

¿TRANSBOUNDARY AQUIFER OR TRANSBOUNDARY GW?

Convention on the Protection and Use of Transboundary Watercourses and International Lakes
(UNECE Water Convention 1992)

- Groundwater can be transboundary, if it can be verified.



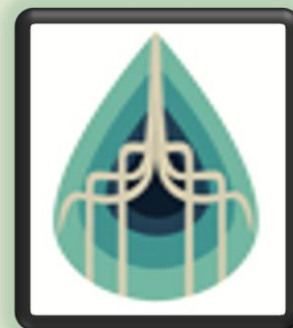
Convention on the Law of the Non-navigational Uses of International Watercourses
(UN Watercourses Convention 1997)

- Transboundary aquifers are only unconfined. Groundwater and surface water are a single physical unit.

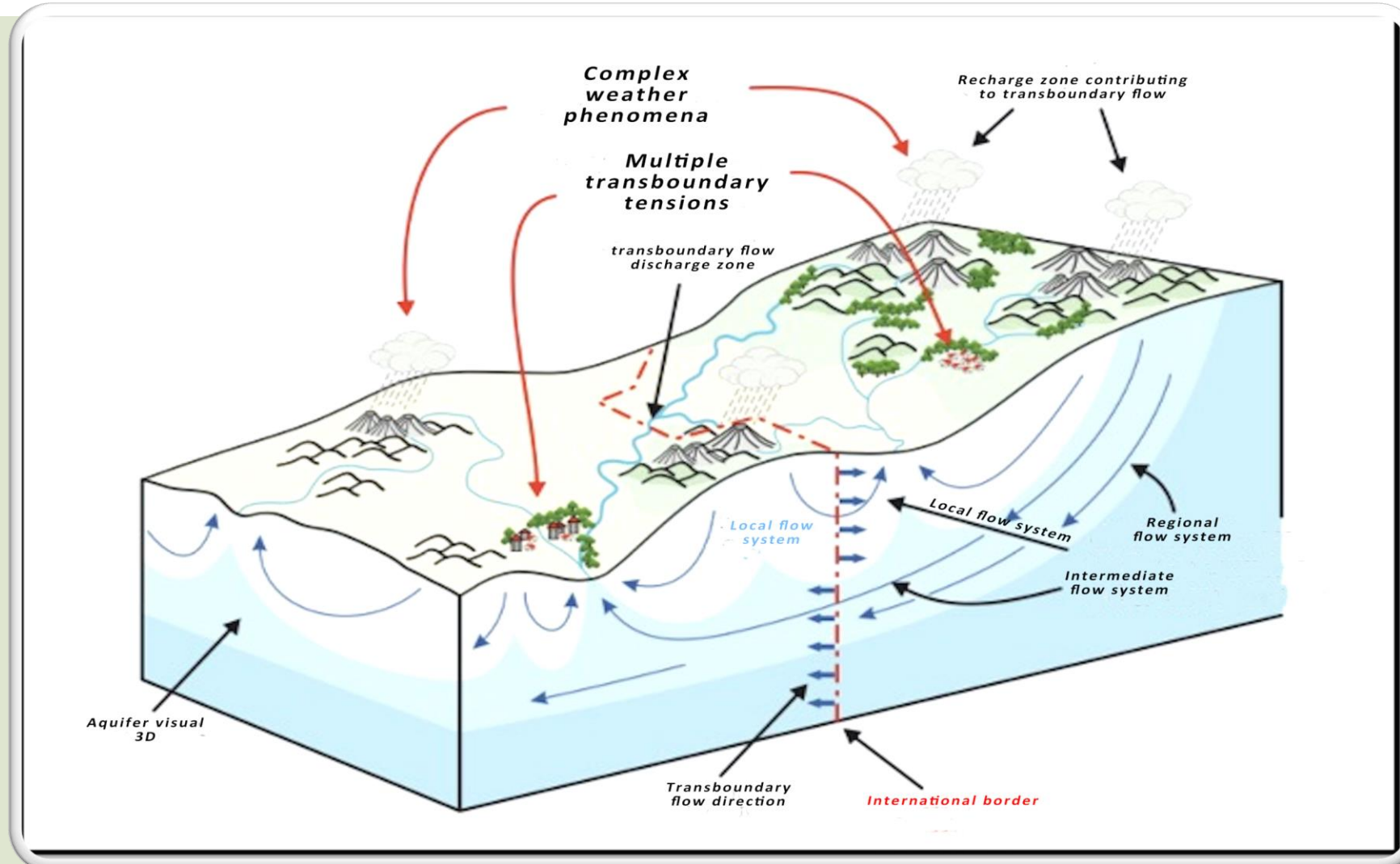


The Law of Transboundary Aquifers
(UN 2008)

