Making Conservation Pay: A New Approach to Central Asia's Water Crisis

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Abstract

Central Asia's water crisis is usually described as a problem of physical scarcity, one of receding glaciers, and declining and increasingly unpredictable river flows. The implied, latent danger is that a sharpening competition for this basic resource could one day trigger region-wide instability.

But this intense focus on scarcity risks overlooking the scope for implementing timely mitigation efforts. Across the Amu Darya basin, ageing irrigation systems now lose between 30 and 50 percent of water during delivery. Most farmers pay for irrigation according to the area of land served, rather than the volume of water delivered. Uncertain land tenure, restrictions on what farmers can grow and unreliable access to irrigation water discourage long-term investment.

All of this makes for a system that neither rewards conservation nor penalizes waste.

Government rules alone cannot solve these problems. Farmers and the organizations that deliver irrigation water need a financial incentive to reduce waste. That requires economic mechanisms that provide those incentives. Accurate measurement of water use is also needed, to identify reductions in losses and allow those responsible to benefit financially. Clear rules and transparent public oversight should govern these arrangements.

But financial incentives alone will not give farmers the means to invest. Targeted subsidies and affordable loans can help them buy water-saving equipment. This support should be allocated transparently and help farmers obtain reliable equipment that delivers lasting savings.

01 A water crisis made worse by the system

The Amu Darya, one of Central Asia's two great rivers, is fed by mountain ranges in Tajikistan, Kyrgyzstan and Afghanistan and supplies much of the irrigation water used downstream in Turkmenistan and Uzbekistan. Its basin is entering a troubling historical phase.

For much of the region's modern history, governments and farmers alike could plan around broadly familiar patterns of snowfall, glacier melt and river flow. But those certainties are now being undermined by climate change. To be clear, this development does not mean that

every year going forward will always be drier than the last. Instead, what we can expect is more unpredictability: longer and more frequent dry periods, more extreme floods and growing uncertainty over how much water will be available, where and when.

Recent evidence indicates that the future has already arrived. In 2025, rivers across Central Asia carried less water than the 1991-2020 average, and in many areas substantially less. The World Meteorological Organization describes a broader water cycle that has become more erratic, as long-established patterns swing increasingly between scarcity and excess. Glaciers may release more water during periods of rapid melting, but their continued retreat progressively weakens a natural reserve on which downstream communities depend.

This emerging threat is colliding with another anthropogenic problem. Irrigation systems in Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan were built largely during the Soviet period, and much of that infrastructure is now badly worn. Canal linings are absent or damaged, hydraulic structures have deteriorated, and many pumping stations are both obsolete and highly energy-intensive. Depending on the country and locality, between 30 and 50 percent of water may be lost while it travels through the irrigation network to agricultural fields.

Further losses occur on the fields themselves. Outdated irrigation methods can leave fields with more water than crops can absorb, particularly where drainage is poor. As this water evaporates, it leaves dissolved salts behind in the upper layers of the soil. Over time, this accumulation, which is known as soil salinization, damages crops and can eventually make farmland unusable.

The precise scale of these on-farm losses is uncertain, partly because the countries of the region lack common methods with which to measure them. The information that is available is often incomplete, fragmented and difficult to compare. As pressure on supplies grows, the region is compelled to grapple with managing an increasingly valuable resource while lacking a clear picture of where much of it goes.

Maintaining such an extensive irrigation system costs money. Revenue comes from charges paid by farmers and other water users for water-delivery services, which is then supplemented by government budgets and support from external donors. Even when all these sources are summed together, however, they often fail to cover routine maintenance, let alone the replacement of pumps, repairs or modernization of water infrastructure.

Water losses are only adding to this financial pressure. Every drop of water lost in transit may still have been diverted, pumped and carried through part of the network. That means that electricity has been needlessly consumed without the water ever reaching a farm. In Uzbekistan, the government estimated in 2024 that supplying 1 cubic meter to agricultural clusters and farmers cost an average of 212 sums (about $0.017). Costs can be considerably higher than the average in some localities, such as Bukhara, Kashkadarya and Namangan.

Public investment has improved some parts of the network, but officials acknowledge that losses remain high in numerous districts.

Incomplete water accounting compounds the problem. Water-metering systems do already operate in parts of Uzbekistan. Online monitoring equipment and smart meters have been installed at some pumping stations. But coverage is not universal, and information produced by existing devices has not always been brought together in a system capable of analyzing consumption across the network. In July 2025, President Shavkat Mirziyoyev acknowledged the problem, stating that Uzbekistan still lacked precise records of the water consumed by individual farms.

Where direct measurements are unavailable, consumption is commonly estimated from factors such as the area cultivated, the crop grown and the expected number of irrigation cycles. There is a practical logic to this approach: a larger cultivated area will generally require more water. But an estimate based on area cannot show whether one farmer used substantially more water than another to cultivate the same fields, whether modern equipment reduced consumption, or where avoidable losses occurred. Uzbekistan is therefore partway through a transition from approximate administrative calculations to direct digital measurement, rather than starting from an absolute absence of water accounting.

But building an effective water-accounting system is not enough on its own to ensure that water is used more efficiently. Economic mechanisms are needed that will push farmers to adopt water-saving technologies and switch to less water-intensive crops. Above all, this means a relatively high price for water-delivery services: for a resource to be valued, it has to cost the user something. Uzbekistan has recently raised its charges for water delivery. In Kyrgyzstan and Turkmenistan, however, water remains a cheap resource for farmers.

Another tool for improving the efficiency of water use is to formalize water-use rights and to allow saved water to be resold. In Uzbekistan, the legal basis for this already exists. The Water Code adopted in 2025 sets transparent rules for determining quotas (long-term water rights) and limits (adjusted each season according to water availability), and provides for the assignment of water rights (parts of water-use quotas and limits) and the resale of saved water. However, practical mechanisms for implementing these provisions of the Water Code are not yet in operation.

As noted above, between 30 and 50 percent of water in the countries of the region is lost on its way to agricultural fields. The problem here lies not in measuring water losses but in the incentives for water-delivery organizations to create the conditions for reducing losses and improving the energy efficiency of pumping stations. Water is delivered mainly by state organizations: units of government bodies (ministries and agencies) or state-owned companies. Officials have no proper financial incentive to use resources such as water and electricity more efficiently or to look after the condition of water infrastructure. Moreover, if

they modernize infrastructure and cut the cost of delivering water, their state funding will be reduced, including subsidies for electricity and for repairing and cleaning canals. This is a powerful disincentive to modernization.

One obvious way to create incentives for conserving resources is to hand some responsibility for water delivery to farmers themselves. Water user associations in Kyrgyzstan, Tajikistan and Uzbekistan are intended to bring together farmers who share an irrigation system. Their role is to organize water deliveries to members, maintain local canals and equipment, and represent farmers in dealings with state water agencies. In Turkmenistan, dehkan associations perform some comparable functions.

In practice, many of these associations remain financially and institutionally weak. Fees for water delivery are low, and farmers do not always pay what they owe. This leaves associations short of money to operate and maintain local irrigation systems. Equipment for canal clearance and repairs is often worn out or unavailable.

Unresolved legal questions compound these practical difficulties. The status of the associations and the infrastructure transferred to them is often unclear. Ownership and responsibility for major repairs need to be clearly established between the associations and the bodies that transfer the infrastructure. Management is also weak, and those who run the associations are insufficiently accountable to their members. Together, these shortcomings undermine the ability of associations to maintain local irrigation systems and meet the needs of farmers.

The problems described here reinforce one another. Less predictable water supplies are harder to manage because ageing infrastructure loses much of the water before it reaches farms. Inadequate finance and weak incentives mean that repairs are postponed or poorly carried out. Gaps in measurement make it difficult to charge for actual consumption or identify where investment would reduce losses. Weak local organizations further obstruct efforts to collect fees, maintain canals and give farmers a say in water management. Central Asia's water crisis is therefore not simply a consequence of climate change. It is also the result of an outdated, poorly accountable system that struggles to maintain its infrastructure and gives those who supply and use water little incentive to prevent waste.

02 Why the System Cannot Correct Itself

These weaknesses are not unknown to the governments of Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. All four countries recognize the need to repair canals, improve water accounting and introduce water-saving technology. The deeper problem is that these measures operate within systems that distribute authority, money and responsibility in ineffective ways.

First, water management remains caught between central control and incomplete decentralization. Much of the system retains the top-down administrative structure inherited from the Soviet period. Central ministries and state agencies decide how much water should go to particular regions, economic sectors and crops. They also control the major canals, reservoirs and pumping systems through which that water travels.

