Water Data Initiative. This initiative focuses on three areas: (1) policy, (2) harmony, and (3) innovation. The speakers stressed the key objective of the World Water Data Initiative is in making data more available to create a global reference for decision makers and stakeholders on water related issues. This reference will build the capacity of all nations to make better decisions in water related issues.

Within the three areas of the Initiative, there are six elements within the policy pillar. It is focused on the types of legal frameworks and institutions in

governments which need to be developed in order to implement SDG 6. This includes making data transparent- open and easily accessible to the public of all nations throughout the world. Furthermore, it focuses on policies that will work to help those communities utilize the data that is available to them. The second pillar of the World Water Data Initiative focuses on data harmonization. This is within the idea that there needs to be an effort to align national policies around the world because it will lead to a wider utilization of tools and standards. This would make global data more universally accessible and useable. The standardization of a data framework and analysis would reduce costs and complexity worldwide and help reduce risks of misinterpretation. This World Water Data Initiative seeks to accelerate the adoption of these standards.

Innovation is the final pillar of the Initiative. Innovation in data development, storage, and accessibility will help in reducing costs to implement SDG 6. Wider utilization coupled with innovation in technology will make data more available to the public.

Evidence-based decision-making and policy development needs data on all scales. Making that data openly available to all policymakers around the world is a priority of the UN to help meet targets of the SDGs. 💧



SS 79 - Korean Water Forum Special Session, Water and the Fourth Industrial Revolution

TIME AND ROOM: 29 May 2017, 17:20 – 18:50; Cozumel 2

SPEAKERS: Aziza Akhmouch, Yongdeuk Cho, Diane d'Arras, Kwangsuhk Oh, Haekyung Lee

HOSTING INSTITUTIONS: Korea Water Forum; Korean Ministry of Land, Infrastructure and Transport

KEY MESSAGES

- **Science and policy have a mutual influence on each other.**
- **Science and technology development have a crucial role in feeding political needs. To bridge the gap between science and policy, decision makers must give scientists the directions for their investigations so that crucial work is developed. Then, decision makers need to guarantee the quality and validity of the data collection.**

SESSION SUMMARY


Information availability, such as the better life index and indicators on regional wellbeing, are very important in guiding the decision making process. With this kind of technology, politics are able to measure the progress and make comparisons. The call for transparency pushes the availability of data, and open data is essential for policy because it raises awareness. One note is that an excess of information is as big of a problem as lack of information. The excess amount of different data and theories can lead to different conclusions, which is very challenging for a decision maker. Governments have a critical role in regulating the way that data and information are produced.

Political decisions can give direction to science, as is demonstrated by the development of a groundwater thermal energy conservation plant. This plant was

a result of the goals established by policies and agreements such as Paris Agreement and the roadmap of the Korean Water Forum. Some of the effects that policy can have on science are data collection and presenting innovative models.

It was acknowledged that climate change has an impact on the water cycle, but science hasn't given many detailed impacts. The number of disasters per continent is increasing, but on the other side, the total of deaths (per disaster) is diminishing, which shows the prevention measures have been effective. Connections among different stakeholders have made cities smarter and this is proof that collaboration works and is necessary.

An example of technology innovation in Korea is a daily-monitored, automatic leakage investigator that can notify the local people as to where old pipes must be changed. This will have an effect on policy because it will provide a database for policymakers on where the older, leaking pipes are located. Once policymakers have this database, they can improve water management.

Another example of technology influencing policy is through the implementation of nanotechnology (TerraSAN) to prevent the formation of biofilm (which contaminates the water quality). This can help in guaranteeing water quality. 



10. Stakeholder Participation

RS 38 - Stakeholder Participation

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SS 34(A/B) - Bridging Stakeholders' Knowledge and the 8th World Water Forum Thematic Framework

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RS 38 - Stakeholder Participation

TIME AND ROOM: 2 June 2017, 9:00 - 10:30; Salon Isla Mujeres

SPEAKERS: Christian Maduka, Liber Martin, Carmen Fernandez

SESSION SUMMARY

This panel discussed the role of stakeholder involvement in water management. This included changing the way water management is viewed by society (from privately to publicly) and changing how individuals view their own responsibility to water management. Finally, a case study of a water fund's creation demonstrated a process that achieved both.

Managing water in the public interest is an explicit requirement of many State laws. Yet, states often fail to protect the public's interest in the water. A two-part solution was proposed to restore the role of public interest in managing water resources. Part one aimed to define the public interest through a public process, and part two suggested to rigorously apply the standards thus developed to every water allocation and water use decision.

