

A Sociohydrological Framework to Understand Conflict and Cooperation Dynamics in Transboundary Rivers

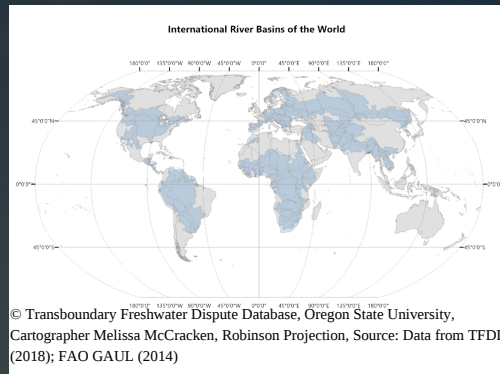
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Transboundary rivers, refer to rivers that flow across more than one countries.

According to the 2019 register of international river basins, there are 310 international rivers shared by 150 countries (totally 230 countries/regions), including 2.8 billion people, more than 47% of Earth land area.

These rivers are essential to the globe's water security, providing approximately 60% of the world's freshwater, that are vital sources to drinking and industrial processes, transportation routes, hydropower, irrigation supplies, species habitat, and fisheries production, which makes them all the more important to manage effectively.



310 RIVER BASINS

150 COUNTRIES

47.1% LAND SURFACE

60% FRESHWATER

507

Conflicts Events

1228

Cooperation Events

Conflict and Cooperation Dynamics



Transboundary river systems are characterized by conflict and cooperation dynamics



TFDD, BAR Project
compiled instances of
conflict and
cooperation over
international
freshwater resources
during 1948 until 2008



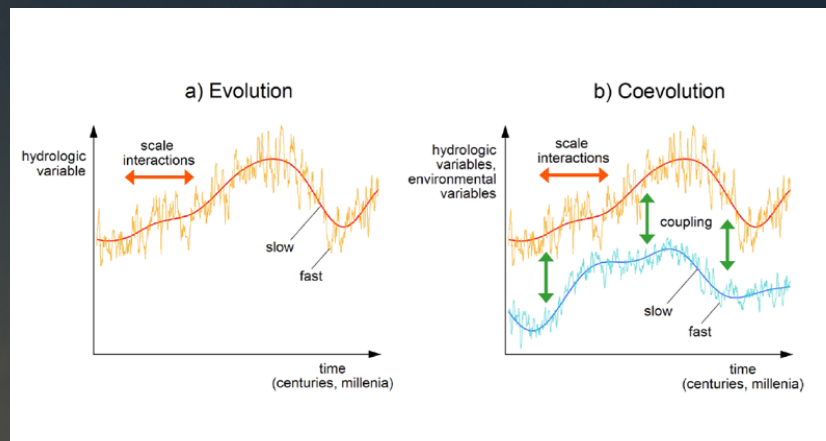
Out of 1831 events, 28% were conflictive (507 events), 67% were cooperative (1228 events).

As transboundary river flows across political boundaries, it fluctuates in both space and time, and has multiple and conflicting demands on its use. The very differing views on how the water should be used, the value of water and how it should be managed which makes collaborative management difficult. Which have often resulted in tensions between riparian states, that leading to greater conflict or cooperation.

Without the knowledge of understanding how different actors came to cooperation or conflict and skills to manage ineffectively, fierce competition for this scarce resource could well bring combatants to the battlefield in the 21st century.

Transboundary River basins

A Sociohydrological System



The essence of Sociohydrology is to study the coevolution of human and water on the landscape, which may lead to previously unobserved 'emergent behaviors' (Sivapalan, 2012);



