

- 1.4 billion people lack safe water access
- 2.4 billion people lack adequate sanitation
- 80% of diseases carried by water killing 5-7 million people annually

- Economic growth
- Food
- Electric power
- Social disruptions
- International relations
- Land rights

Willingness to
utilize political
collateral

Lower (**security**)

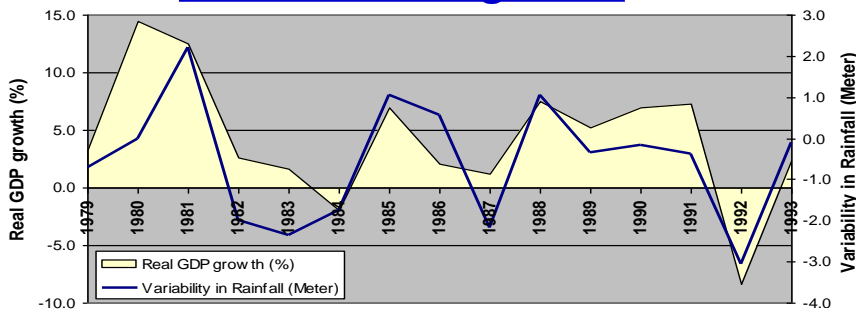
Higher (**Security**)

*“When one tugs at a single thing in nature, he finds it attached to the rest of the world.” – John Muir*¹

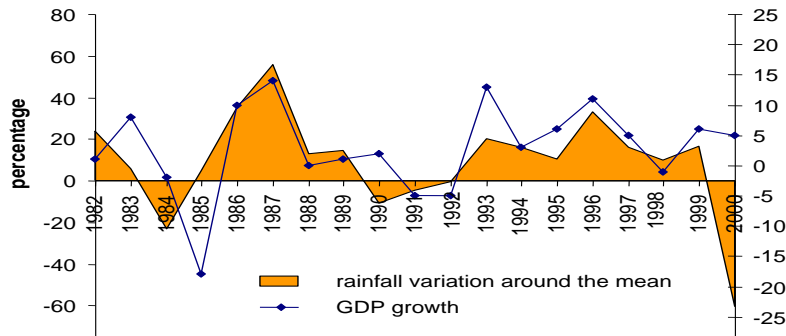
What is Water Security?

- **Water security** is the availability of water in the right amounts at the right times as it impacts **human security, national Security, and economic growth.**
 - Not all human security concerns rise to the national security level.
 - Water security may not be about water

Rainfall & GDP growth

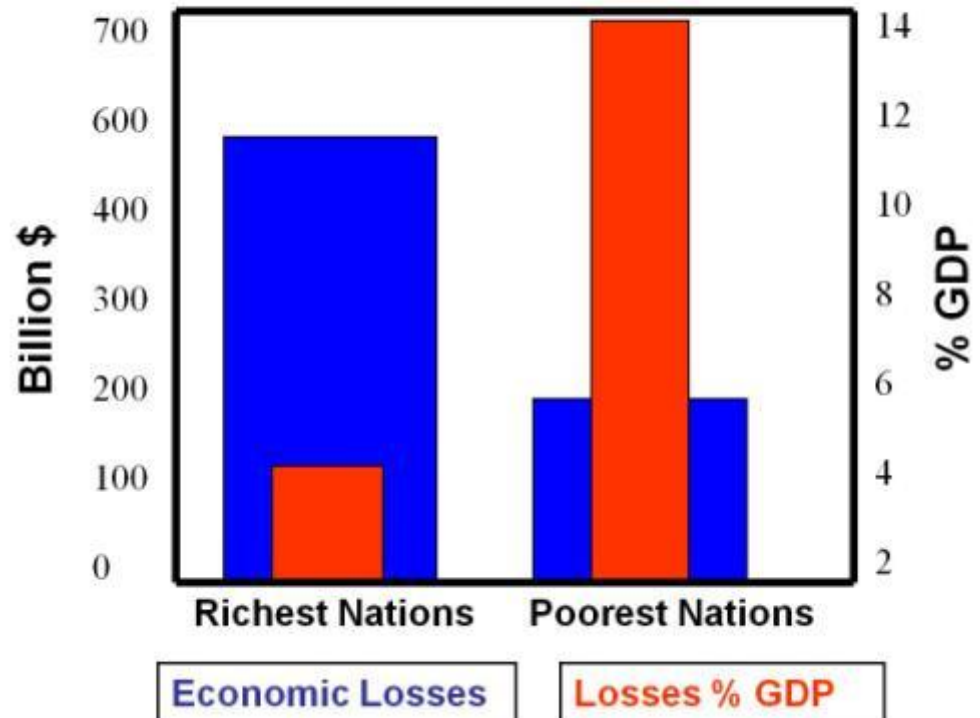


Zimbabwe 1978-1993



Ethiopia 1982-2000

Disasters Losses, Total and as Share of GDP
1985 – 99 (World Watch 2001)



Water and National Security

“The only matter that could take Egypt to war again is water.”

– Anwar Saddat, 1979

“The wars of the next century will be about water.”

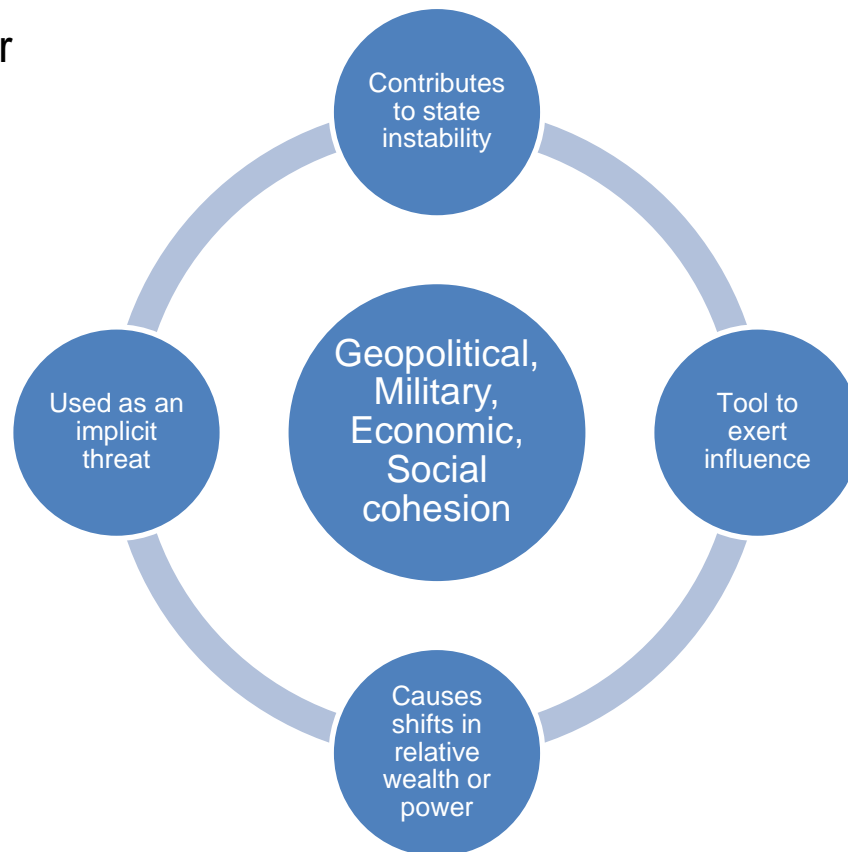
– Ismail Seageldin, Vice President, World Bank, 1995

The potential for wars fought over water is just one aspect of the national security side of water.