- Permeable water-bearing geological formation located on a less permeable layer, and the water contained in the saturated zone of the formation, which can be hydraulically related to other aquifers, forming a Transboundary Aquifer System which, due to its geological extension, can have different parts located in different states



TRANSBOUNDARY REGIONAL HYDROLOGICAL SYSTEM (ADAPTED FROM UNESCO-PHI, 2015)

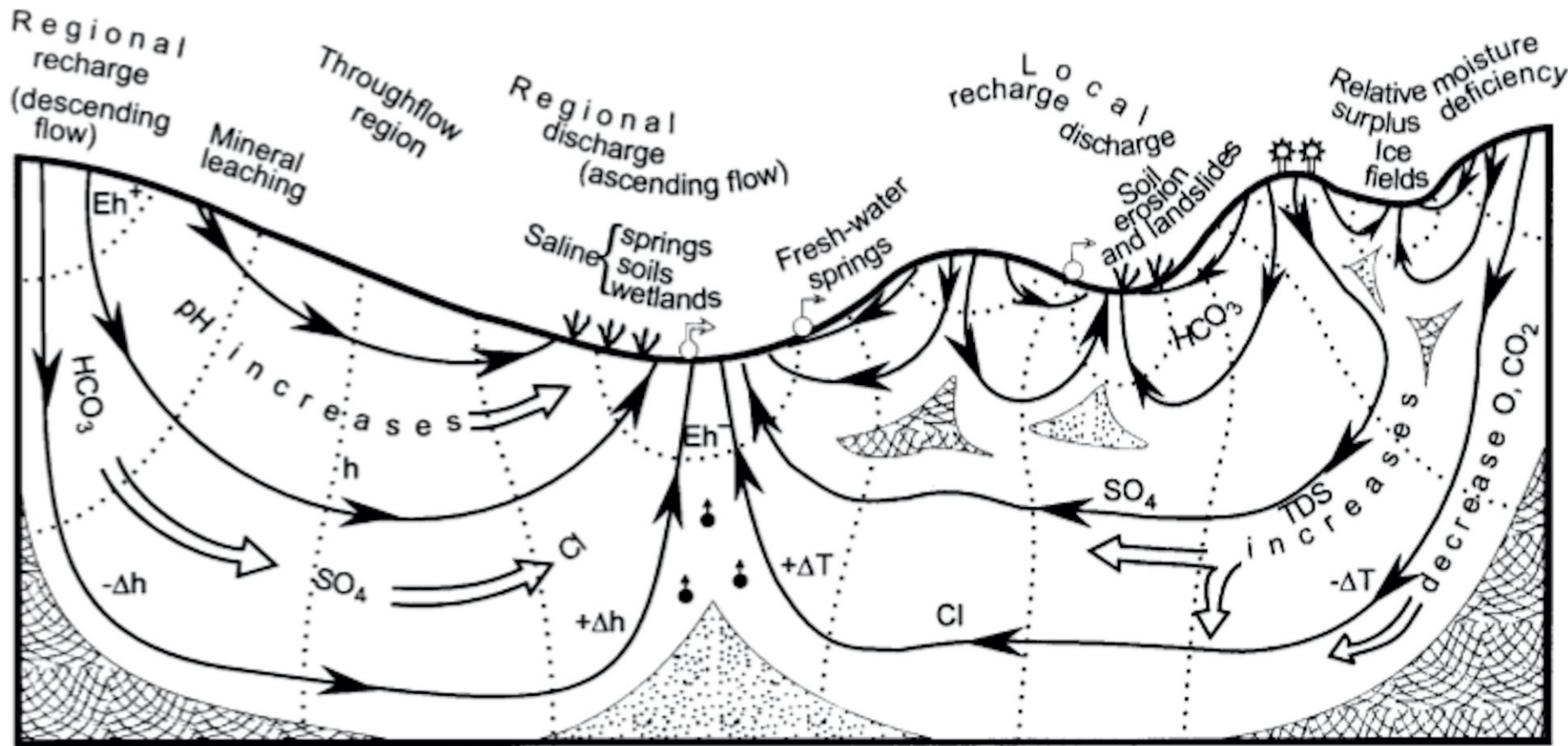


¿TRANSBOUNDARY AQUIFER OR TRANSBOUNDARY GW? U.S.-MEXICO BORDER AREA SITUATION

Concept	State	Legal definition
Aquifer	Arizona (USA)	Means a geological formation that contains sufficient saturated materials to be capable of storing water and transmitting water in usable quantities to a well. Source: Arizona Revised Statutes
	California (USA)	Means a geological formation or structure that transmits water in sufficient quantities to supply pumping wells or springs. Source: California Water Code
	New Mexico (USA)	Means a geological formation that contains sufficient saturated material to be capable of storing and transmitting water in usable quantities to a well. Source: New Mexico Statutes Chapter 72, Water Law
	Texas (USA)	Geological formation, group of formations, or portion of a formation capable of yielding significant quantities of groundwater to wells or springs. Source: Texas Administrative Code.
	Mexico	Any geological formation or set of formations hydraulically connected to each other, through which water circulates or is stored water can be extracted for usage and exploitation and whose lateral and vertical limits are conventionally defined for purposes of evaluation, management and administration of the national waters in the subsoil. Source: Ley de Aguas Nacionales Mexicana
	Groundwater	Arizona (USA)
California (USA)		Water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water. Source: California Sustainable Groundwater Act.
New Mexico (USA)		This concept does not exist in the law.
Texas (USA)		Water percolating below the surface of the earth. Source: Texas Administrative Code
Mexico		This concept is not defined in law.

WATER DYNAMICS IN THE HYDROLOGICAL CYCLE: ACCURACY

Groundwater Flow Systems by Tóth (1999).



EXPLANATION

- Line of equal hydraulic head
- Flow line
- Spring: cold, warm
- Phreatophytes
- Xerophytes
- Redox conditions:
 oxidizing
 reducing

- Hydraulic heads:
 subhydrostatic
 hydrostatic
 superhydrostatic
- Hydraulic trap: convergence and accumulation of transported matter and heat
- Quasi-stagnant zone: increased TDS

MEXICO-U.S., TRANSBOUNDARY GW MANAGEMENT:

- Who will assess the systemic functioning of Transboundary GW? (Universities, federal or state agencies, private sector?).
