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CONFERENCE REPORT

Interdisciplinary knowledge frameworks for transboundary river basins

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A workshop titled *Hydroenergy and Climate Change* was held in Buenos Aires, Argentina, in July 2014. The goal of the workshop was to identify and frame global change research questions in the context of hydropower development and water-energy futures in South America. Participants included a mix of social scientists, hydrologists, biologists, water engineers, policy specialists and social advocacy actors, all specialized in different aspects of hydroenergy. The main objectives of the workshop included:

- generating new knowledge geared toward interdisciplinarity;
- developing skills and building capacity for local and regional stakeholders; and
- creating spaces for interaction and collaboration for a diverse set of stakeholders and policy issues related to the governance of transboundary basins.

This conference report provides the main findings and some of the important recommendations of the workshop, especially related to emerging interdisciplinary themes around hydropower and climate change in the Uruguay River Basin in South America. We conclude by outlining our next steps to develop good practices for interdisciplinary, user-oriented global change research and develop an interdisciplinary socio-scientific network between natural and social scientists, policy makers and social actors involved in water politics as governance mechanisms and practices.

A larger research effort

The workshop was the first in a series of workshops under a three-year project funded by the Inter-American Institute for Global Change Research (IAI). *Advancing Good Practices in Building Interdisciplinarity: Moving Towards User-Oriented Science* is a project aimed at advancing good practices in building interdisciplinarity for global change research.[2] The overall goal of the larger research project is to reflect on and improve the current practices of knowledge generation, mobilization and use with respect to the social and environmental impacts of hydropower development, and water-energy futures in South America. Fostering dialogue between diverse stakeholders involved in the processes of construction and contestation of knowledge on transboundary waters in relation to dams

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and hydropower development is central to the exploration of the possibilities and limitations of interdisciplinary knowledge building.

Linking hydropower and climate change for interdisciplinarity

The intersections between hydropower and climate change dynamics provided a privileged field to explore issues of interdisciplinarity at our workshop. This is the case because research has yet to explore the multiple and complex causal relations between both processes. Issues of the scale of dams, technical specifications in their design, greenhouse gas emissions caused by dams, and degree of vulnerability given their particular geographical location are all intervening factors in this debate.

What is at stake is the assessment of risks in a context of uncertainty introduced by climate change. What is certain is that multiple perspectives and fields of specialized knowledge are needed. The institutionalized fragmentation of 'expert' knowledge into distinct academic disciplines has led to great advancements in many fields along the natural science–social science divide. Yet, this has come at the expense of creating insular and self-referential epistemic communities that are ill equipped to expand knowledge production through cross-fertilization with other fields. Moreover, beyond the confines of scholarly research and labs, there is also policy knowledge in the different public institutes or ministries with competencies in areas that broadly relate to hydropower and climate change. Interdisciplinarity requires articulating knowledge across this pluralized landscape.

Increasingly, interdisciplinary research is seen as necessary to produce new creative solutions to grand societal challenges like climate change (Lyall & Fletcher, 2013). Interdisciplinary research suggests the crossing or merging of disciplinary boundaries. The integration necessary for interdisciplinary research requires interaction between natural and social scientists, as well as a diverse set of stakeholders and government officials. Workshops are an important first step in providing a forum or venue for these actors to come together toward interdisciplinarity.

The Uruguay River basin as a case study

For our workshop, the Uruguay River basin (URB) provided a good case to explore the processes by which interdisciplinary knowledge could be created, mobilized and used in relation to the governance of a transnational basin. As a subsystem of the La Plata River basin, the URB comprises parts of Argentina, Brazil and Uruguay. The Uruguay River runs along a 2200 km stretch extending from Brazil to the international border between Argentina and Uruguay, covering an area of 340,000 km^2 (180,000 km^2 in Brazil, 60,000 km^2 in Argentina and 100,000 km^2 in Uruguay).

The geographical location of the URB and the La Plata River basin corresponds to the areas of greatest population density, economic activity, transportation and trade flows in all of South America. In this respect, this basin is particularly vulnerable to contamination: degradation of water quality due to large-scale agriculture, industrial activities, untreated sewage and other factors linked to unsustainable practices of land and water use. The governance of this sub-system basin is therefore a challenging task, considering the many issues involved, particularly the socio-economic and ecological implications of using and managing common hydric resources that extend through three riparian states. Notwithstanding the need for interlinked policy issues in all mentioned areas involved

in the URB, hydroenergy features as the main policy agenda dictating the politics of the URB.

There are long-term policies aimed at optimizing the hydroenergy potential of many rivers in the region, both in Brazil and in neighbouring countries, through binational hydro initiatives. There are currently nine dams operating in different sections of the URB, all of which are in Brazil with the exception of the Salto Grande Dam, which is a binational Brazil–Uruguay initiative located on the border between these two countries. There are plans to build eleven more dams. These plans include Garabí and Panambí, which are the case studies of the project. Garabí and Panambí are driven by Argentina and Brazil and will be located on an international border section of the Uruguay River.

Natural resources and regional integration in South America is an evolving, fragmented and contested set of agendas and processes (Saguier, 2012, 2014). Since Garabí and Panambí are binational initiatives, they are part of the bilateral relations of Argentina and Brazil aimed at energy integration. In this case, the agenda of energy integration shapes the politics of transboundary basin relations, which is also a form of regional integration with respect to natural resources.