Water also shapes political behavior and regional security dynamics.

Water Wars are overblown;
‘Cold’ Water Wars are not...

- What impacts are significant?
 - Causes a noticeable, even if temporary, degradation in one of the elements of national power



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River

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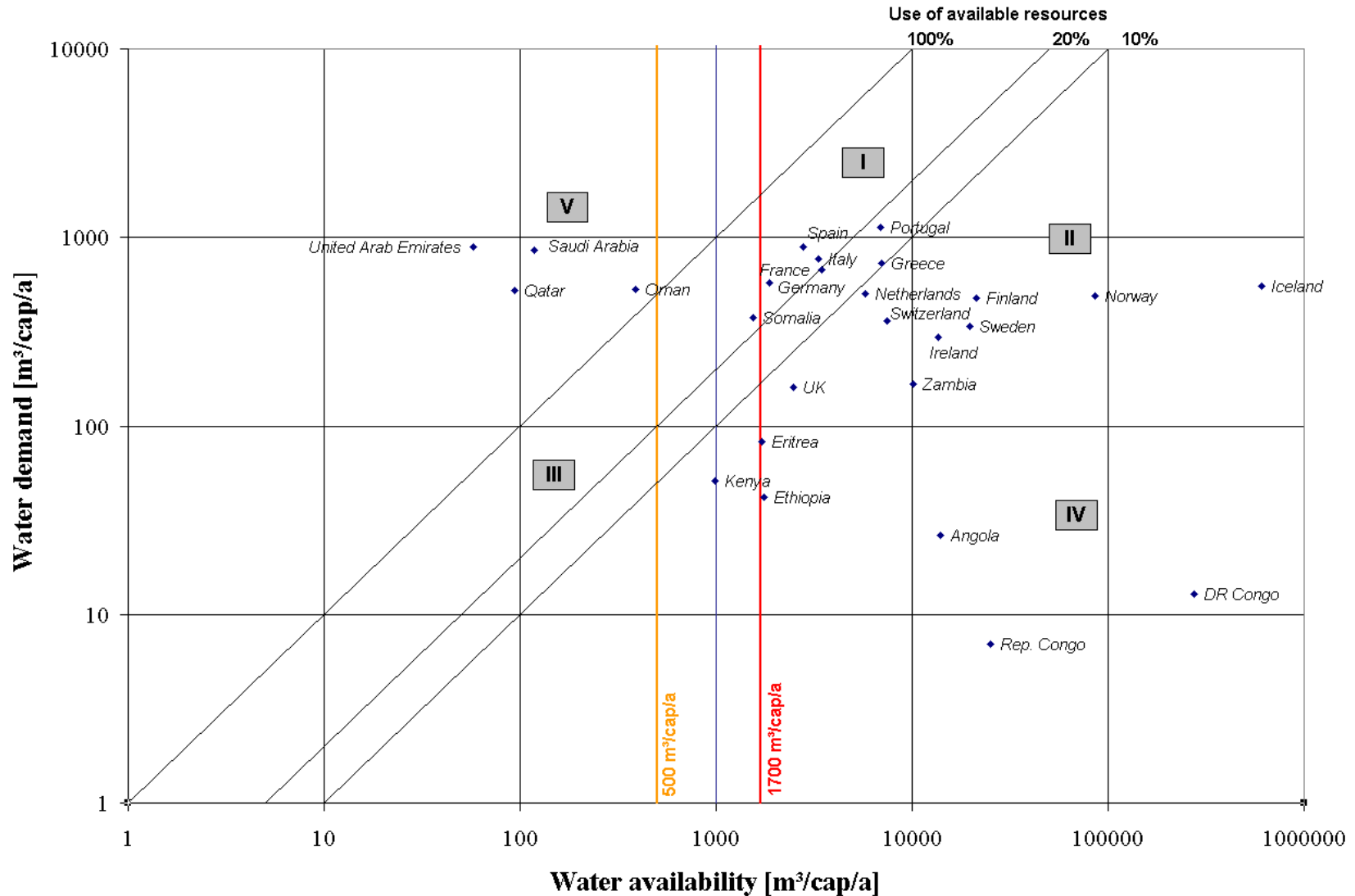
Political order

U.S. Policy and Water Security



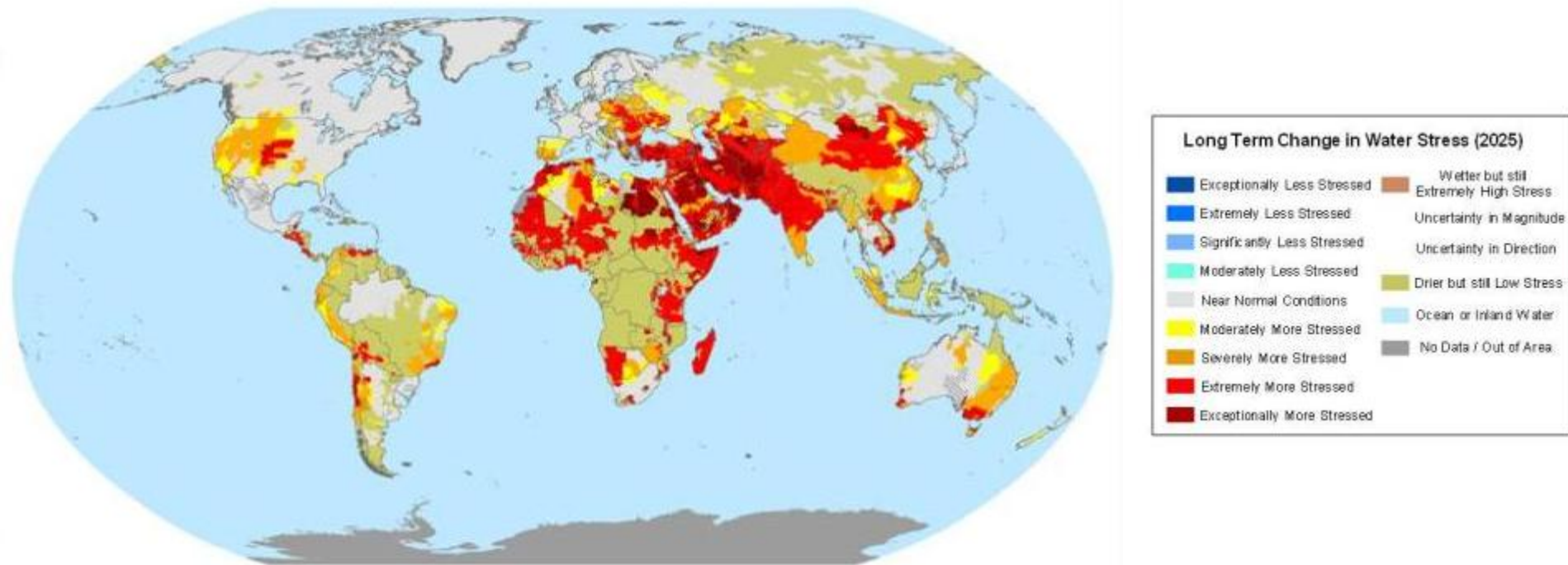
- *“Water security for us is a matter of economic security, human security, and national security, because we see potential for increasing unrest, conflicts, and instability over water. That is why I asked the National Intelligence Council to prepare an intelligence estimate on the national security implications of water security up to the year 2040.” Secretary of State Clinton World Water Day March 22, 2011.*
- *“President Obama and I recognize that water issues are integral to the success of many of our major foreign policy initiatives.” – Secretary of State Clinton, 2010*