- Official recognition of **scientific evidence**: strengthen transboundary water management institutions (CILA/IBWC).
- **Official recognize the groundwater as a transboundary international watercourse.**
- **Scientific homologation of methodologies and legal concepts on U.S.-Mexico border.**

AGREEMENT BETWEEN THE UNITED STATES OF AMERICA AND THE UNITED MEXICAN STATES ON COOPERATION FOR THE PROTECTION AND IMPROVEMENT OF THE ENVIRONMENT IN THE BORDER AREA
LA PAZ AGREEMENT (1983)

Article 4:

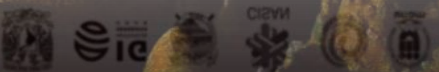
For the purposes of this Agreement, it shall be understood that the "border area" refers to the area situated 100 kilometers on either side of the inland and maritime boundaries between the Parties.

WHERE?

TOWARDS HOMOLOGATION OF NEW SCIENTIFIC-LEGAL MEXICO-US. GW CONCEPTS

Legal concept	Definition
Groundwater	Water that occupies the porous, conduits, or fractured space of sediments and rocks in below the surface, product of the infiltration rainwater (which depends on the conditions of the climate, soil and vegetation); also the water that rises to the surface feeding streams, rivers, ecosystems, springs, sea and wetlands.
Aquifer	The geological referent in which groundwater moves and whose properties (porosity, storage coefficient and hydraulic conductivity –permeability-) favor the one-time stored volume and groundwater movement.
Groundwater Flow Patterns	<p>Groundwater flow is generated by gravitational forces through elevation differences on the water table, whereas the flow patterns develop in local, intermediate and regional systems, modified by the permeability heterogeneities in subsoil rocks. The topography has a ubiquitous effect on these patterns causing its movement at greater depths.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Local systems have lower temperature, pH and salinity, and the residence time is from months to a few years. <input type="checkbox"/> Regional systems have high pH, temperature and salinity, their time of residence is of thousands of years. <input type="checkbox"/> Intermediate flows have an extension limited by the convergence of at least two regional systems.
Groundwater interactions with aquifer and flow patterns are of the types	<ul style="list-style-type: none"> (i) physically controlled by Darcy's Law; (ii) chemical, water quality due to the dissolution of the minerals in subsoil rocks; (iii) isotopic, due to the elevation recharge zones and their age or residence (time) in the sub-soil and (iv) biological, due to its interaction with ecosystems, which are manifestly contrasted in the discharge, transit and recharge zones of each flow pattern.

*Ley del Agua Subterránea:
una propuesta*

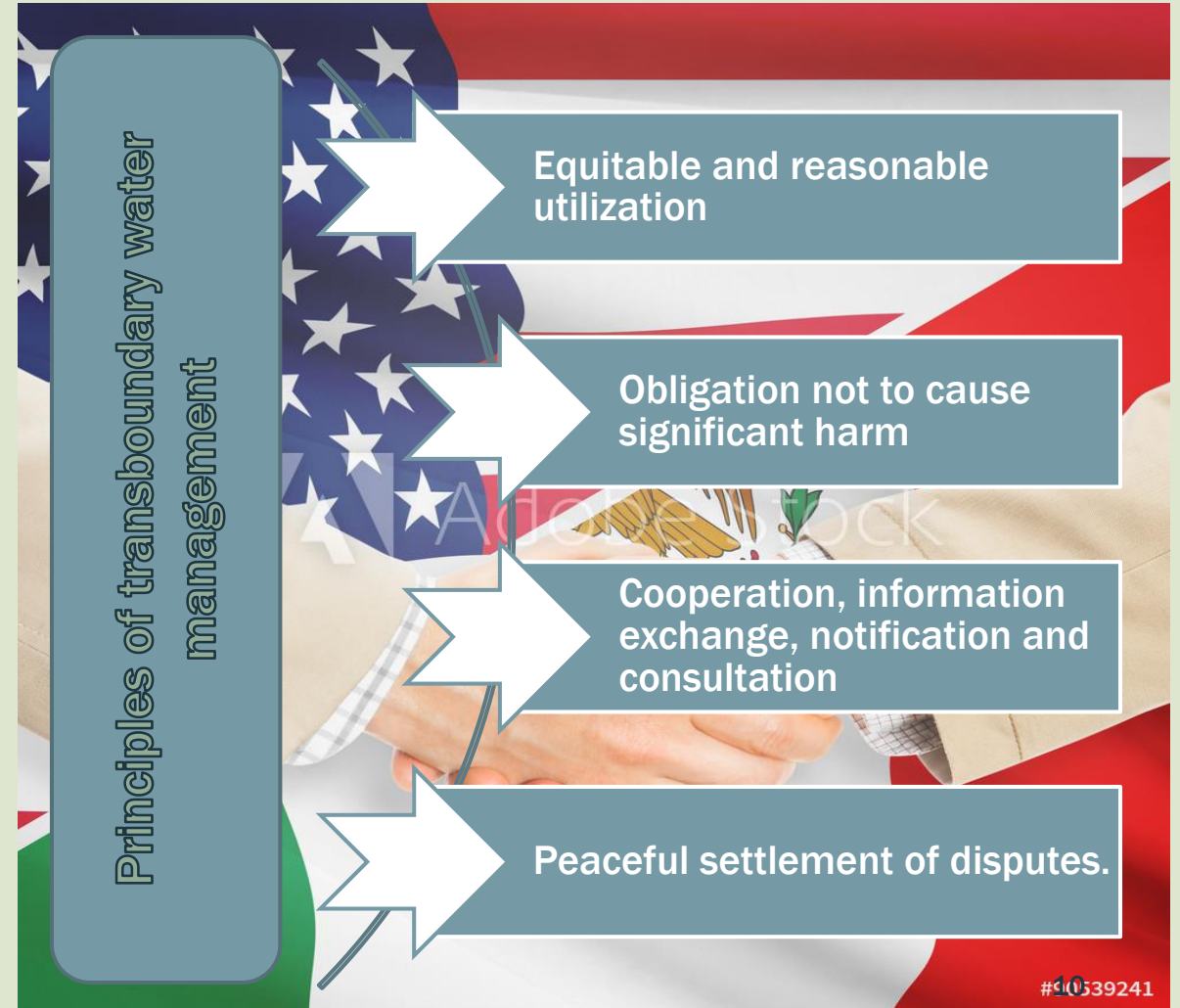


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REGULATORY FRAMEWORK TRANSBOUNDARY GW MEXICO-U.S.

It is necessary to strengthen the binational institutions for:

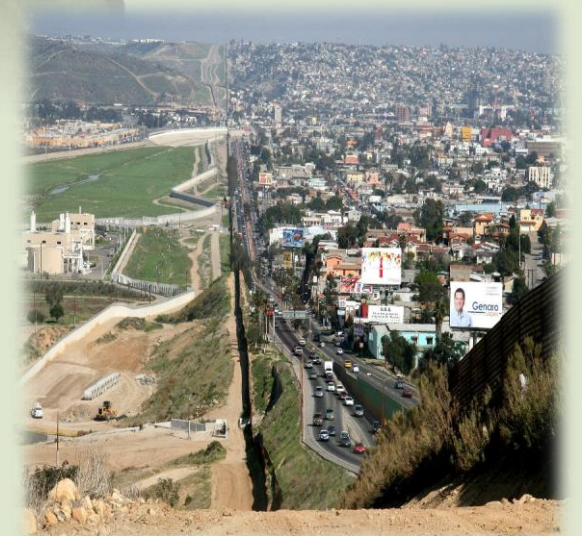
1. Execute plans, programs and any other sectoral planning instrument applicable to the joint management of transboundary groundwater.
2. Identify economic and financial resources for the program execution.
3. Organize and coordinate the mechanisms for homologation, comparison, validation and exchange of information.
4. Organize and coordinate public participation and their mechanisms for the program readiness.



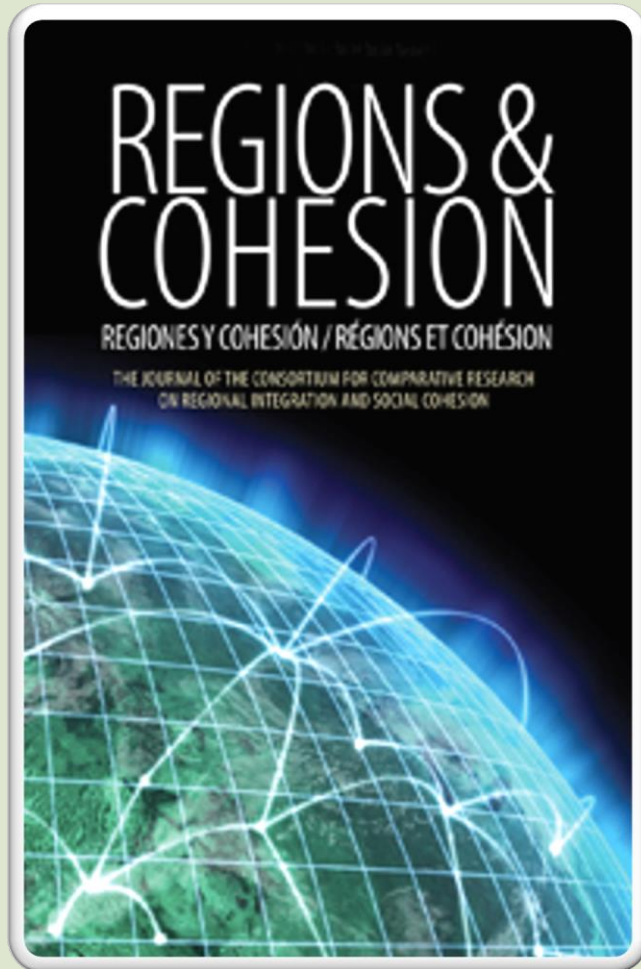
REGULATORY FRAMEWORK TRANSBOUNDARY GW MEXICO-U.S.

What key aspects of groundwater need to be monitored and managed together?

1. Well census with its construction type, levels and use.
2. Pumping volume data for each well.
3. Hydrogeological maps that provide water quality data, age water and vulnerability to pollution and climate change negative effects.
4. Census of well holders.
5. Application of protection measures for natural recharge and discharge areas (springs and wetlands).
6. **Early warnings precautionary principle:** Limit water pumping when there is evidence of ecosystem damage, water quality or lowering of the static level.



CRITICAL ASSESSMENT OF THE TRANSBOUNDARY AQUIFER “RIO SAN PEDRO”: A CRITICAL REVIEW



- 1. Conceptualize Groundwater from a System approach.**
- 2. Encourage in Mexico the development of professionals in GW Flow Systems.**
- 3. Strengthen the infrastructure monitoring and data bank.**
- 4. Strengthen regulations for collection and management on groundwater information.**
- 5. Lack of knowledge about the hydrogeological referent can stimulate and encourage conflicts (at any scale).**
- 6. Change the paradigm of hydrological cycle teaching.**

Kuri, G., Carrillo Rivera, J., & Álvarez, R. (2019). Evaluación crítica del acuífero transfronterizo río San Pedro, *Regions and Cohesion*, 9(1), 61-85. Retrieved Oct 30, 2019, from: <https://www.berghahnjournals.com/view/journals/regions-and-cohesion/9/1/reco090106.xml>