CONFLICT AND COOPERATION

Emergent Phenomena



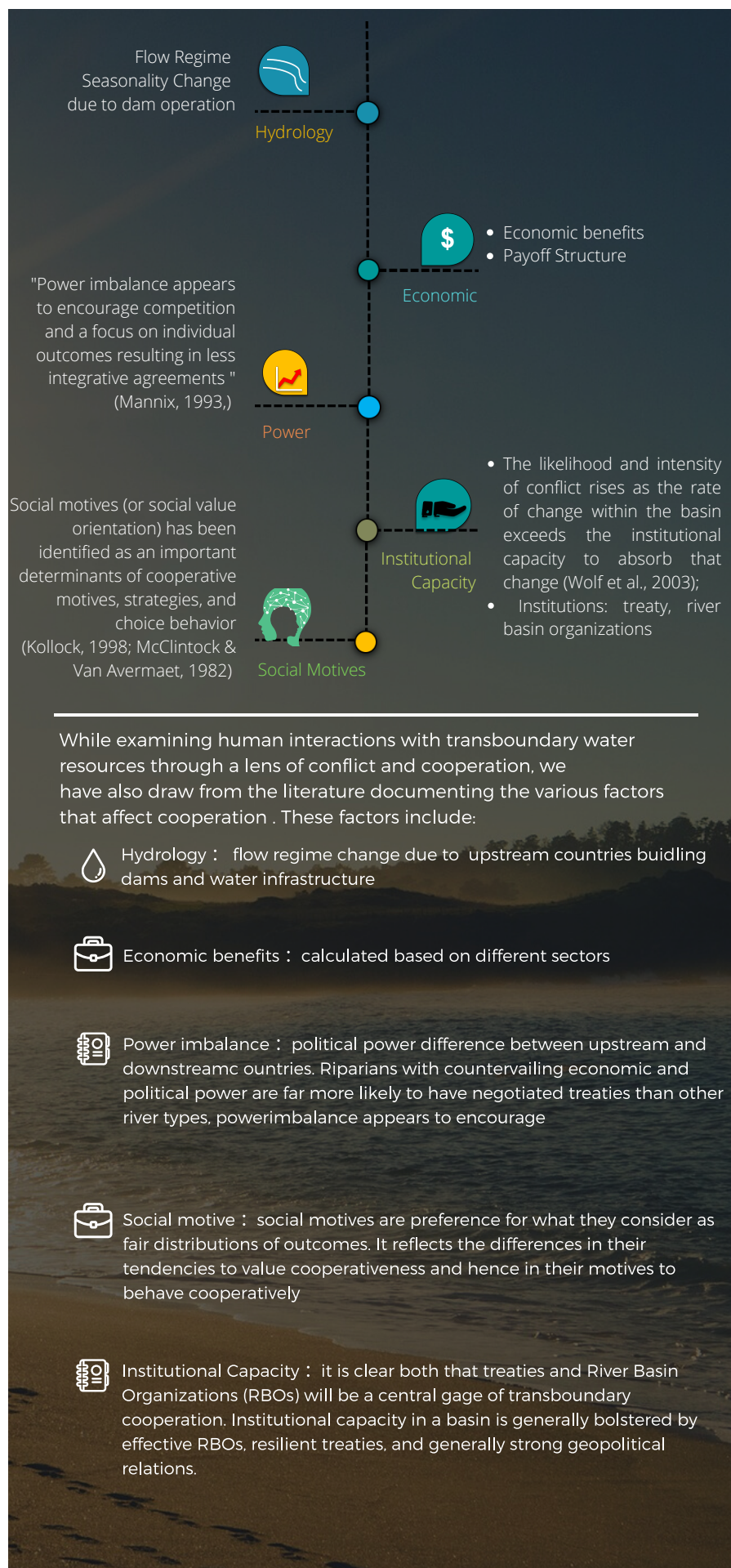
In parallel with these inventories providing global overview of transboundary tensions and cooperation, many authors have explored conflict resolution or cooperation management in transboundary basins, investigating factors such as water scarcity, climate change, level of democracy, existence of transboundary treaties/ river basin organizations, etc.

However, conflict-cooperation paradigm alone is insufficient for understanding the range of impacts from human interactions with transboundary water. It provide a simplified picture of the complex reality of disputes. Particularly, these scope and scales do not sufficiently capture causal links between conflicts/cooperation and factors potentially conducive to tensions over water.