Current Water Stress



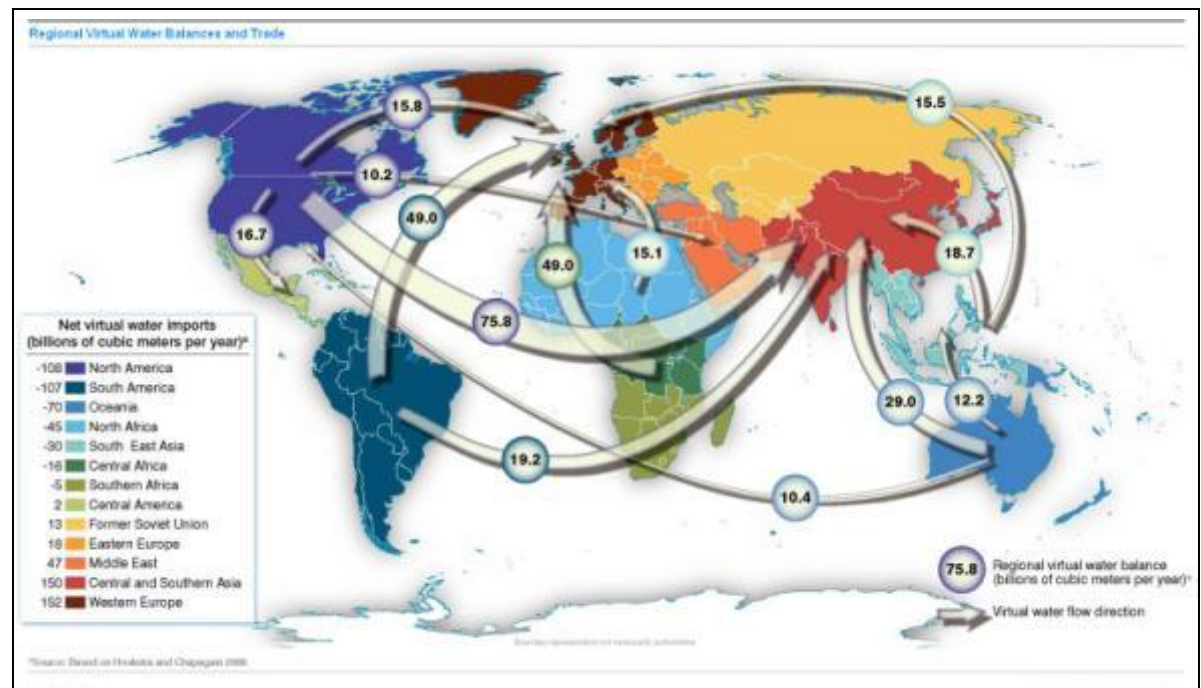
Future Water Stress

- World population projected to grow from 6.9 to 8 billion by 2025
- By 2030, global water requirements will exceed sustainable supplies by 40 percent
- More than one sixth of the world's population lives in glacier- or snowmelt-fed river basins which will be affected by a decrease in water volume later this century



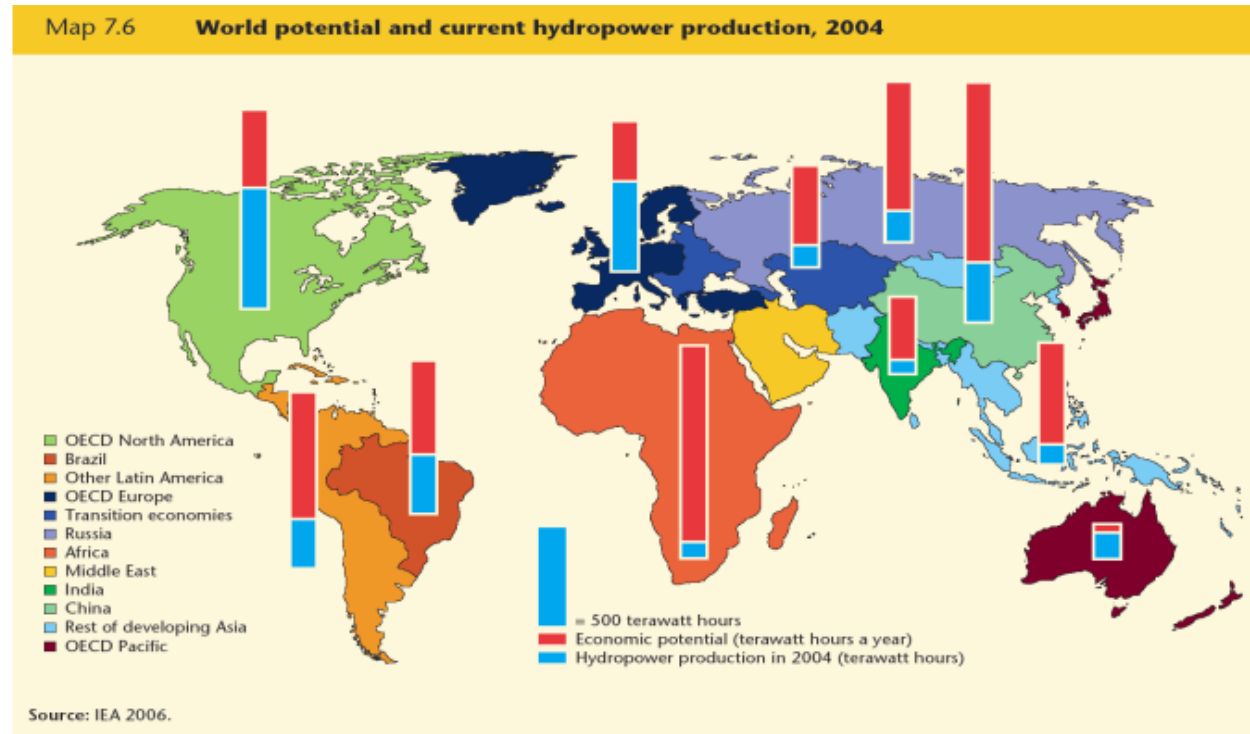
Water and Food

- 20% of irrigated lands are salt-laden
 - Losing irrigated land by 30% in 2025 and 50% by 2050
 - Agricultural water shortages can lead to less food and fewer jobs
- Higher standards of living lead to higher water consumption.
 - Water scarcity can be alleviated through import of water embedded in products like food, but also creates vulnerabilities to suppliers and the market.



