

The Water Paradox

Overcoming the Crisis in Global Water Management

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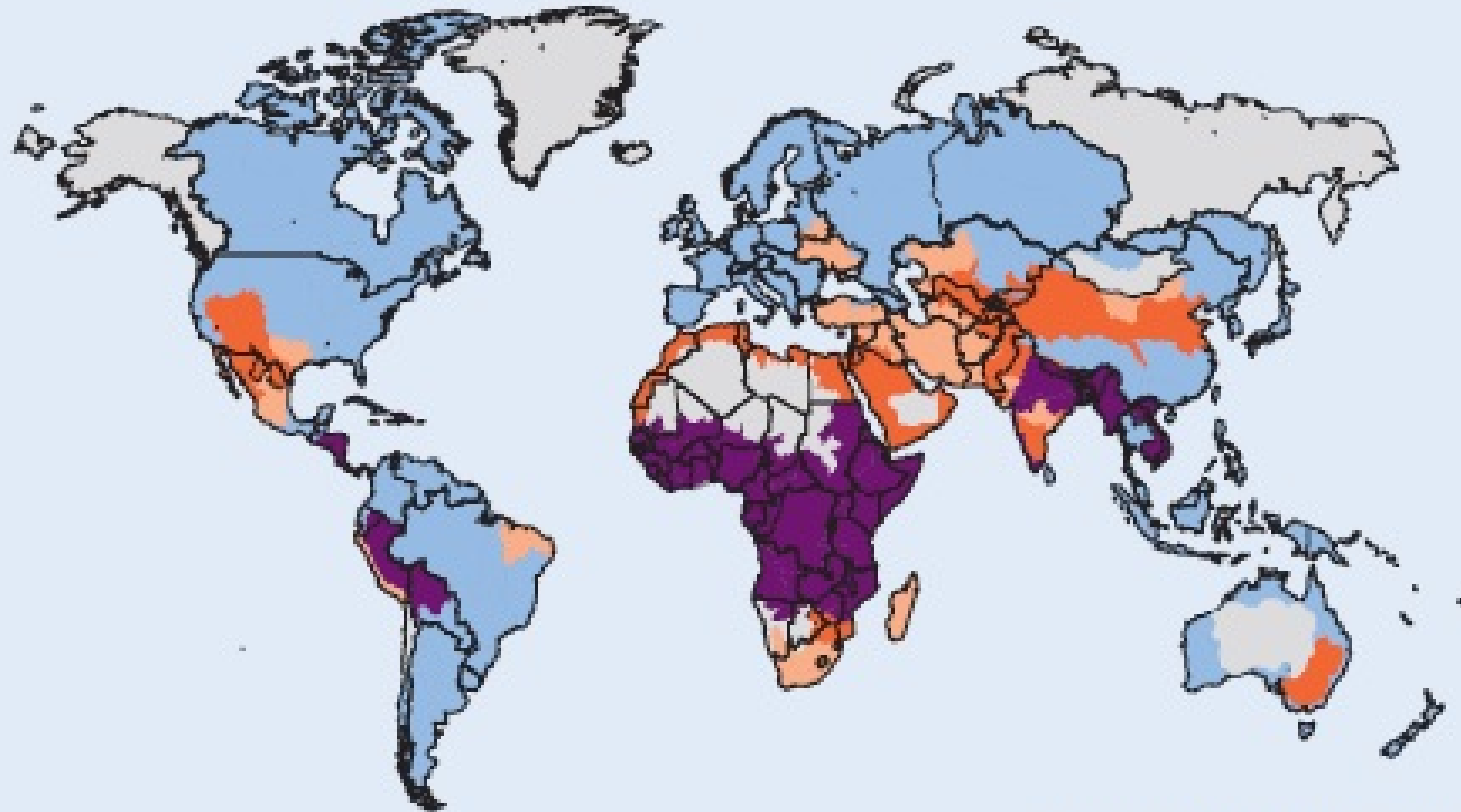
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Symptoms of a Global Crisis

- About one third of the world's population (2.5 billion people) live in water-scarce regions.
- By 2030, intense water scarcity may displace as many as 700 million people.
- By 2050, more than half of the world's population—and about half of global grain production—will be at risk due to water stress.