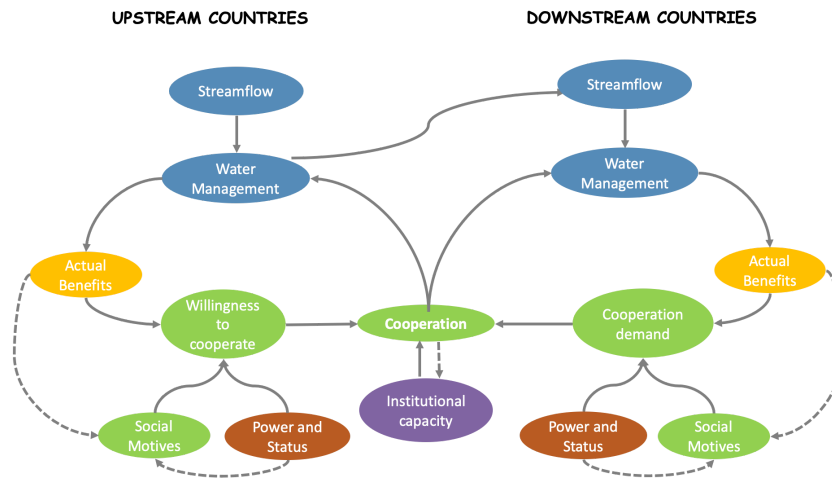
River riparian's are physically interdependent. The hydrology of an international river basin links all the riparian states, requiring them to share a complex network of environmental, economic, political and security interdependencies. Transboundary river is a sociohydrological system. Conflict and Cooperation: a dominated pattern emerging from dynamics of TR human-water system.

Therefore, sociohydrology can contribute to a better understanding of cooperative and noncooperative responses by interpreting them as outcomes of long-term coevolution of political, cultural, institutional, and socio-economic conditions of the actors involved (Pande&Ertsen,2014). It provides a coevolutionary view of hydrologic systems, revolving around feedbacks between environmental and social processes operating across different time scales

CONCEPTUAL FRAMEWORK

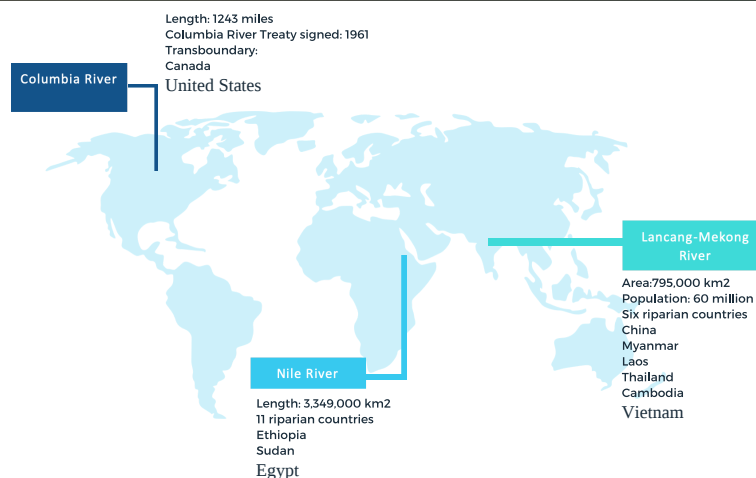


Conceptual framework is developed to understand the causal loop of the dynamics of cooperation between upstream and downstream countries



Conceptual framework start by simulating the discharge after dam operation and calculate benefit for upstream and downstream. Unhappiness and socio-economic driver for cooperation are calculated based on benefits of different sectors, and cooperation will change the dam operation rules and thus discharge. As a results of politics, hydrology and economics, we see a changing will ingness to cooperate

Case Study Area Three River Basins



We applied this conceptual framework to three river basins with across geographical locations and with different conflict and cooperation level. These three river basins are:

1. Columbia River Basin

The Columbia River Treaty is a key case of cooperation that has been used as an example of successful transboundary river management. Through the treaty, Canada maximized flood protection and, in turn, the U.S. maximized hydropower production. The countries shared equally the benefits gained through cooperation;

