Improving data, community engagement, and strategic initiatives to address America's groundwater challenges

Proposals from the Environmental Defense Fund

The following set of recommendations was produced by the Climate Resilient Waters Systems team of the Environmental Defense Fund in response to the President's Council of Advisors on Science and Technology (PCAST) call for input on America's groundwater challenges.

Over-extraction of groundwater is a significant threat to U.S. aquifers and rivers, impacting the communities and economies that depend on them. Declining groundwater levels jeopardize water accessibility and reliability for agricultural production, drinking water and food security. Reports from state agencies and peer-reviewed literature have documented chronic well level declines across key areas of food production in the United States. Overuse of groundwater not only affects direct users but also impacts hydrologically connected surface waters, which can adversely impact surface water users and degrade ecosystems.

Groundwater's lack of visibility, local control, and shared ownership forms persistent and formidable barriers to sustainable management.

The Environmental Defense Fund has over a decade of experience in advancing landmark groundwater initiatives in the western U.S. By working with communities and leveraging scientific expertise, EDF aims to drive sustainable practices and policies that protect this vital resource. EDF commends PCAST for recognizing the importance of building groundwater resilience and soliciting public input on how to address America's groundwater challenges. Our expertise lends itself to addressing three of the questions posed by PCAST:

1. How can we enhance the timely collection of data on groundwater inventory, use, recharge, and flow across the United States to gain a whole-of-country picture of the nation's groundwater resources?
2. How can we engage with communities to successfully ensure a sustainable supply of groundwater, including for agriculture, industry, energy, human consumption, and healthy ecosystems and biodiversity?
3. What strategies and incentives can help limit groundwater over-use?

1. How can we enhance the timely collection of data on groundwater inventory, use, recharge, and flow across the United States to gain a whole-of-country picture of the nation's groundwater resources?

Increase funding to federal and state groundwater monitoring networks to enhance the spatial and temporal resolution of groundwater levels and water quality monitoring. Prioritize funding to expand monitoring coverage in groundwater-reliant communities to ensure safe drinking water access and enable timely response during extreme climate events, such as droughts. Additionally, given the depletion of groundwater in many regions, expansion of monitoring efforts should focus on vulnerable areas prone to salinity intrusion, subsidence, pollution, domestic well failures, depletion of interconnected surface water (rivers and streams) and impacted groundwater dependent ecosystems.

Improve cross-agency data management infrastructure and data governance to support decision-making. This involves funding existing and new data governance structures that can ensure that local, state and federal collected data are high-quality, interoperable, reliable and useful for decision makers. Funding should aim to increase the capacity of existing expertise and resources coordinating data efforts and initiatives under a common data governance framework. This requires identifying, defining and funding roles required to manage, develop, coordinate and implement protocols for data collection, documentation, quality control, verification, and data publication.

Advance technology that supports state and federal water data collection, management, and sharing to enable coordinated data processes across agencies and departments. Funding data repositories and platforms-including data on aquifer table elevation, water availability, water quality, and evapotranspiration--that are user-friendly and accessible is crucial for quick access and analysis, leading to informed and timely decisions. Coordinated data processes include development of common metadata and data standards, improving interoperability and documentation, data taxonomies, and more.

2. How can we engage with communities to successfully ensure a sustainable supply of groundwater, including for agriculture, industry, energy, human consumption, and healthy ecosystems and biodiversity?

Build more inclusive planning and decision-making processes. Non-profits and other organizations play a crucial role in facilitating engagement among diverse stakeholders, including state and federal agencies and community-based organizations. They provide science-based solutions and can bridge the gap between funding sources and those implementing sustainable strategies.

Support local governance or regional coordination structures to foster collaborative and sustainable groundwater management. With support from state or federal government, these bottom-up structures can ensure long-term sustainability and equitable access to groundwater. These can be key for coordinating diverse actions that aid in the planning and implementation of groundwater management strategies. These structures also create spaces for communication and engagement, balance power dynamics in decision making and aim for an equitable distribution of benefits from groundwater management. By enabling these collaborative spaces, groundwater management can be implemented more effectively, finding strategies that create consensus, are multi-benefit and win-win solutions and can reduce social conflict. In some regions this may require an examination and restructuring of governance systems and procedures to invite meaningful public participation and authentically incorporate situated knowledge. For example, it may require consideration of venues, languages, and time frames in which discussions occur.

Fund pilots and research that demonstrate practices to reduce water consumption, protect groundwater resources and prove their feasibility. These projects along with research and monitoring can be key to conveying practices and innovative approaches with decision makers, water users, non-profits, conservation groups, etc. that aim to ensure groundwater sustainability under local conditions.

Outreach and technical assistance are key to conveying best practices and strategies that users such as farmers and industry can adopt. Outreach via locally trusted messengers is crucial to conveying the essential role of groundwater and the impact of depletion. Effective outreach efforts foster collaboration among actors, local leadership and support bringing perspectives and concerns of all sectors (communities, farmers and ranchers, conservation groups, etc.) to decision making spaces. Additionally, these actions foster collaboration of state and federal decision makers with local organizations such as universities, extension specialists, community and farmer organizations, etc. Technical assistance is critical to increase the adoption of different sustainable groundwater use strategies and ensure they are well designed and economically feasible for interested users and different local contexts.

Support tribes in resolving tribal water issues. Several sovereign tribes are still without a resolution and full state and federal recognition of their water rights. For some tribes, this prevents access to water to meet basic needs. Federal infrastructure dollars should be directed towards improving access to clean and reliable drinking water on tribal lands, as well as other investments that advance livelihood security consistent with tribal self-determination in the use and conservation of their water. State and federal governments must work with tribes to complete equitable water rights settlements for those tribes who seek it or help find other resolutions to fully recognize and fulfill tribes' unique water rights.

3. What strategies and incentives can help limit groundwater over-use?

Consumptive use and demand reduction programs are crucial efforts in promoting the transition of groundwater overuse to sustainable water and land management. These programs aim to reduce water demand by repurposing previously irrigated agricultural lands to new uses that require less water and create new public benefits. These programs encourage voluntary water conservation, enhance groundwater recharge, create community recreational spaces and restore natural habitats. By integrating financial incentives, technical support, and collaborative efforts, these initiatives help ensure long-term water sustainability, support agricultural communities, and protect environmental health across various regions.

Water accounting is the foundation of smart water management. Through accounting of groundwater, water managers and water users can track water availability and water use. This enables the ability to identify imbalances and instances of overextraction, highlighting areas at risk of depletion. Water accounting provides data that can be used by policymakers and water managers to make informed decisions about water allocations, restrictions, and conservation measures. Where relevant, water accounting can integrate groundwater data with surface water and other hydrological data, supporting a holistic approach to water management that considers the interconnectedness of different water resources. Continuous water accounting allows for adaptive management, where strategies and policies can be adjusted based on the latest data and trends in groundwater use and availability.

Agricultural irrigation efficiency can help to optimize water use, conserve water resources, and lead to significant water savings. However, it is not a sufficient or effective strategy on its own and must be coupled with policies and practices that ensure the saved water is not simply redirected to uses that increase consumption. Other policies and practices must be in place to effectively limit groundwater overuse, such as setting caps on total water extraction, and incentivizing the reduction of overall water use rather than just improving efficiency.

Development of alternative water sources can reduce pressure on groundwater resources. For example, increased investments are needed to accelerate municipal and industrial wastewater reuse, direct potable reuse projects, aquifer storage and recovery, managed aquifer recharge projects, and net zero water solutions in urban areas, such as onsite water reuse and rainwater capture.

New eligibility criteria for relevant grant programs can better protect groundwater that is conserved through such programs. In basins experiencing groundwater over-use, water conservation efforts are only likely to address that over-use if those basins are closed to new uses, otherwise conserved water can be taken up by a new user, further exacerbating the issue. Federal funding programs that seek to address groundwater over-use should prioritize regions that are closed to appropriation or meet certain sustainability-focused management standards.

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