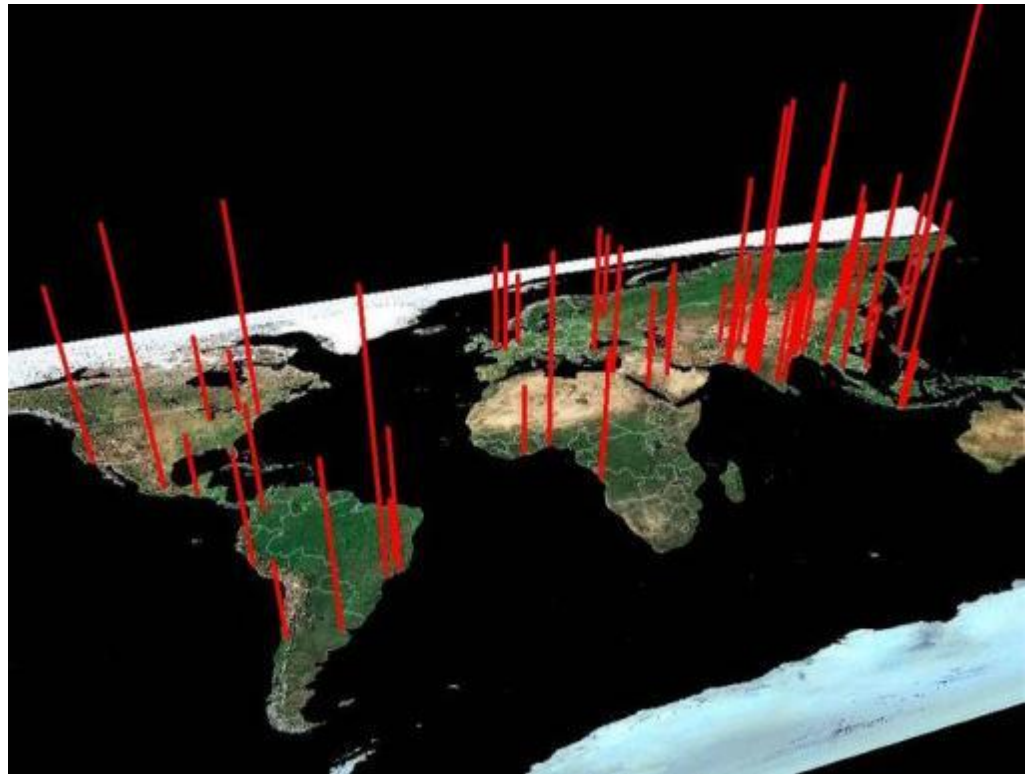
Water and Energy

- Thermal power plants depend on water availability
- Hydropower water losses through evaporation can exceed one million gallons per MWh
- Biofuels require significantly more water to produce than gasoline
- Power shortages can also create water shortages



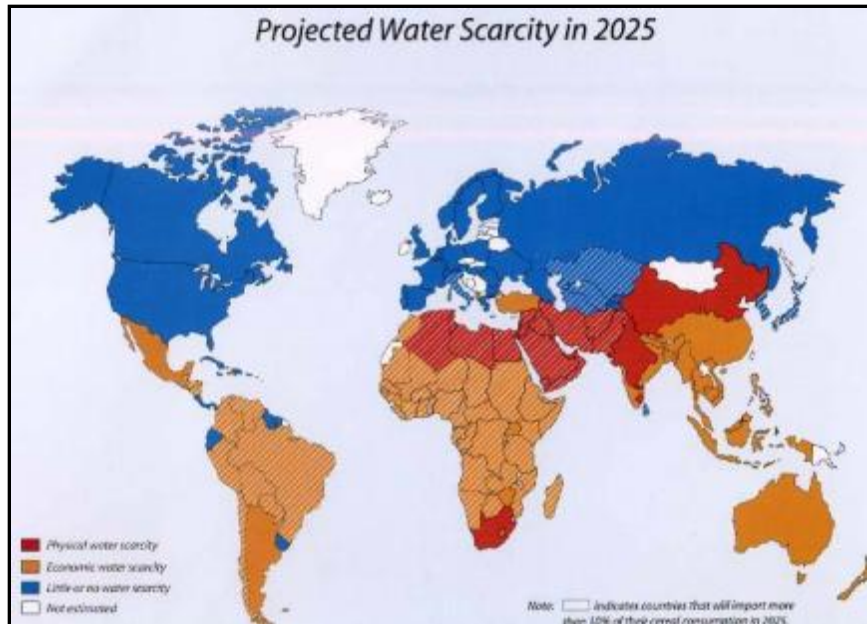
Growing Municipal Demands

- Rapidly growing cities constitute major centers of water demand for sanitation, industry, and hydroelectric power.
 - Cities can also constitute major sources of water loss and waste, with leakage rates reaching 30-50%.
-
- Urban population was 30% of total in 1950, 50% in 2005, and will be 60% in 2030



Resiliency of water treaties likely to be tested

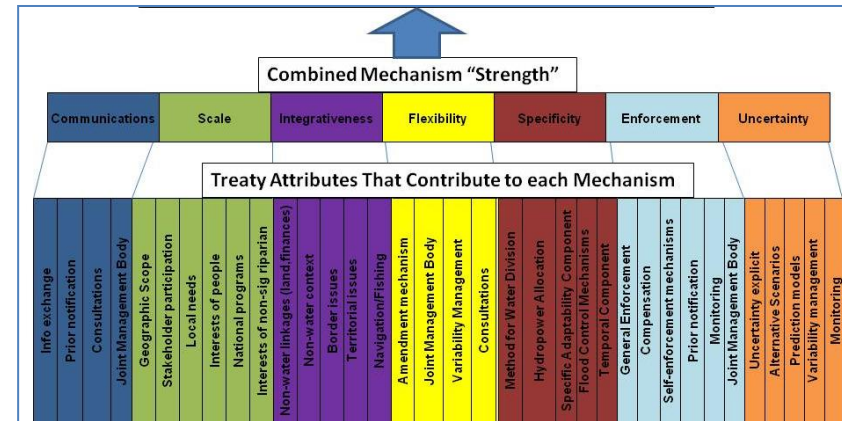
Some authors have predicted that treaties will fail, with potentially profound political-economic consequences.



