

Final Report: Climate Risk and Water Security in the Americas, Feb. 27-March 2, 2011, San José del Cabo, Baja California Sur, Mexico

A collaborative research meeting on climate risk and water security in the Americas was held February 27 to March 2, 2011 under the auspices of the Inter-American Institute for Global Change Research (IAI) and the University of Arizona (UA). The meeting brought together 40 researchers and water managers from Brazil, Chile, Argentina, Mexico, United States and Canada. The three primary aims of the meeting were to 1) synthesize and share results from ongoing IAI-CRN II projects that address water vulnerability under climate change (see IAI Synthesis Effort report) 2) identify common challenges and successful strategies for managing water management in arid regions of the Americas under conditions of climate change and non-stationarity and 3) capitalize on the synergies of this nascent collaborative network of IAI researchers and regional water managers to establish a center for water security, led by researchers at the UA. The central goal of such a center is to facilitate communication among the growing network of water and climate stakeholders. The underlying logic for establishing a center on water security in the Americas is the notion that the creativity for addressing new and unprecedented challenges can be found within these collaborative networks. Such creative approaches are already apparent in the individual IAI projects, including research that works closely with on-the-ground water managers at the municipal level to co-produce usable science and interdisciplinary projects that bring together climatologists and anthropologists.

The four-day meeting had several successful outcomes. Presentations spanned several topical areas, including regional approaches to water management in urban and rural sectors, scenario planning for municipal water agencies, markets mechanisms for water distribution, issues of public safety and civil defense, extreme climatic events, and the water-energy nexus. Many researchers felt that this final topic area – the water-energy nexus – could serve as an entry-point to multiple stakeholders from various sectors together. Dr. Megdal of the Water Resources Research Center at the UA, emphasized that energy is expended in not only the production of water, but also in its conveyance. Additionally, she noted the high energy demands for emerging technologies such as water reuse and desalination. Dr. Pineda, with El Colegio de Sonora in northwest Mexico outlined the “perfect storm” of problems facing many urban regions in the arid Americas, including concerns about future supplies of water, energy, food. The group also discussed key terms related to water security such as vulnerability, adaptation and different understandings of the word “security.”

Researchers and practitioners identified several key challenges to water security in the Americas including issues of governance, water conflicts between sectors (e.g., urban/rural and mining/agriculture), lack of long-term climate information and inadequate coverage of meteorological monitoring stations throughout the Americas, communicating climate risk and the uncertainty of climate forecasts to stakeholders, issues of both water quantity *and* quality, and regulation of groundwater extraction and overexploitation of aquifers. There was an interesting discussion of the impacts of the changing seasonality of water availability – not only in regions that depend on snowmelt, but also thinking about how the shifting time and duration of rain showers in Mexico City can affect rush hour traffic.

Researchers and practitioners also identified major gaps in knowledge where further research is needed, particularly in an international comparative research framework. A short-list of important research questions was developed, including:

1. Given that there is a lot of climate information with a range of uncertainty, how do water managers deal with uncertainty?
2. What do we, as scientists, need to do to interact with decision makers over uncertainty? How do we communicate uncertainty?
3. How can we reduce uncertainty? How can we facilitate a better understanding of extreme events that will provide more information for improved predictions and decision-making?
4. How can low frequency variation modulate the frequency and intensity of extreme events?
5. What is causing the shift in the timing and the shift in the intensity of precipitation? How does the shift in the time of day and the intensity of rain that fall affect social vulnerability?
6. How are the extreme events, in themselves, changing? And what are the impacts of those changes on populations, land use, agriculture.
7. How does land-use change and urbanization affect the hydro-intensity of storms?
8. How can we address extreme vulnerability that results from milder or strong storm events? How do we address the vulnerability associated with very severe storms that affect small populations? What other vulnerabilities are overlooked (e.g., social vulnerability associated with mesoscale convective systems and the hazards they create)?
9. What are the conditions that lead people to settle where they are vulnerable? How can we translate through distinct epistemologic frameworks—for example, cultural understandings of hazards/risks contrasted with technoscientific understandings.
10. How are large-scale producers affected by extreme events in contrast to small-scale producers, given different access to resources?
11. Countries and regions have some commonalities and differences in how they respond to catastrophes relating to extreme climate events. What are those commonalities and differences, and are they adaptive responses, or maladaptive ones?
12. What are the trade-offs between upstream and downstream hazards in ecosystem services? How are the ecosystem services valued and what are the acceptable or desirable trade-offs between urban and rural areas? How do urban land use changes affect downstream peri-urban & rural areas? And, rural land use changes affecting other (urban/non-urban) areas?
13. How will managers assure future water supply due to the intersection of climate change and variability with demographic growth and urbanization? How will they assure supply for coming population in next 2-3 decades, despite droughts, and floods? How well prepared are municipalities for climate extremes in the face of demographic growth?
14. How do decision-makers plan adaptively for future water management in urban and rural areas that may experience excess/surplus issues in the next decades, leading to increased flood vulnerability?