Three approaches were offered to define public interest. First, the utilitarian approach which yields an objective result but tends to favor short term economic gain while not protecting long-term values like environmental, aesthetics, and recreational. Second, the pluralist approach which tends to favor the majoritarian views of those most active in the process. Third, the communal approach is the suggested option because it requires recognition that public interests are distinct from private interests. Using the communal approach, private interests remain important but they become subordinate to shared, communal interests in water. How people view themselves and their role in the environment directly impacts how they behave in the environment. Educating the community creates a responsibility in the water users/citizens. This can be a responsibility to take care of the water and what it is used for and so pay the service fee on time. Water is necessary, but it is expensive. By educating people on their role in the environment, we may be able to have them realize they should pay for the water.

Water is what connects all stakeholders together. A water fund links the water users to the upper basin which provides them water. These funds are built on trust and we must trust the money going into the fund is being used properly. Focusing on integrity increases effectiveness of achieving goals, generates credibility, and fosters long term cooperation. Using a case study on Cuenca Verde in Columbia, this presentation demonstrated how integrity tools can be weaved throughout a water fund. Using pre-analysis, interviews with key stakeholders (landowners, internal staff, and associated partners), and a participatory workshop, this program aims to create water funds that are successful and full of integrity.

There were several steps in the participatory workshop. First, they describe the logic and structure of the water fund. Then they facilitate discussion on how to structure the water fund based on a business model. Key in this step is providing a framework but allowing the stakeholders to fill in the business model and stakeholders suggested trust as the overarching theme. Integrity tools were found throughout the business model including communication with landowners. The next step is to discuss the risks that could affect the water fund and how to prioritize those risks, and then identify the management measures already established to use them to mitigate the risks.

The outcomes of this project included:

- Raised awareness of the importance of integrity for the Fund;
- Generated a climate of trust to talk about integrity management;
- Identified areas for improvement (risks); and
- Generated commitment for the design and implementation—they created it. No one told the participators what to do, so they felt more involved. 💧

SS 34(A/B) - Bridging Stakeholders' Knowledge and the 8th World Water Forum Thematic Framework

TIME AND ROOM: 31 May 2017; 15:30 – 18:50; Salon Coba

SPEAKERS: Benedito Braga, Torkil Jønch Clausen, Glauco Kimura

HOSTING INSTITUTION: World Water Council

SESSION SUMMARY

Capacity building has an integral role in extending. The session gave the opportunity to all interested stakeholders to contribute to the development of the 8th World Water Forum Thematic program. The meeting gathered the Thematic Process coordinators and other interested stakeholders to develop together the Forum's program at a more detailed level, guaranteeing linkages to other processes (i.e. 2030 Agenda, Sustainable Development Goals - SDGs, Implementation Roadmaps from the 7th Forum). Benedito Braga, President of the World Water Council, gave the opening speech explaining how the World Water Forum is more than a triennial event, and rather a continuous process that aims to:

- Develop the capacity to design global policies taking local realities into account;
- Foster effective cooperation measures in the water sector;
- Discuss and provide a framework of solutions from all stakeholders;
- Align communication strategies in the water world;
- Influence the global agenda on water and convince high-level decision makers.


Torkil Jønch Clausen, Chair of the Thematic Commission of the Forum, presented the Thematic Framework and informed that there are over 150 organizations working together as Thematic and Topic Coordinators for the 9 themes to be discussed in the 8th Forum:

1. CLIMATE – Water security and climate change
2. PEOPLE – Water, sanitation and health
3. DEVELOPMENT – Water for sustainable development
4. URBAN – Integrated urban water and waste management
5. ECOSYSTEMS – Water quality, ecosystem livelihoods and biodiversity
6. FINANCE – Financing for water security
7. SHARING – Sustainability through stakeholder involvement
8. CAPACITY – Education, capacity building and technology exchange
9. GOVERNANCE – Water governance for the 2030 Development Agenda

The themes are composed of 32 topics that will lead to the nearly 100 Sessions expected to take place in the 8th World Water Forum. There will be an open call for Special Sessions and High Level Panels that aim to address current key global-political issues. Sharing, Governance and Capacity Building are crosscutting themes to be addressed by all the other themes.

Glauco Kimura, member of the 8th World Water Forum Secretariat, introduced the open consultation platform Your Voice to the audience. This is the first experience of the Forum with an online tool to facilitate contributions from interested stakeholders worldwide and enable unheard voices to be heard. The platform has registered over 20 000 visitors and nearly 1000 users so far, and 60% of the participants were from Brazil. He explained that the platform has been open for public participation since February 13th and that the first round of debates lasted until April, focusing on the Thematic Sessions. The second round starts on June 8th and will allow participants to contribute to the crosscutting themes until July. The final third round opens in August and will enable debates linking the Forum and the SDGs. Kimura highlighted that Your Voice allows participants to vote in the top priority issues regarding the Forum Thematic Process and that more engagement is needed from the youth and form seniors.

The speakers' presentations were followed by a roundtables workshop, which enabled the Thematic Process actors and coordinators present, as well as other interested stakeholders from the World Water Congress to propose sessions and cases for each of the 9 themes.

For more information on the 8th World Water Forum, visit www.worldwaterforum8.org 





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