“Climate changes will inevitably affect water resources around the world, altering water availability, quality, and the management of infrastructure. New disputes are already arising in transboundary watersheds and are likely to become more common. The existing agreements and international principles for sharing water will not adequately handle the strain of future pressures, particularly those caused by climate change.” Peter Gleick

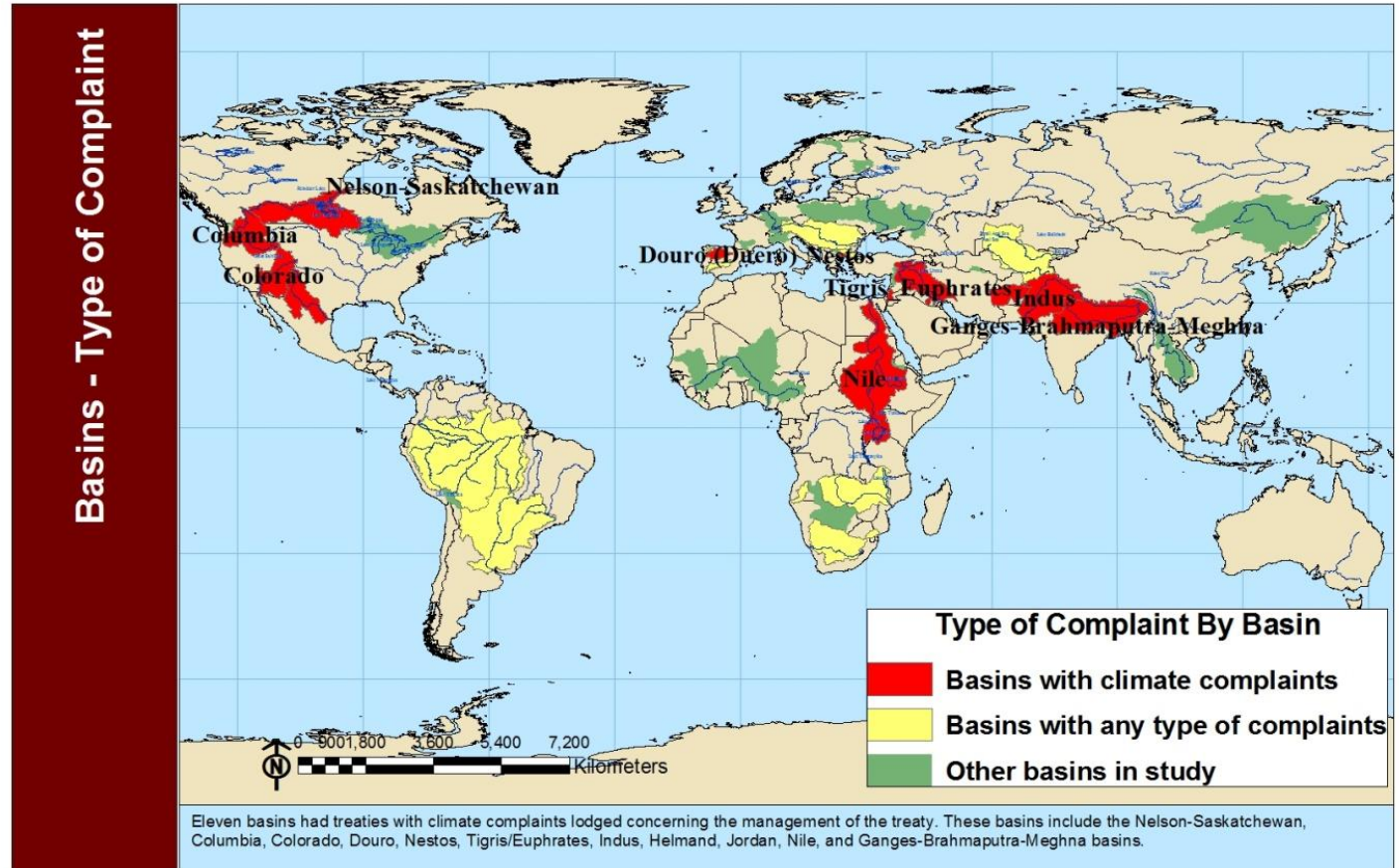
Measuring/observing treaty parameters

Mechanism	Purpose	Practical Application/ Components	Number of times mentioned in literature	Ranking of relative importance
Communications	Increase the contact and data sharing between parties to increase compliance and cooperation	Information exchange	25	1
		Establish meetings schedule/protocol		
		Data validation		
Flexibility	Manage changes in the water flow/availability or in the existing political framework.	Treaty amendment mechanisms that can be applied in times of rapid change	20	2
		Managerial tools to recognize and plan for variability		
		Communications mechanisms for observing and relaying change		
Specificity	Provide precise rules and procedures to structure the participant's actions	Guidance for implementation of the treaty; Crisis response to and mitigation of drought/flood	13	3
		Confirm locations and measurement methods for increased data accuracy		
		Illustrates benefits/requirements outside of water (hydropower, etc)		
Integrativeness	Increase the cross-scale and cross-topic cooperation the treaty addresses	Non-water exchanges or concessions linked to water issues	12	4
		Integrated view of total environmental sphere		
		Requirements of larger political issues		
Enforcement	Provide leverage and protocols to influence adherence to the treaty	Resolution mechanism and procedures for disputes	12	4
		Communication requirements for alterations to basin		
		Equitable joint management bodies that can exert influence. Provides commissioners with guidance during tension.		
Scale	Provide policy direction for regional, national, and local management	Enhance public participation	11	6
		Include needs of all stakeholders/non-signatory riparians		
		Incorporate national programs		
Uncertainty	Recognize and plan for the possibility that available data may not accurately reflect current conditions or that the future may be very different from the current environment	Alternative scenarios to increase preparedness	4	7
		Application of prediction models		
		Variability management for periods of flood/drought		

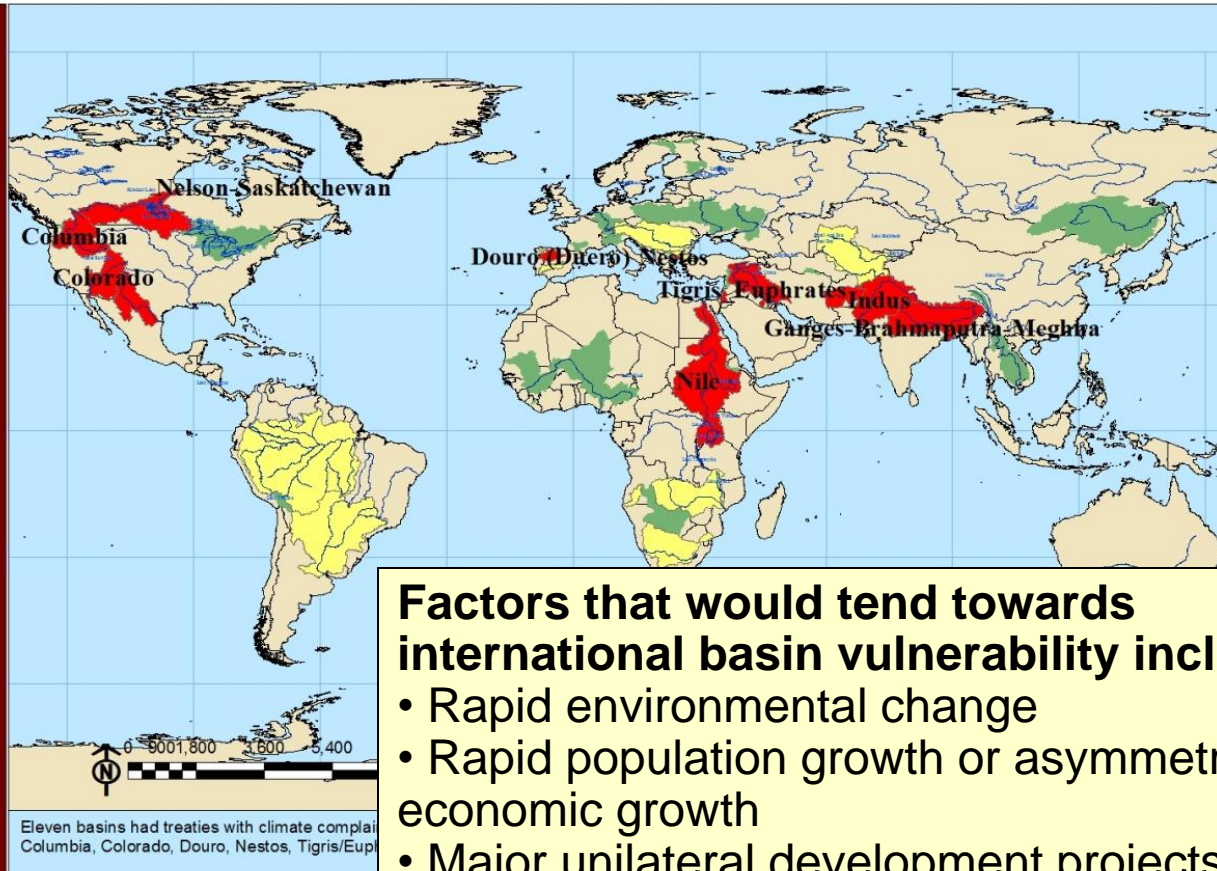


146 treaties ⇒ 100 categories ⇒ 35 components ⇒ 7 mechanisms

- A total of **388** complaints were then evaluated to determine if it originated from flow variability/changes.
- A total of **85** events were classified as 'climate complaints'.
- Conflict events other than those that originated from flow variability or climate were classified as 'any type of complaint'.



Basins - Type of Complaint



Factors that would tend towards international basin vulnerability include:

- Rapid environmental change
- Rapid population growth or asymmetric economic growth
- Major unilateral development projects, such as dams
- “Internationalization” of a basin

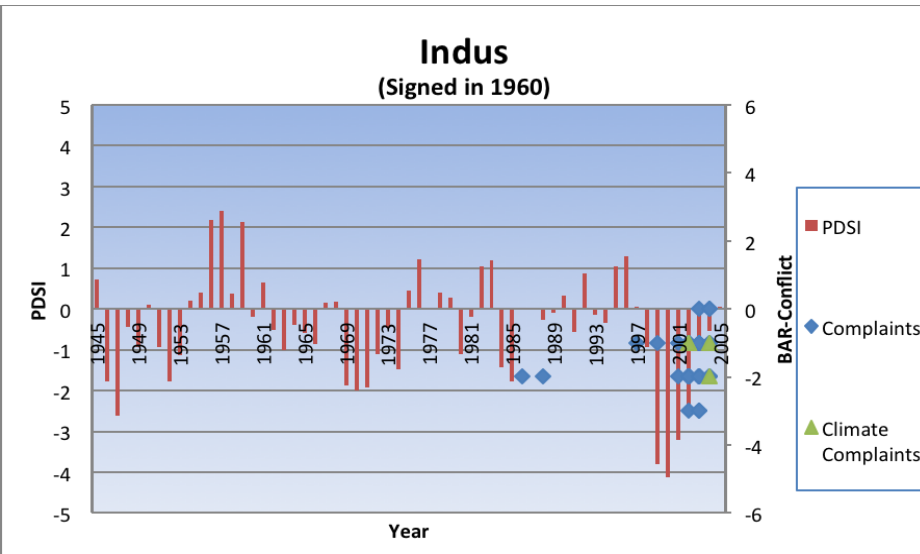
“Perceptions of a rapidly changing environment may cause nations to take unilateral actions to secure resource, territory, and other interests.” – NIC, Global Trends 2025

Indus Water Treaty (1960)



- Indus water critical to Pakistani agriculture, EP, employment, income
 - Unique application in dividing rivers
- ## Stresses
- Variable rainfall
 - Rapid population expansion
 - Receding glaciers
 - Soil salination
 - Groundwater overpumping
 - Increased development
 - Afghanistan development (not party ;12% contribution via Kabul River)

Complaints and Current Issues



The treaty has weathered at least 109 water-related complaints, only four of which were pertaining to changes in climate

Sub-national issues

- Lack of trust between provinces
- Kalabagh dam on the Indus River in Sindh province

Trans-national Issues:

- Accusations of Indian flow manipulation
- Afghanistan and Indian development projects
- Water tied to land/Kashmir: Escalating disputes over development since 1999 threatens peace
- Public opinion on both sides hardening

Baglihar, Neelum-Jhelum, and Kishenganga Dams

- Baglihar first time to use neutral expert in 2008
- Pakistan initiated the formal arbitration process regarding India's Kishanganga Dam hydroelectric and diversion project along the Kishanganga River
- Court of Arbitration for Kishenganga; highest level, never before used clause of IWT.



Baglihar Dam

- US \$1 billion, 450MW Baglihar Dam on the Chenab
- Proposed in 1992
- Pakistan formally requests neutral expert in 2005
- Dr. Raymond Lafitte, was appointed as the Neutral Expert in May 2005 and provided his ruling in February 2007
- India finished first phase in Aug 2008 ; functionally complete
- Reservoir filled
 - *“Baglihar Dam cleared by neutral expert, and stating that the overall design of the Baglihar dam being built by India on the Chenab as a run-of-river plant ‘has been upheld by Prof. Raymond Lafitte, (Embassy of India Washington DC, 2007)*
 - *“World Bank validates Pakistan stand on Baglihar Dam’, followed by a pronouncement that Lafitte had ‘made it clear in (his) verdict that India has been found guilty of breaching the Indus Water treaty of 1960’ ”(PakTribune, 2007).*



Ability to impound water limited by terrain (700m wide at dam, 400m upstream)