2. Mekong River Basin:

Construction and operation of mainstream hydropower dams in upstream countries after 2010 increased dry period flows and reduced flood peaks which affect fishery and agricultural benefits of downstream countries. Downstream countries expressed their concerns and the upstream countries changed the way to regulate reservoirs to share benefits with downstream countries and obtain indirect political benefits;

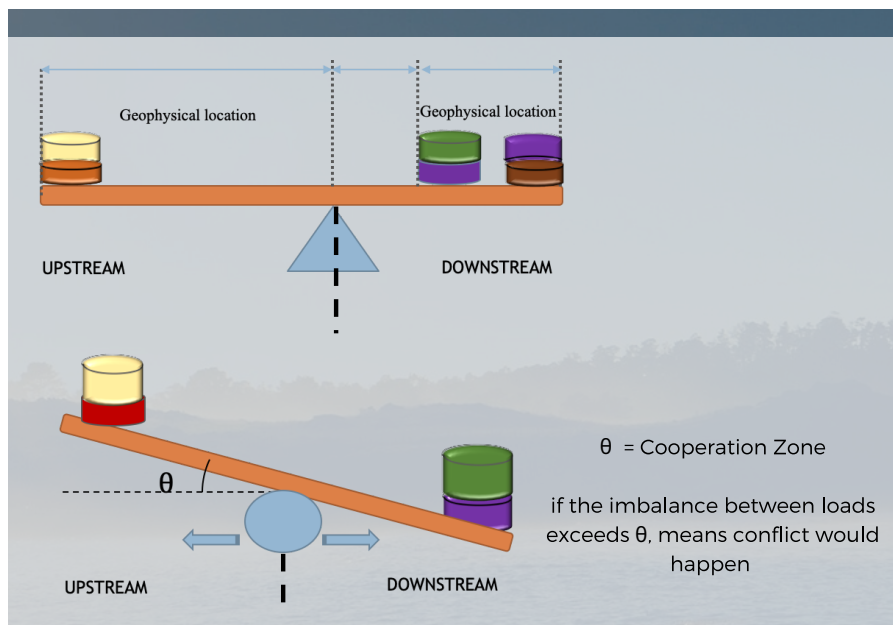
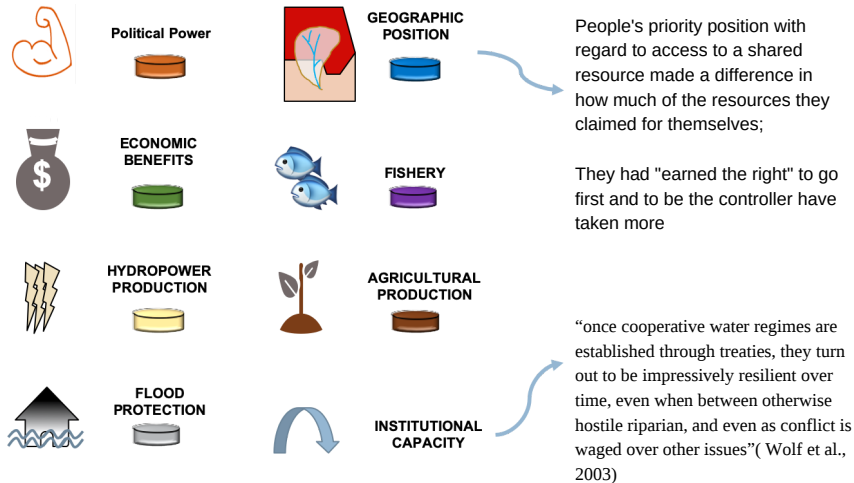
3. Nile River Basin:

Interaction of politics, hydrology and economics among Ethiopia, Sudan and Egypt have resulted in changing willingness to cooperate and a power balance shift from downstream to upstream

The Seesaw Effect In Transboundary River

Drawing from the sociohydrological models developed from the conceptual framework within the three river basins, seesaw effects have been observed in conflict and cooperation dynamics in transboundary rivers. Following illustration explain how it works:

The following types of loads can be obtained by each side:



Taking Nile River Basin as example:

