SLIDES: Rivers and People in the Neotropics: Social and Ecological Science for Environmental Flows

Elizabeth P. Anderson

Follow this and additional works at: http://scholar.law.colorado.edu/coping-with-water-scarcity-in-river-basins-worldwide

Part of the Aquaculture and Fisheries Commons, Climate Commons, Comparative and Foreign Law Commons, Environmental Health and Protection Commons, Environmental Policy Commons, Hydrology Commons, Indian and Aboriginal Law Commons, Latin American Studies Commons, Law and Society Commons, Natural Resources and Conservation Commons, Natural Resources Management and Policy Commons, Social Policy Commons, Sustainability Commons, Water Law Commons, and the Water Resource Management Commons

Citation Information
http://scholar.law.colorado.edu/coping-with-water-scarcity-in-river-basins-worldwide/16

Reproduced with permission of the Getches-Wilkinson Center for Natural Resources, Energy, and the Environment (formerly the Natural Resources Law Center) at the University of Colorado Law School.
Rivers and People in the Neotropics

Social and Ecological Science for Environmental Flows

Elizabeth P. Anderson
Florida International University, Miami, FL
Neotropical rivers are frontiers for new scientific discovery.
Neotropical freshwater fishes (>5600 species)

Slide courtesy of James Albert, Univ. of Louisiana
Neotropical freshwater fishes: Species richness

Source: Albert, J.S. and R.E. Reis. 2011. Historical Biogeography of Neotropical Freshwater Fishes
Neotropical ichthyology: Growth of knowledge

Alpha taxonomy
• 1889: 1,000 species
• 1920: 2,000 species
• 1974: 3,000 species
• 2000: 4,000 species
• 2010: 5,000 species
• 2015: 5,600 species
• Anticipated: >8,000

Neotropical rivers are increasingly being altered by dams and water diversions.
Global boom in hydropower dam construction

Source: Zarfl et al. 2014. Aquatic Sciences

- >30 dams built in the 1990s
- Plans to double generation capacity between 2004-14

Anderson et al. 2006, River Res App; Anderson et al. 2008, Aq Cons
Hydropower in the Andean Amazon (2016):
- 97 existing / construction
- 160 planned

Anderson et al. in prep, PNAS
Megaprojects: New strategies for development

- What’s changed: size and number of projects
- Centerpieces of national growth processes
- Regional interlinking strategies
- Increasing role of Brazil and China
  - Financing
  - Internationalization

The biodiversity and ecosystem service costs of Neotropical dams and water diversions are high.
Western Amazonia Working Group (SNAP): 
Fishes, food security, and infrastructure (hydropower)

Source: Carlos Cañas, WCS; Science for Nature and People (SNAP), NCEAS

Longest freshwater fish migrations in the world
The dourada and babão

Source: Carlos Cañas, WCS; Science for Nature and People (SNAP), NCEAS
Near Ibarra, Ecuador
“...I have lived off of transportation, fishing, and learned to swim in the River...my grandparents enjoyed the River...I want to protect it for future generations.”

-lifelong Sarapiquí River riparian resident, Costa Rica
The management response: Two stories

Honduras, Central America

Peru, Upper Amazon
Patuca River, Honduras
Discussion of flow-ecology and flow-ecosystem services relationships
Identification of critical areas where low flow can limit movement of canoes
Management options for Patuca 3

Without environmental flow recommendations

With environmental flow recommendations
Lessons for the Neotropics from the Patuca River Basin, Honduras

• E-flows initiatives as a kind of biological and social inventory
  – Opportunity to collect data, stimulate more science

• Importance of traditional ecological knowledge in understanding flow-ecology relationships
  – Observations of rivers over generations, knowledge of temporal variability

• Focus on a key ecosystem service in setting recommendations for e-flows
  – Relatively simple estimations of what was needed to move canoes

Source: TNC, ENEE; Esselman & Opperman 2010, Ecology & Society
Chinese Interest in Honduran Hydroelectric Projects

In the signed agreement signed, China announces its interest in investing in the projects known as Patacuí I, II and III.

Thursday, September 9, 2010

The agreement states that Chinese state-owned Sinohydro will assist Honduras in carrying out feasibility studies for the hydroelectric projects and will discuss financing with Eximbank.

"Chinese experts in partnership with Honduran colleagues have started evaluating the feasibility and maturity of the Patacuí project, as well as the significant economic and social benefits it will bring," reports Proceso Digital.

Source: proceso.hn

MORE ON THIS TOPIC

Chinese Hydroelectric Company in Costa Rica
August 2011
Sinohydro could invest $400 million in the construction of a hydroelectric dam, in conjunction with the Instituto Costarricense de Electricidad (ICE).