- Little or no water scarcity
- Approaching physical water scarcity
- Not estimated
- Physical water scarcity
- Economic water scarcity



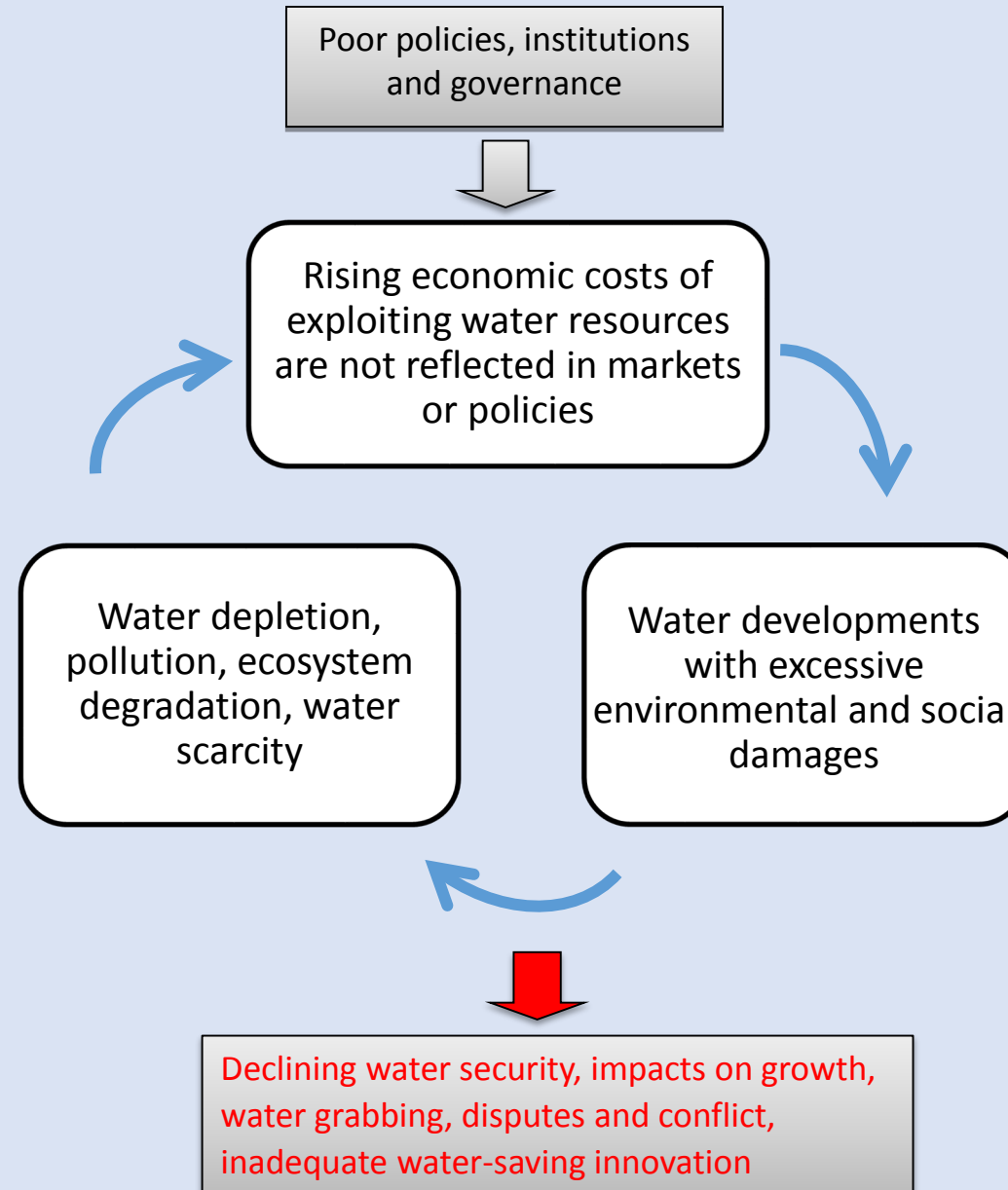
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Source: International Water Management Institute