Kishenganga -India

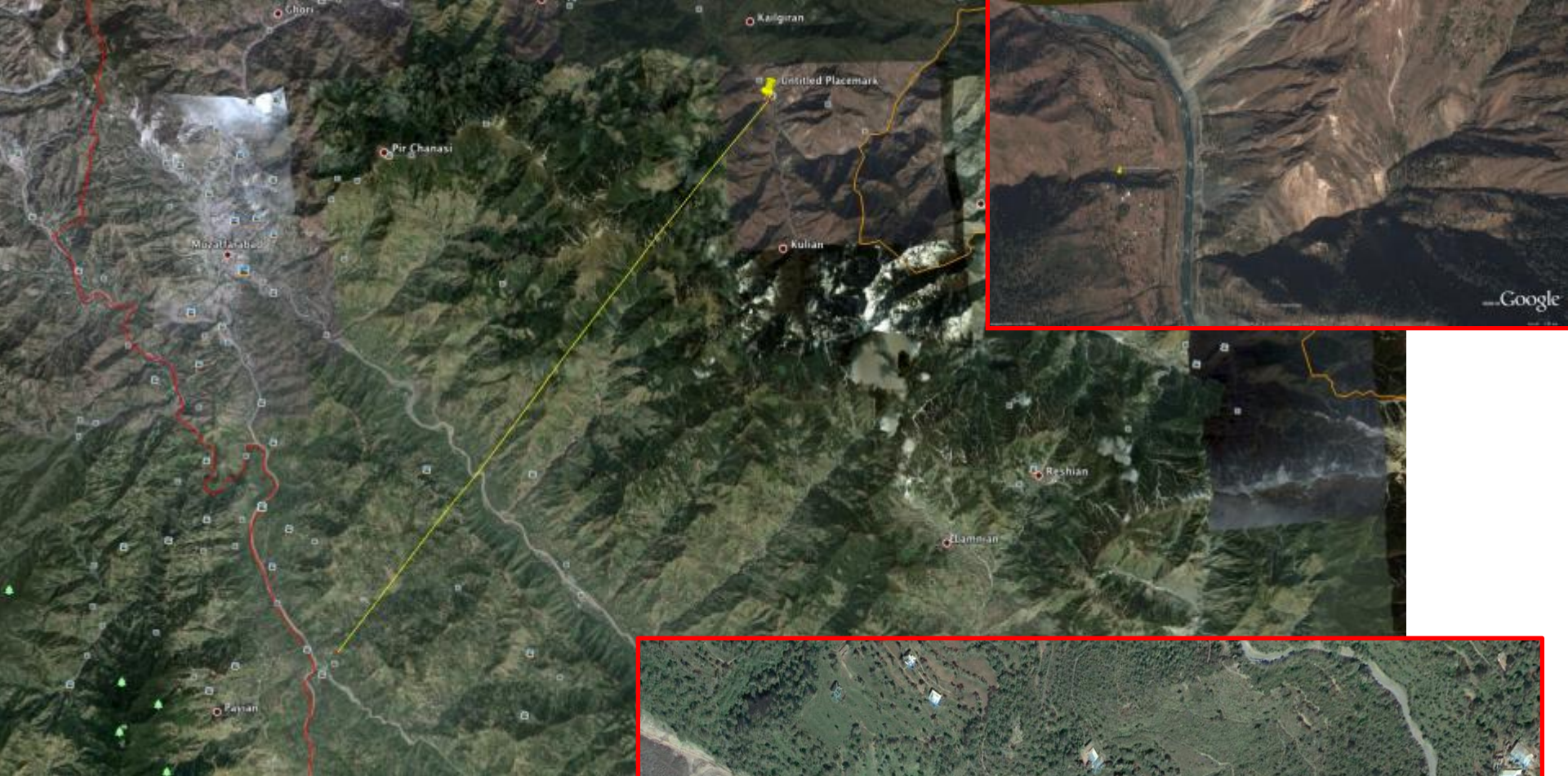
- 330 MW project
- Dam intended to divert to Wullar lake via 27 km tunnel before flowing into Jhelum
- Visited by WB/Arbitration group in June
- Likely to be completed in 2014



Neelum Jhelum Dam



- 969-megawatt (MW) projected to be completed by 2016, but maybe sooner (new drilling technology)
- The total cost of the project is \$2 billion
- Early stages of construction
- Head race tunnel is 28.5 Km



Neelum Jhelum Pakistan

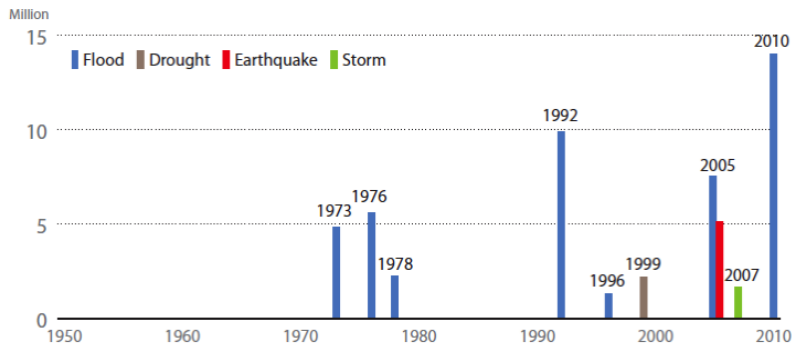
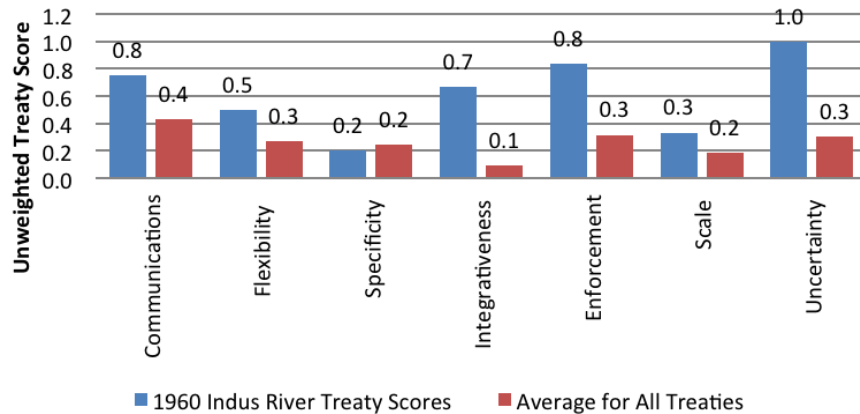


Indus Basin Summary

The IWT is strong and efficient for relations between the India and Pakistan, but may be hampered by the lack of *scale* components that include local stakeholders and other relevant nations.

- Domestic problems exacerbate international problems
- Perceptions and overall relations drive water issues
- Limited mechanisms for managing flooding
- Generally models indicate precipitation increases, but will be overwhelmed by diminished meltwater from snow and glaciers that will ultimately result in significant flow decreases by the end of this century.