The Chinese dam construction company is in negotiations to build a 300MW hydroelectric generating plant, according to representatives of the Embassy of Costa Rica in China.

China To Invest $50 Million in Hydro Power Plant Patacuí III
April 2011
The first phase of the Hydro Power Plant is picking up steam after the signing of an agreement between Honduras and China.

After three months of negotiations, the governments of both countries agreed to the construction of the first phase of the hydro plant, located 220km east of the capital city Tegucigalpa.

GOODS
hydroelectricity

KEY ENTITIES
Sinohydro Corporation

COUNTRIES
Honduras
China

INSIGHT
Hydroelectric Project Patacuí III
hydroelectric dams
hydroelectric projects
construction
hydroelectric construction
Energy
Infrastructure and Construction
“A ellos van siempre los dólares… a nosotros van siempre los dolores.”

http://blog.nature.org/conservancy/2011/02/07/dolares-y-dolores-along-the-rio-patuca/
Marañon River, Ecuador/Peru
Hydropower dams in the Marañon (2016):
• 35 existing / construction
• 82 planned

Anderson et al. in prep, PNAS
IIRSA: Integration of Regional Infrastructure of South America
Peruvian Amazon, Cordillera Escalera, Loreto: Importance of freshwater in Shawi cosmology
Shawi Cosmology: Water = source of strength

Source: Diana Alvira, The Field Museum; Huertas & Chanchari. 2012. Mitos del Pueblo Shawi sobre el Agua
Manuel Taricuarima, a shaman of the Peruvian Amazon's Kukama people, says that when he attended patients here in the past, he would put his hand on the person's head, shut his eyes and sense not only the seriousness of the problem, but also the spirits he had to summon in order to bring relief. Taking a bowl made from the shell of the fruit of a small tree called huang (Crescentia cujete), he would go to the bank of the Marañón River, a major tributary of the Amazon, and scoop up water for the healing ritual as a symbol of his communication with the river spirits.

He had done that ever since his father taught him to heal. But then came 2012, and the rights to the port in this small city were granted in concession to private companies as a first step toward the development of a river- and highway-transportation network linking Peru and Brazil. Under the new regulations, residents of local river communities could no longer dock their small canoes at the port. Taricuarima felt his spiritual bond with the river had been broken.

"Now, I feel very weak," says Taricuarima, who is 76. "Now I can hardly cure people of their illnesses. Since they sold the ports to the companies, there are many vessels, motor oil and much and the plan's upgrades for the coastal port of Paita as well as the river ports of Lago and Yurimaguas and Pucallpa are underway. The airport in the northern coastal city of Piura also is being expanded as part of the plan. The next phase involves dredging parts of the Marañón, Huallaga and Ucayali rivers at an estimated cost of US$74 million to make them navigable year-round for cargo and passenger vessels traveling to and from Brazil. That would allow river traffic to connect with highways in the Peruvian towns of Yurimaguas and Pucallpa, which in turn lead to seaports on Peru's Pacific coast.

Eight bidders have expressed interest in the project, which will include dredging, installing navigational aids and monitoring water levels and channel depths. The winner will be chosen during the first half of this year, according to the Peruvian development investment agency Proinversión.

Critics have raised environmental, safety and cultural concerns. More vessels on the Amazon, Marañón, Huallaga and Ucayali rivers will make river travel more dangerous for local residents who depend on dugout canoes with motors called pirogue. Small-boat operators disburse cash to casino players and cash transfer points to shopkeepers who stay in school or pay days, floating and ignoring disbursements by the women in the middle of a flooded canoe ride.

The hydroelectrics make parts of the river uninhabitable when water levels are low, and water levels in a river system are critical in a 2-million-hectare shrimp region between the Marañón and Ucayali rivers.

The term benefits assessment called
In progress: Demonstrating the cultural and ecological values of a free-flowing Marañón

- Amazon Waters Science for Nature and People (SNAP-NCEAS): scenarios
  - WCS Peru, TNC, others
- Marañon Waterkeeper / Remando Juntos: activism and local voices
  - Conservamos por Naturaleza, Peru; others
- Living Andean Rivers: scientific synthesis and capacity building on flow-ecology and flow-culture linkages
  - Florida International University, South American universities
- Computational sustainability framework for examining ecosystem-services impact of dams
  - Cornell, Florida International University, others
In summary:

• The Neotropics is a region in the midst of rapid and irreversible change.

• Rivers, their biodiversity, and the human populations that depend on them are at the center of much of this change.

• The management and conservation response to Neotropical river alteration must consider both ecological and social information, together.

• Sometimes socio-cultural river linkages offer the strongest arguments for environmental flow management.