The academic research on transboundary basins and water governance stresses the importance of transparency, informed and accessible public debates, equity and fairness in decision making and implementation, and processes to support linkages between credible and legitimate scientific knowledge and policy applications in relation to basin governance processes (e.g., Berardo & Gerlak, 2012; Tortajada, 2010). Moreover, traditional science does not often engage with interdisciplinary approaches to explore the implications of water for global change and vice versa. Yet, there is a need for more interdisciplinary approaches to better understand the interactions between natural ecosystem components and human-based ones in terms of water resources. Interconnections between social groups, public and private interests, and natural science systems are not adequately exposed and incorporated into knowledge construction processes.

In the absence of information regarding the different interventions on the URB, several questions remained unanswered. Does hydroenergy override other issues of basin governance? How is knowledge related to the hydroenergy being produced disseminated and used by the different actors involved in hydroenergy development? The project's focus on the URB allows us to pursue these questions in the context of solving real problems of mitigation and adaptation to global change.

The processes by which information about the social and environmental impacts of hydropower plants is being constructed, used and contested represents a strategic site to explore questions of interdisciplinarity and the shifting practices that define the current trends of governance challenges of a transboundary basin. Comparatively little research has been conducted on the Uruguay River compared with equivalent basins, such as the Paraná. Our focus on the URB has generalizability to conflicts and processes underway in other basins in South America. The governance of transboundary basins constitutes a strategic area to develop new ideas and approaches to policy in relation to interdisciplinary knowledge processes.

Framing global change research questions: emerging interdisciplinary themes

Workshop participants identified opportunities to enhance the dialogue between diverse perspectives and disciplines and move interdisciplinarity forward around hydropower development and water-energy futures in South America. The following themes are

presented as potential sites for collaborative work between different specialized fields of knowledge.

Issue framing and communication of hydroenergy and climate change linkages. There is ground for better approaches in public information, assessment and communication as part of efforts to integrate diverse knowledge frameworks into dialogue processes. Currently, there is little understanding of the role of hydroenergy in relation to socio-environmental development issues, particularly with climate change. Hydropower advocates focus narrowly on the energy contributions of dams, leaving aside other dimensions where dams can provide potential benefits for developmental concerns, as well as mitigation and adaptation responses to climate change (water flows regulation, water storage, energy, etc.).

Deliberative spaces and citizenship. The establishment of permanent forums where different sectors and epistemic communities can participate in relation to dam issues can foster interdisciplinary knowledge construction. In such forums there can be participation of public authorities of municipalities and provinces in the basin area, in addition to representatives of the different water governance institutions and institutes and scientific experts. The existing basin councils (*consejos de cuencas*) are inadequate for this. In some cases, as in the Argentinian province of Misiones, provincial legislation establishes that the decision to build hydropower infrastructure must be subject to a binding plebiscite. Permanent forums can contribute to informing public debate, hence improving conditions for a better exercise of a citizenship right to plebiscite consultation.

Natural science contributions to policy decision making related to industrial production. There is room for building interdisciplinarity by establishing the links between science and productive activities, as well as showing the social and economic importance of scientific research. Expanding and developing the notion of environmental services can help visualize the contributing factors of ecological systems to sustained economic activity and life conditions in general. The framing of scientific research in terms of 'inputs' or 'services' that can be valuable for policy decision making and industry is potentially useful to promote interdisciplinary work.

The political economy of energy futures. Inquiring into who benefits and who loses with a particular energy model or policy is central to understanding how knowledge is generated and used in relation to the promotion of one energy option over others. There is a need to compare the global warming emissions of the hydroenergy sector with those of other sectors (carbon, gas, oil and indirectly biofuels). Political economy, natural science and technical insights can produce interdisciplinary analyses that highlight the power implications of the seemingly neutral technical discourse that frames energy policy debates. We should turn to 'hydro-economical' and 'hydro-social' studies.

Reflecting on past experiences. There are many examples of hydropower initiatives undertaken in South America that provide a valuable ground to reflect on the potential and limitations of interdisciplinary knowledge processes. The experiences of environmental impact assessments are good examples of how knowledge is produced, mobilized and used by different stakeholders linked to these processes. In most cases, private consultancy firms are commissioned to perform impact assessments, often without public oversight or validation from scientific institutions. Likewise, water governance initiatives with participatory socio-environmental principles, such as Cultivando Água Boa (Cultivating Good Water) for the Itaipu binational hydropower dam, are also an experience to explore the potential for interdisciplinary knowledge processes.

Interdisciplinary knowledge frameworks. A series of practical initiatives were suggested to foster the creation of interdisciplinary knowledge frameworks through

promoting trust between the often separate scientific and policy communities. One way to tackle this is through activities to generate information collaboratively. Designing research groups between scientific and policy communities may be a step in that direction – for example, a system of internships of university researchers in policy institutions, collaborative research, etc. Hydro-electrical dams are rich repositories of data since they keep accumulated measurements, evaluations, etc. One way to create synergies with the research communities is to build collaborative links with the dams to access and work together with this information.

Next steps

We will proceed with two important next steps. The first is to craft a set of good practices for interdisciplinary research user-oriented global change research that reflect the current limits or challenges to fostering interdisciplinary knowledge-producing practices, along with possible avenues to overcome such challenges.

Second, we will work to further build an interdisciplinary socio-scientific network between natural and social scientists, policy makers and social actors, and to better foster dialogue between the diverse stakeholders involved in the processes of construction and contestation of knowledge on transboundary waters in relation to the governance of the URB.

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Notes

1. Both authors contributed equally to the writing of this article.
2. Visit the workshop site at http://udallcenter.arizona.edu/Building_Interdisciplinarity/Hydroenergy_and_Climate_Change_Workshop_July2014.html. For information on the broader project Hydropolitics, Regional Integration and Climate Change in South America, visit http://rrii.flacso.org.ar/hidropolitica/.

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