Researchers and practitioners also identified several strategies for moving forward to address these challenges. They expressed considerable interest in developing a comparative approach to water management in the Americas, highlighting differences in physical geography and climate regimes, as well as distinct social and institutional responses. International collaboration creates an ideal “laboratory” where researchers can analyze the outcomes of different strategies; or the impact of the same strategy or policy in regions with different climate

systems and different social and institutional settings. As noted by Dr. Bauer of the UA, the question of water security is not only a matter of the physical resource, but also a matter of water governance and different ways of responding to water conflict. This means there is a great need to study laws, institutions and policies related to water use and evaluate different institutional frameworks, property rights to water (both in practice and in law) and different kinds of water use by sector. Practitioners from different regions were eager to learn about the experiences of using water banking, conservation programs and water markets in other regions.

Mr. Marra, of Tucson Water, raised the interesting question of trade-offs between short-term and long-term conservation (i.e., if we pick all the “low-hanging fruit” now, what will we do in the future?) Others highlighted additional ‘trade-offs’ that must be considered, such as water for the environment versus water for agriculture, and sparked discussion on the utility of incorporating environmental services into cost-benefit analyses.

There was a discussion of the important role that infrastructure will likely play in addressing many of these challenges. Dr. Pineda noted that the need to reinvest in infrastructure provides an opportunity to “re-invent” cities. There was considerable interest in the role that water reuse and desalination might play in augmenting supplies for urban areas and certain sectors, such as mining in Chile (as well as the challenges that these technologies might raise).

Another proposed strategy for adaptation to climate change was to focus on successful examples of adaptive management that deals with current natural variability that we experience now. We can learn from past examples of natural disasters and historic patterns of climate extremes (e.g., El Niño).

Following the IAI emphasis on “action science,” the group re-stated a commitment to co-producing scientific knowledge by collaborating with researchers from multiple disciplines, engaging with water managers and decisionmakers across sectors and facilitating public participation. To be successful, such integration must start during the project design stage. Building capacity and providing decision-support is an important element of these collaborative projects. Engagement with managers and decisionmakers must be consistent and long-term in order to overcome political barriers and political turnover. The end goal of these intensive collaborations is to producing science that influences policy decisions.

Lastly, participants in this workshop dedicated considerable time to reviewing several funding opportunities to provide financial support to establish a center for water security and begin addressing the above challenges. There was significant interest in moving forward with proposals to address issues of vulnerability to extreme events – expanding the research area to include in semi-tropical, as well as semi-arid regions.

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Project URL: <http://udallcenter.arizona.edu/iai/index.php>

Annex A - Participants List

Annex B – Workshop Program

Appendix A: Participant List

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Appendix B Workshop Program

Climate Risk and Water Security in the Americas

Sunday, February 27, 2011 – Project Review and Proposal Development (Puebla Room)

Goal – Review of ongoing projects to identify strategic opportunities and directions for Americas-wide collaboration (this will contribute to the development of the center for water security and adaptive management, and specifically, to research proposals)

Preparation requested

- Those researchers who have already been identified to discuss a proposal (see 2:30 session details below) will come prepared (with 1-2 pages) to discuss, in detail, a specific proposal(s): Deadlines, funding amounts? Specific requirements? Contact program manager?
- We will distribute an annotated bibliography of recent literature that will help inform our proposals (Jamie McEvoy, Chris Scott)

9:00 – Discuss working definitions of key terms, including: water security, integrated assessment, adaptation at regional scale, coping at individual scale, differences across institutional scales (Holm Tiessen, Chris Scott, Bob Varady)

10:30 – Coffee break and continue discussion of regional approaches or variations

- NOAA Sectoral Applications Research Program (SARP) project cases (Margaret Wilder)
- Mexico (Luis Farfán, Federico Graef)
- Chile (Francisco Meza, Sebastian Bonelli)
- Argentina (Carolina Vera)
- Brazil (Synara Broch)
- U.S. (Gregg Garfin, Federico Prado, Kevin Lansey)
- Canada (Brian Luckman)
- Partnerships across countries/ regions (Holm Tiessen)

12:30 – Working lunch – Identify existing research initiatives that can leverage, support and/or work collaboratively to develop a center for water security and adaptive management

- What resources do we already have?
- What funding options are already “in the pipeline”?