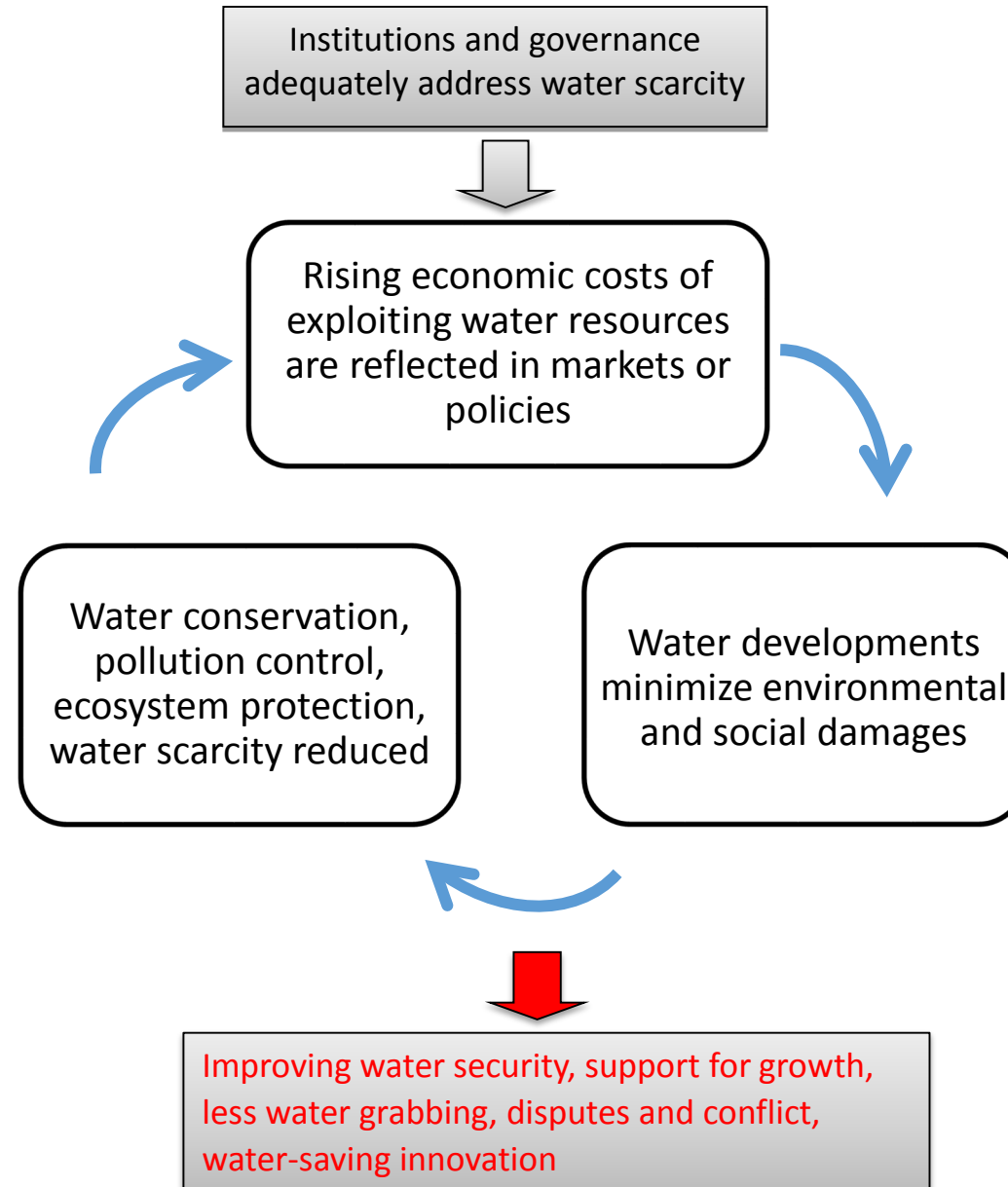
The Water Paradox

- Despite mounting evidence of growing over-use and scarcity of water, why is the world not mobilizing its vast wealth, ingenuity and institutions to avert this crisis?
 - If water is valuable and scarce, why is it so poorly managed?
- *We persist in exploiting freshwater as if it were abundant, even as we recognize its scarcity.*
- *Our policies, governance and institutions were developed when water was abundant, not scarce.*

Vicious cycle of excessive water use and scarcity



Virtuous cycle of managing water use and scarcity



Three examples

- Water markets
- Pricing of water and sanitation services
- River basin management

A role for water markets?

- Some argue that water scarcity problems in Western states could be alleviated through the increased use of water markets.
- Markets have the potential to increase the efficiency of water use by moving water from lower-valued uses (e.g. irrigation) to higher-valued uses (e.g. municipalities and industries).
 - Farmers in the American West use roughly 80% of the region's water, including in low-value or subsidized crops, such as alfalfa, cotton, or rice.
- Both parties would gain if some water in agriculture is released and sold for other uses.
 - E.g., in Western states water in urban areas is priced at \$200 per acre-foot or more, whereas water prices in agriculture are around \$25 per acre-foot.
- Farmers receive revenues from selling their excess water, and they would be more efficient in using their remaining water.
 - Any water wasted could instead be sold at higher prices in the city.

Why are water markets not more widespread?

- Water markets are generally local or statewide.
- There is little private water trading across state lines due to a variety of state regulatory restrictions and to the costs associated with transporting water great distances.
- Transferring water requires access to canals and aqueducts, as well as to rivers or streams whereby water can be released by one diverter and appropriated by another.
- Legal uncertainty surrounding water rights increases the cost of water market transactions, and may expose a seller to unwanted judicial scrutiny and the risk of relinquishment of part of their right.
- Transactions costs are also high because of extensive regulatory oversight, to reduce impacts on the environment, return flow, groundwater, etc.

