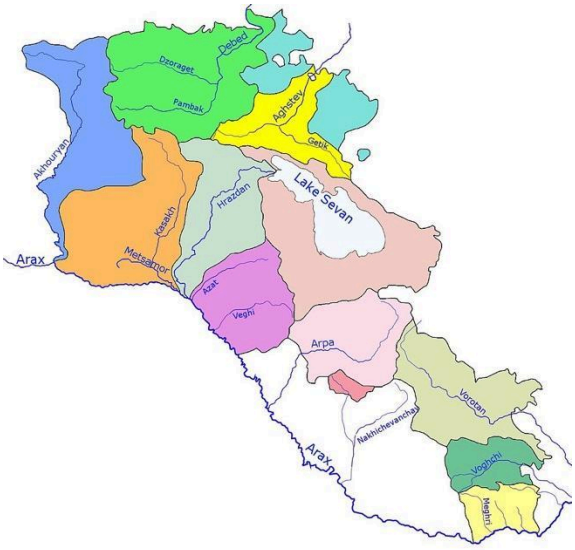
The Impending Armenian Water Crisis

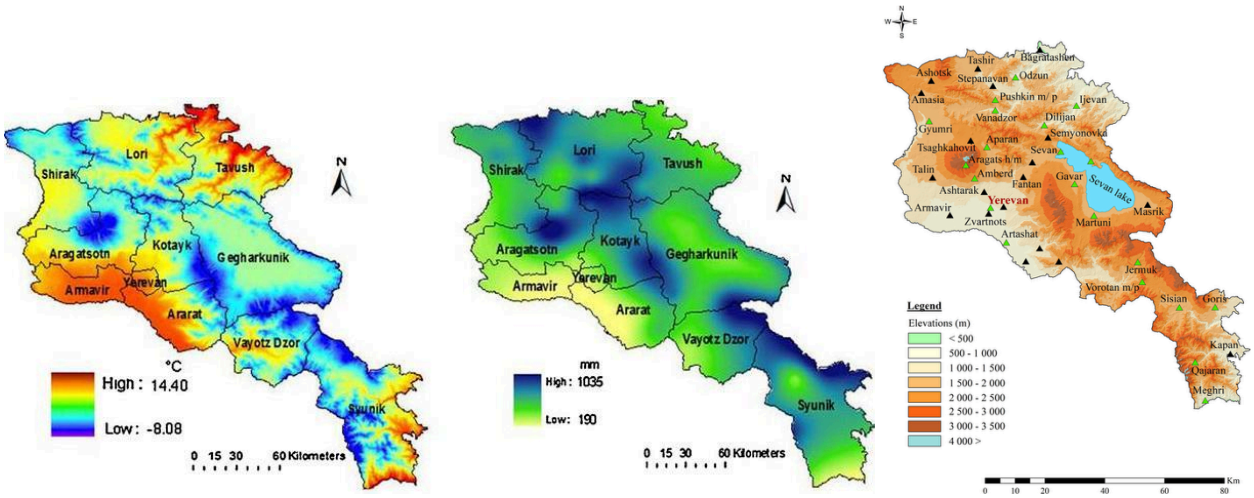
Armenians have always considered themselves in a “water-rich” country, as rain, rivers and groundwater have historically provided all the water needed by a population that has been stressed by many other factors, and thus not at all concerned about or even aware of water resources and their limitations.