**1960 Indus River Literature Review
Treaty Score**

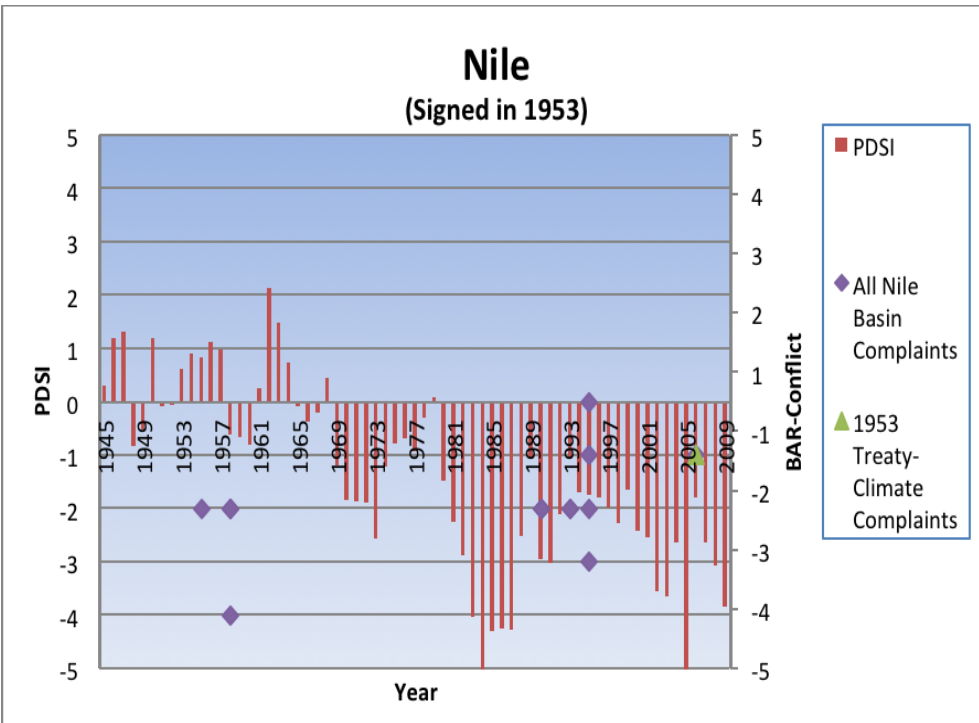


Nile Treaty(1959)



- 75 percent of the waters to Egypt (55.5 billion cubic meters (BCM)) and 25 percent to Sudan (18.5 BCM).
- Treaty refers to “full utilization” and “full control of the river”.
- Egypt’s position is that any alteration of the existing treaty must be accomplished through the treaty protocols and with the consent of all parties
- Egypt references its “natural and historic rights” and any efforts to minimize the treaty by its “involuntary signatories” can be considered an attack on “inviolable Egyptian rights”

Complaints and Current Issues



Thomas Homer-Dixon --- 'conflict is most probable when a downstream riparian is highly dependent on river water and is militarily and economically strong in comparison to upstream riparians.'

No provisions for non-signatory nations to exploit Nile waters without Cairo's permission...

In 1999, nine riparians (with Eritrea in observer status) created the Nile Basin Initiative (NBI)

The treaty/basin has had 12 complaints, only one related to climate/flows.

Nile Stresses

- Cooperative Framework Agreement
- South Sudan--Jonglei canal (70% finished)
- Food: Global change in food security---2009/2010
 - Ethiopia plans to lease 3 million hectares, an area about the size of Belgium, to private investors over the next 2 ½ years
 - Saudi group plans to invest \$2.5 billion by 2020 developing a rice-farming project in Ethiopia.
- Development: Millenium Dam
- Arab Spring, new government/Nile views in Egypt
- Doubling of population from 1995-2025

Cooperative Framework Agreement

- Designed to replace the NBI, could be at odds with 1959 treaty
- Ethiopia, Burundi, Kenya, Rwanda, Tanzania and Uganda signed; could take years to ratify
- CFA does not include volumetric water allocations, but principles of international law; Egypt wants rights explicitly maintained
- CFA could give upstream nations standing and legal justification to gain NGO funding
- All nine NBI countries seem to agree that a peaceful solution would allow international funds for development to be released once a legal framework is in place
- Donor support for the NBI is set to expire in 2012

Border Dam/Project X/Millennium/Renaissance

10th largest dam in world

US\$4.8 billion, more than 15% of Ethiopia's GDP

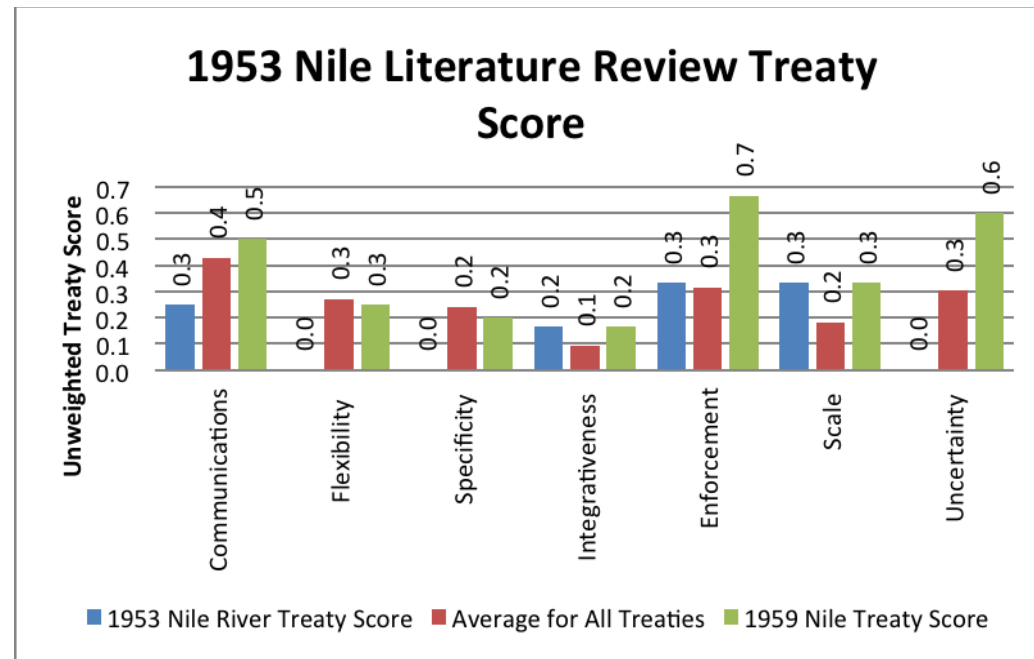
63 BCM reservoir (twice the size of Lake Tana)

5.25 gigawatts, plan to increase electricity supply fivefold by 2015



Nile Treaty Strength Summary

- Lacks a provision for amendment and a mechanism for solving differences
- *Scale* of primary importance in the 1959 Nile Basin Treaty since no riparians other than Egypt and Sudan are explicitly considered
- *Integrativeness*- factors outside of those specific to the scope of the treaty were primary most complaints
- No countries are projected to have an increase in variability by 2030 and only four (Sudan, Uganda, Central African Republic, and Democratic Republic of Congo) are projected to have increased variability by 2050.



Conclusions

1. Water much part of larger security picture
2. The importance of the treaty to each country is in part shaped by the treaty itself.
3. Not all conflict is bad and not all cooperation is necessarily good, with cooperation and conflict sometimes coexisting.
4. Solutions are often static; problems are not