Why are farmers reluctant to sell water?

➤ *Don't blame the farmers! There are significant legal, institutional and regulatory barriers that create disincentives to trade.*

- Although prior appropriation may legally separate water and land rights, in practice farmers and ranchers have little incentive to sell or lease their water to outside users, unless they plan to cease their agricultural operations.
- Instead, they have an incentive to “use” as much of their water rights or risk “losing” this right.
- It may not be their “right” anyway; irrigation districts often have legal title to water and decide how they are used.
- This not only leads to inefficient and excess water use, but also a reluctance to “parcel” water rights to sell any “excess water”.
- Drought and climate variability impacts on water supplies reinforce this reluctance.

Water markets are spreading

- A number of states and localities are experimenting with different mechanisms:
 - Direct transfers – buying the actual water right.
 - Indirect transfers – buying shares of an irrigation district or its network to gain water resources, and the district or network retains overall right.
 - Leasing rights – Sellers retain the right for future use, but lease water temporarily over one or multiple years.
- Water banks – Hold deposits of water rights from multiple suppliers for future use, or lend and sell them.
 - They can pool water saved through conservation, retain excess water, and release more deposits to offset droughts.

TABLE 1
Water Transfer Prices (per Acre-Foot) by Sector

3,232 transactions
from 1987 to 2005

	Agriculture-to- Urban Leases	Agriculture-to- Agriculture Leases	Agriculture-to- Urban Sales	Agriculture-to- Agriculture Sales
Mean price (\$)	114	29	4,366	1,747
Median price (\$)	40	10	2,643	1,235
Number of observations	189	178	1,013	169

TABLE 8
Water Transactions by Type and State

	Number of All Transactions	Number of Sales	Number of Short Term Leases	Number of Long Term Leases
Arizona	175	118	41	12
California	481	71	305	60
Colorado	1,707	1,899	60	31
Idaho	105	27	74	2
Montana	28	2	10	11
New Mexico	118	64	36	15
Nevada	126	112	4	3
Oregon	77	12	44	17
Texas	253	82	119	90
Utah	75	56	15	3
Washington	45	16	24	5
Wyoming	47	6	39	1
Total	3,232	2,165	771	210

Prices are higher for agriculture -to-urban trades than for transfers between agricultural producers.