The income of state operators of canals and pumping stations is practically unaffected by the reliability of water deliveries, reductions in water losses or lower costs. Proper incentives for conserving resources should come from water-user associations and public-private partnership arrangements that give farmers and private companies a greater role. But, as noted above, central authorities have not consistently transferred to water-user associations the powers and resources without which this local responsibility cannot make a real difference. A water-user association is expected to distribute water, collect fees and maintain smaller canals, yet is given neither control over the infrastructure, nor the equipment needed to repair it, nor the authority to make important decisions. This mismatch weakens accountability: when water deliveries fail or a canal needs repair, farmers may have no clear means of establishing which organization must act or holding it responsible. Meanwhile, the transfer of water infrastructure to private management under public-private partnerships has not been widely adopted, partly because the allocation of responsibilities and risks remains unsettled and the process of transferring infrastructure to private companies lacks transparency.

Second, the sector lacks a financial model that can sustain the infrastructure on which water deliveries depend. Agriculture accounts for roughly 90 percent of freshwater consumption in the four countries, yet payments from agricultural users do not cover even the operating costs of the water delivery system. Government subsidies and donor support help meet the shortfall, but the combined funds remain insufficient to maintain the infrastructure adequately, let alone modernize it. The problem is therefore not simply low revenue from farmers: the overall system of finance fails to provide enough money to keep canals, pumps and other facilities in working order.

These arrangements give both the organizations that deliver irrigation water and the farmers who use it little financial incentive to reduce waste. Farmers likewise have limited opportunities to benefit financially from the water they save, including through its sale or transfer to other users. Neither group can therefore count on a financial return from greater efficiency.

This structure also helps explain why private capital has played only a limited role. A private investor would typically be a company that finances, modernizes or operates part of the irrigation system under a contract with the state. It would spend money at the outset and recover that investment over time through service charges or payments agreed with the state. But the company cannot confidently assess whether it will recover its money if charges

are too low, ownership of the infrastructure is unclear or the terms governing payment and its responsibilities are uncertain.

Third, some of the most important constraints originate outside the water sector. Agricultural land generally remains state-owned. Farmers and agricultural companies cultivate it through leases or other rights granted by the state. The terms of those arrangements determine whether a farmer can retain the land, transfer the right to use it or offer that right to a bank as security for a loan.

In many cases, the rules governing the renewal of leases remain uncertain. Farmers may also have limited rights to sell or transfer their leases and may be unable to use them as collateral. A farmer cannot confidently borrow money for a drip-irrigation system that will take several years to repay if they do not know whether the lease will remain valid for that long.

Water rights create a similar problem. A farmer may receive an allocation for a given season without receiving a secure long-term right to a predictable quantity of water. The farmer may also lack clear information about how the authorities will reduce allocations during a drought. This makes it difficult to plan production or assess whether investment in new irrigation equipment will prove worthwhile.

In Turkmenistan and Uzbekistan, the state can also attach crop requirements to the right to use agricultural land. Authorities may determine how much land must be devoted to particular crops. Producers therefore cannot always choose crops solely according to local conditions, commercial demand or the availability of water. They may be unable to move away from a water-intensive crop even when water becomes scarcer or more expensive. This weakens the connection between water availability and decisions about what to grow.

Finally, national reforms alone cannot resolve problems that arise from dependence on a shared river. Along the Amu Darya, weaknesses in cooperation between governments compound the failures of water management within individual countries.

The Central Asian states inherited and adapted a regional allocation system developed during the Soviet period. Their governments agree on how much water each country may withdraw, and regional bodiescoordinate those decisions. But these bodies lack effective means to enforce agreed limits or penalize governments that disregard them. Implementation ultimately depends on each government's willingness to honor collective decisions, with disputes left to political negotiation.

The gaps in water measurement identified at farm level also have a regional counterpart. Farm meters and monitoring stations produce data within individual countries, but the basin lacks a comprehensive database that brings together compatible information on river flows, national withdrawals, water delivery and final consumption. As a result, regional bodies are

left to coordinate how the river's water is shared without a common set of accepted data on how much is available and where it goes.

Afghanistan exposes yet another gap in these regional arrangements. The system developed among the former Soviet republics and has never fully included Afghanistan, even though the country forms part of the Amu Darya basin. Its Qosh Tepa Canal project will divert water from the Amu Darya to irrigate land across northern Afghanistan. The existing regional arrangements provide no settled process through which Afghanistan and the Central Asian states can negotiate its share of the river or manage the effects on downstream countries. A full treatment of that problem lies beyond the scope of this paper, but it remains an important omission from the basin's system of cooperation.