1:30 – Review specific funding sources for a center for water security and adaptive management

- Catalyzing New International Collaborations – NSF #11-508 (Margaret Wilder, Jamie McEvoy)
- Pan-American Advanced Studies Institutes (PASI) – NSF #10-517 (Gregg Garfin, Federico Prado)
- Research Coordination Networks (RCN) – NSF #10-566 (Chris Scott, Kevin Lansey)
- Partnerships for International Research and Education (PIRE) – NSF #09-505 (Chris Scott)
- Collaborative Research Network (CRN III) – IAI (Luis Farfan, Bob Varady, Chris Scott)
- NOAA (Margaret Wilder)
- Spain links? (Francisco Meza)

2:30 – 5:00 – Break into groups by proposal, assign specific roles and work on drafting

- Identify team members who can commit to taking the lead on specific funding proposals
- Work on proposal outlines, identify next steps

Climate Risk and Water Security in the Americas

Monday, February 28, 2011

Two parallel meetings before lunch: A) IAI Synthesis, B) Proposal Development (continued from Sun., with other researchers joining the proposal teams). After lunch, all participants join the single session.

IAI Synthesis (Cholula Room) suggested participant list: Christopher Martius, Holm Tiessen, Graciela Raga, Elma Montaña, Mariana Concha, Brian Luckman, Mario do Espirito Santo, Francisco Meza, Sebastian Bonelli, Chris Scott, Bob Varady, Jamie McEvoy, Luis Farfán, Chad McNutt., Federico Prado, Felipe Martin

Proposal Development (Puebla Room) suggested participant list (Sun. night arrivals, please join a proposal group of your interest; continue drafting proposals – i.e., no set program of presentations): Gregg Garfin, Margaret Wilder, Kevin Lansey, Synara Broch, Carolina Vera, Patricia Romero-Lankao, Sharon Megdal, Carl Bauer, Thomas Meixner, José Lever, Federico Graef

9am – 1 pm – IAI Synthesis Meeting (Cholula Room)

Synthesis of the IAI hydrology and water governance projects – Holm Tiessen, Christopher Martius
Goal – This session will prepare a synthesis write-up using major findings (as well as of the obstacles encountered in preparing a synthesis) - note-takers: Chris Scott, Jamie McEvoy

- What are the IAI CRN2 and HD research results that allow us to prepare here-and-now assessments of streamflow patterns, watershed and groundwater recharge regimes, water consumption patterns and water needs including, e.g., ecological minimum flows?
- What linkages are observed to current-day climate variability? Can risk & vulnerabilities be evaluated?
- Can we analyze trends in the above points that allow future projections of water security?

Products

1. One-page synthesis reports (per project, prepared in advance) addressing the questions above (streamflow, groundwater recharge, water consumption, needs, risk, and vulnerabilities)
2. Synthesis report across projects with emphasis on water security (writing continued Wed. morning)

1pm – 2pm – Lunch for both IAI Synthesis and Proposal Development groups

2pm – 4pm – Water Security and Adaptive Management in the Arid Americas (Puebla Room)

Goal – Address North America – Andean comparisons and prepare for the stakeholder forum the next day – note-taker: Christopher Martius.

- What commonalities and differences exist between the two regions in relation to streamflow, groundwater recharge, water consumption, needs, risk, and vulnerabilities? (Resource persons: Thomas Meixner and Brian Luckman)
- Is a comparative, cross-regional approach useful and if so, what research networks and stakeholder engagement would be most productive? (Resource person: Carl Bauer)

4 pm – 5 pm Researchers' Meeting: Workshop Planning Session (Puebla Room) – Chris Scott

Goal: Shape research consensus on key messages for stakeholders

Objectives: 1) Discuss program and roles of each researcher and 2) Identify key topics (e.g., climate change, urban growth issues) and discuss how we will frame/approach these issues with the stakeholders

Climate Risk and Water Security in the Americas

Tuesday, March 1, 2011 - Puebla Room, Hotel Royal Solaris
San José del Cabo, Baja California Sur, Mexico

Objective – to provide a discussion forum for scientists, practitioners, and decision-makers to chart strategies on water security research, policy and practice

8:30 **Welcome**

- Holm Tiessen, Inter-American Institute for Global Change Research (IAI)
- Robert Varady, University of Arizona (UA)
- Federico Graef, Center for Scientific Research and Higher Education of Ensenada (CICESE)
- José Gajón, Civil Defense – Baja California Sur