Water trades are increasingly occurring for longer periods of time, either through multi-year leases or through sales of the water right.

The states with the highest urban growth appear to be making the most water transactions.

Distribution of Payments of Investment and Operational Costs for Water and Sanitation Services, Selected Countries

Country	Share (%) of Investment Costs		Share (%) of Operational Costs	
	Government	Consumers	Government	Consumers
Canada	75	25	50-70	30-50
France	50	50	0	100
Japan	100	0	0	100
Spain	70	30	50	50
United States	70	30	50	50

Source: Based on Organization for Economic Cooperation and Development (OECD). 2012. *Meeting the Water Reform Challenge*. OECD, Paris, Table 2.3.

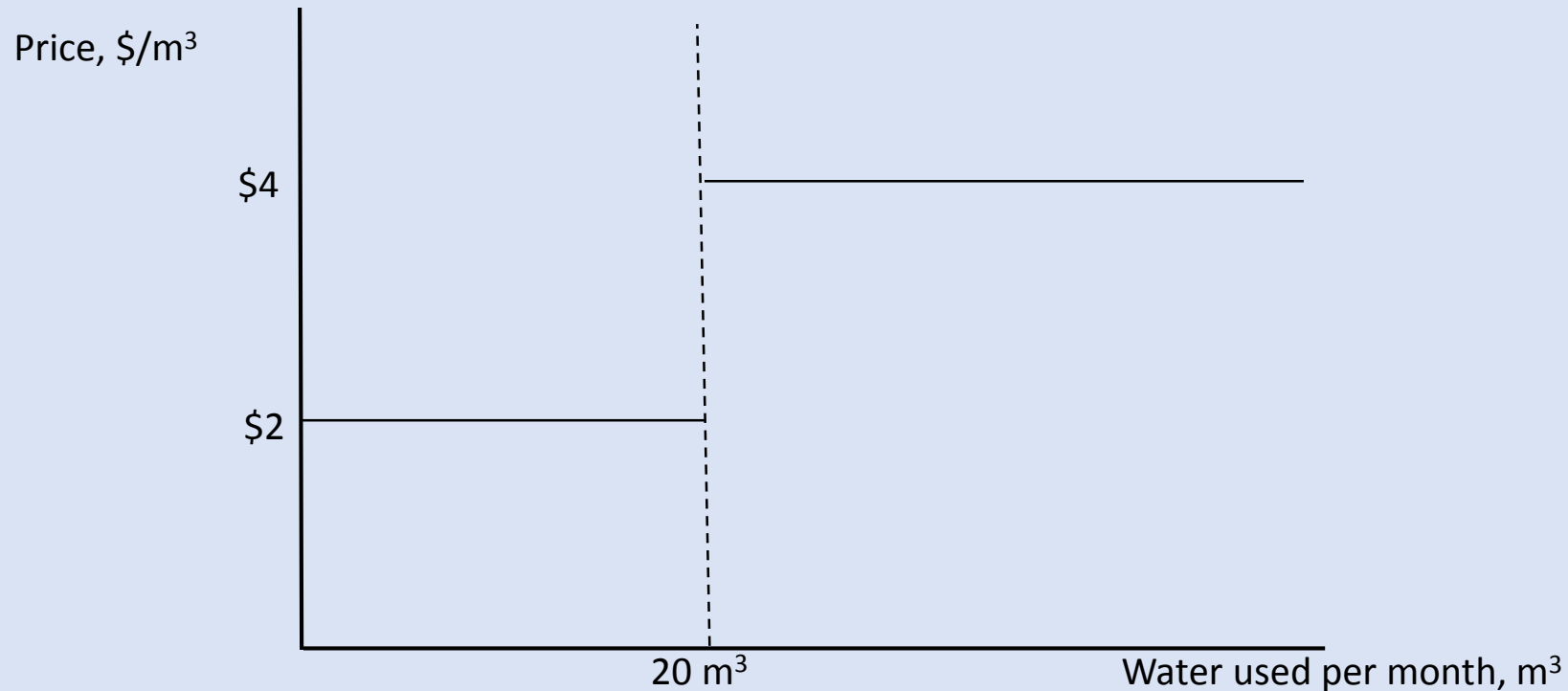
Governments typically pay a large share of the investment costs, and also often subsidize the operating costs, for water and sanitation services delivered to municipal and industrial users.