03 The Signpost

The reforms proposed below rest on the idea that those who deliver and use water should benefit financially from greater efficiency. Farmers generally cannot choose between competing canal networks, so market competition alone cannot bring about this change. Governments should instead link the income of organizations that operate canals and pumps to reliable water deliveries and reductions in the water lost along the way. Farmers should pay for irrigation according to the volume of water they receive, allowing conservation to reduce their bills. Affordable finance and targeted support should help them invest in equipment that makes those savings possible.

These arrangements require a clear division of responsibility between government bodies, water-delivery organizations and users. They also require public access to information on expenditure, water allocation and service quality, together with opportunities to question decisions and hold those responsible to account. The recommendations that follow combine financial incentives with these safeguards so that gains in efficiency serve the wider public interest.

The diagnosis outlined above identifies weaknesses both within countries and across the shared river basin. The recommendations laid out here therefore address national reforms and cooperation among the countries that depend on the Amu Darya.

Recommendations at the national level

A clearer division between policymaking, oversight and water delivery should guide national reforms. Ministries should set policy and regulations; state agencies should oversee infrastructure and supervise operators; delivery organizations should operate

and maintain the system against measurable service obligations. This would reduce conflicts of interest between those who provide services and those who assess them.

Water councils and user associations should give farmers a substantive role in decisions. Governments should consult on proposed regulations and publish data on water availability, consumption, losses, costs and expenditure. Meters and compatible digital records are essential to make this information reliable.

Water entitlements should provide a dependable basis for production and investment. Users should receive long-term allocations based on available supplies, with agreed procedures for reductions during drought. Transparent rules should also permit paid transfers of water entitlements, including conserved water, subject to reliable measurement and safeguards for other users.

Delivery organizations need the authority and financial incentives to fulfil their responsibilities. State operators should gain greater financial autonomy and retain a share of savings from lower delivery costs and water losses. Contracts should link these benefits to reliable service and adequate maintenance. Public-private partnerships should specify ownership, investment obligations, payment terms and responsibility for repairs, supported by transparent tenders and measurable performance standards.

Water-user associations need clear legal status, accountable management and sufficient equipment, finance and staff. Ownership and responsibility for repairs must be settled explicitly for infrastructure transferred to them.

Sustainable finance should support both routine maintenance and infrastructure renewal. Charges should reflect measured consumption and rise gradually towards recovery of operating costs and, eventually, the cost of renewal. Differences in delivery costs and water scarcity should inform tariffs, with transparent subsidies where necessary to address affordability. Governments should improve collection, expenditure planning and disclosure of public support. Private investment, donor grants and concessional loans can supplement these revenues, but investments must include provision for subsequent maintenance.

Farmers also need support to invest in conservation. Subsidies, tax incentives and affordable loans should support meters and suitable water-saving equipment. Transparent eligibility rules, public oversight and equipment-quality requirements should help ensure that support produces lasting benefits. Practical training and access to maintenance should accompany investment, and measurements before and after installation should establish whether equipment reduces water and energy use.

These measures should be supported by stronger land rights and greater freedom to choose crops. Secure leases, clear renewal rules and rights to transfer or borrow against land-use entitlements would encourage long-term investment. Greater freedom to choose crops would allow farmers to respond to water availability and cost rather than compulsory production requirements.

Recommendations at the basin level

National reforms require regional agreements that governments can implement and monitor. Countries should establish procedures for reporting and addressing breaches of allocations agreed through the Interstate Commission for Water Coordination.

A shared information base should combine compatible data on flows, withdrawals, consumption and costs. Common methods for measuring losses would help identify investment priorities and assess results.

Governments should jointly plan improvements to shared infrastructure and agree on responsibility for operation, maintenance, emergency repairs and financing. Coordinated investment priorities would strengthen discussions with donors and development banks.

Cooperation should also extend to the principles behind water charges. Identical tariffs are unnecessary, but countries should exchange experience and adopt compatible approaches to consumption-based charges and gradual increases.

Finally, Afghanistan should progressively be included in technical discussions and information exchange. Its participation would improve basin-wide forecasts and provide a foundation for cooperation among all countries that depend on the Amu Darya.

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