8:45 **National and regional perspectives**

- José Luis Meza Trejo, National Water Commission, Baja California Region, Mexico
- Lucas Oroz, National Water Commission, Northwest Region, Mexico (presentation by Roberto Molino)
- Chuck Cullom, Central Arizona Project, USA
- Brian Luckman, University of Western Ontario, Canada
- Mariana Concha, General Water Directorate, Chile
- Carolina Vera, University of Buenos Aires, Argentina
- Synara Broch, Federal University of Mato Grosso do Sul, Brazil
- Luis Farfan, CICESE – Summary

10:00 **Global change and water security – Roundtable**

Framing questions: How do we define and understand the concept of water security? What are the priority challenges that we face in specific contexts within the arid Americas? What are key steps in moving forward to address these challenges?

- Discussion of definitional issues and conceptual framing – Robert Varady, UA
- Overview of IAI, water-related projects, water security center, next steps – Holm Tiessen, IAI
- Roundtable 1 (discuss framing question):
 - Ralph Marra, Tucson Water, USA
 - Felipe Martin, National Irrigation Commission, Chile
 - Carolina Vera, University of Buenos Aires, Argentina
 - Synara Broch – Federal University of Mato Grosso do Sul, Brazil
- Roundtable 2 (continue discussion):
 - Chad McNutt, National Oceanic and Atmospheric Administration, USA
 - Graciela Raga, National Autonomous University of Mexico
 - Gregg Garfin, University of Arizona, USA
 - Federico Prado, National Science Foundation, USA
 - Patricia Romero-Lankao, National Center for Atmospheric Research, USA
- Summary – Francisco Meza, Catholic Pontifical University of Chile

11:30 **Coffee break**

- 12:00 **Relationship between water security and resource management in other sectors**
Framing question: What are the water security challenges emanating from the intersections of climate and water scarcity in the arid Americas?
- José Gajón, Civil Defense – Baja California Sur
 - Socioeconomic vulnerability – Margaret Wilder, University of Arizona
 - Urban water – Nicolás Pineda, Colegio de Sonora
 - Rural water – Felipe Martin, National Irrigation Commission, Chile
 - Energy – Sharon Megdal, University of Arizona
 - Ecosystem services – Gregg Garfin, University of Arizona
 - Extreme events – Graciela de Raga, National Autonomous University of Mexico
 - Summary – Jamie McEvoy, University of Arizona
- 1:30 **Lunch**
- 2:30 **Planning for collaborative networks on water security and adaptive management**
- Conceptual strategic proposal – Christopher Scott, University of Arizona
 - Gaps in current understanding and practice as opportunities – Holm Tiessen, IAI
- 3:30 **Breakout groups (followed by report-back in plenary session) – Gregg Garfin, UA**
- Group 1: Thematic scope and researcher – practitioner – decision-maker interactions
 - Group 2: International collaboration and development/funding

Climate Risk and Water Security in the Americas

Wednesday, March 2, 2011

8am – 1pm – Center for water security and adaptive management - development and next steps (Puebla Room)

- 8:00 Summarize and synthesize stakeholder workshop (Tuesday) – Gregg Garfin
- 8:30 Report-back on IAI CRN2 synthesis (from Monday meeting) including stakeholder input – Chris Scott
- 9:00 – 11:00 (working coffee break) - **IAI Synthesis and Proposal Development** (break into groups)
- 9:00 **IAI Synthesis Draft Report Writing (Cholula Room)**
- Group 1: Water Resources – Christopher Martius and Chris Scott
 - Address following guiding question: What are the IAI CRN2 and HD research results that allow us to prepare here-and-now assessments of streamflow patterns, watershed and groundwater recharge regimes, water consumption patterns and water needs including, e.g., ecological minimum flows?
 - Group 2: Climate Risk – Holm Tiessen and Bob Varady
 - Address following guiding question: What linkages are observed to current-day climate variability, and can risk and vulnerabilities be evaluated?
- 10:30 Reconvene to assemble IAI synthesis group work in final report – Chris Scott
- Address following guiding question: Can we analyze trends in the above points that allow future projections of water security?

9:00 **Proposal Writing (Puebla Room)**

- Subgroups (based on priority proposals from Sunday and Monday) to incorporate/ address stakeholder priorities in proposal drafts, discuss next steps – Gregg Garfin

10:30

- Identify and address overlaps, inconsistencies, or gaps among the set of proposals selected for further development

11:00 All reconvene in Puebla Room - Identify next steps and assign responsibilities – Chris Scott

- Report back on draft IAI synthesis report
 - Next steps, dates, responsibilities
- Summary of draft proposals
 - Next steps, dates, responsibilities

1:00 Adjourn and depart