Proper pricing of water and sanitation services

- Ending under-pricing could:
 - Improve **cost recovery**
 - Foster **water conservation**
 - Ensure **equity** for low-income families
- Two-tier pricing system:
 - A *fixed service charge* per month to cover operating and maintenance costs.
 - A *two-tier block rate charge* on per unit of water used per month.

A Two-Tier Price for Domestic Water Services



A two-tier price for water services for households would increase water conservation while protecting low-income households from the burden of water pricing.

If a typical low-income household consumes on average each month less than 20 cubic meters (m³) of water for domestic use, then a lower price of \$2 per m³ could be charged for the first 20 m³ of water consumed each month. If this amount was consumed, then the household's monthly water bill would be \$40. However, if a household consumed more than 20 m³ of water, it would pay \$4 per m³ for the additional water used. Consequently, if a household consumed 40 m³ of water each month, its monthly water bill would rise to \$120.

Comparison of Governance of Four Major River Basins

River basin	River length (km)	Basin area ('000 km ²)	Catalyst for reform	Key governance features
Colorado, United States and Mexico	2,100	622	Environmental concerns	Multiple jurisdictions that coordinate actions across the basin; limited use of water markets to allocate water between and within states.
Yellow (Huang He), China	5,464	752	Severe drought	Single basin authorities plan and manage water across jurisdictions; top-down water allocations by central government.
Murray-Darling, Australia	2,589	1,061	Severe drought	Single basin authorities plan and manage water across jurisdictions; de-centralized administration and extensive use of water markets to allocate flows.
Orange-Senqu, Botswana, Lesotho, Namibia, South Africa	2,300	973	End of Apartheid in South Africa	Multiple jurisdictions that coordinate actions across the basin; limited use of water markets to allocate flows.

Source: Based on R. Quentin Grafton, Jamie Pittock, Richard Davis, John Williams, Guobin Fu et al. 2013. "Global insights into water resources, climate change and governance." *Nature Climate Change* 3:315-321.

Insights for river basin governance and management

- Crises can provide a catalyst for reform.
- The need for economic valuation of freshwater ecosystem services to evaluate the trade-offs between consumptive and instream uses.
- Water management plans should take into account the inherent variability of rivers and streams shared between water users and instream uses for environmental benefits.
- The use of water markets and trades to help reduce the costs of reallocating water to environmental benefits, especially during times of low in-stream flows.
- The contribution of centralized and nested water governance structures within basin-wide management institutions to revise water allocations as environmental conditions, scientific knowledge and societal values change.

PRTI Definition of a Healthy Working River

“Our definition of a healthy working river is one that supplies the goods and services demanded by our complex society, within the existing and evolving water rights system and honoring existing property rights, while maintaining and improving ecological integrity and resilience.

The word "river" connotes not only the river channel and its banks but also the upper watershed that supplies the water, the lands that are irrigated by the river, the areas supplied with domestic and industrial water from the river, and the treated wastewater and other return flows that come back into the river.”

http://prti.colostate.edu/resources_definition.shtml

Thanks!

“For every complex problem there is an answer that is clear, simple, and wrong.”

H.L. Mencken