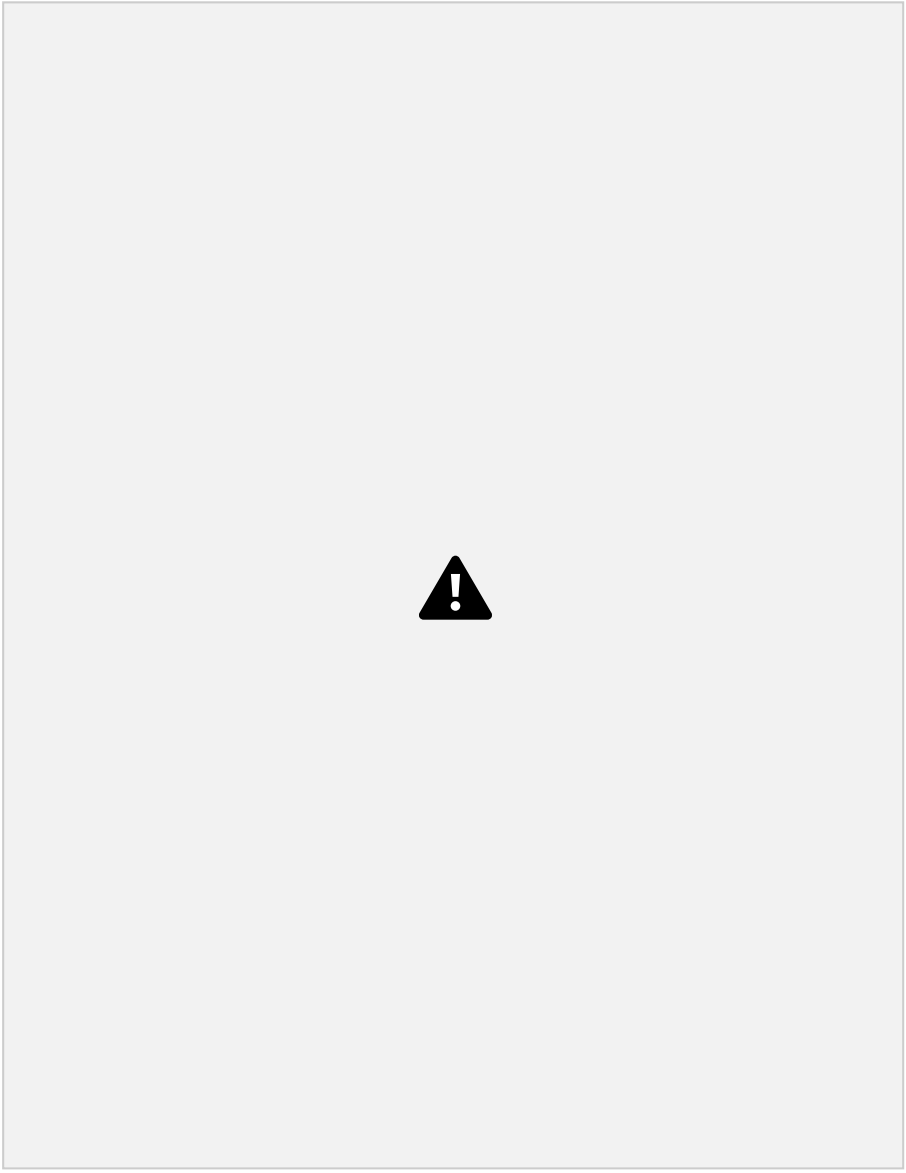
Major Armenian rivers and watersheds. Most rivers drain to the Araks River between Armenia and Turkey, which feed the Kura River in Azerbaijan and ends in the Caspian Sea (internally draining lake). In the north, the Debed and Aghtsev rivers drain directly int eh the Kura.

However, this “water-richness” is changing, while public perception is taking longer to adjust to the new reality. It is said that “A rich man is one who spends less than he makes, regardless of amount.” Likewise, a poor man is one who spends more than he makes, regardless of amount. The same applies to Armenian water resources. Armenia is water-rich only so long as it uses less water than is provided by rain, rivers, and groundwater recharge. As such, this formerly water-rich nation is quickly becoming water-stressed merely through water waste, mismanagement, and non-management.

On top of that, the actual amount of water supply through rivers (notably the Araks and its tributaries) has been decreasing in recent decades, wishfully due to temporary drought, but much more likely due to the impacts of climate change that has already caused the average temperatures of the region to increase by more than 1˚C since the 20th century average, with more heating expected by 2050 and beyond. This has already led to drier summers than we are accustomed to- and summer is when we need the water most, especially for agriculture.



Historical climate of Armenia (20th century). Left: Mean annual temperature. Center: Mean annual precipitation. Note the correlation- colder places are wetter and warmer places are dryer, also corresponding with elevation (Right).

	Expected changes in climate in the 21st century. Average temperature increases and average precipitation decreases, but expect less rain in summer when it is most needed.

Current day Armenia seems to suffer from left-over policies and procedures from Soviet times, when a centralized government enabled powerful international treaties (e.g. Tukiye, Iran) and quelled economic and political tensions between internal Republics (e.g. Armenia, Azerbaijan, Georgia). Water policies now must stand on their own both internally to Armenia and externally to apply to not only the still-standing agreements with Tukiye and Iran, but also to Georgia, and especially Azerbaijan, which lies downstream of Armenia.

This brings up the age-old question- “Whose water is it?” One could argue that it belongs to whomever owns the land through which it flows, and that the owners can do what they want, extract how much they want for profit and leave it at that. On the other hand, people did not create the water, so another argument could be made that water was provided by God’s hand, and that it is for the use of all humanity without regard to political boundaries. This same argument pertains to oil, which was also not made by people, but rather provided by God’s hand (and millions of years of geologic processes), so should likewise be provided freely for the use of all humanity. Without

getting into the obvious regional political ramifications of each of these arguments, one can imagine that depending upon which side a border you reside, you may embrace one and not the other. But they are the same argument (with the slight difference that water availability is based on a flux, meaning the rate of supply, while oil is based on a stock, meaning the amount that is there that will never be replaced).

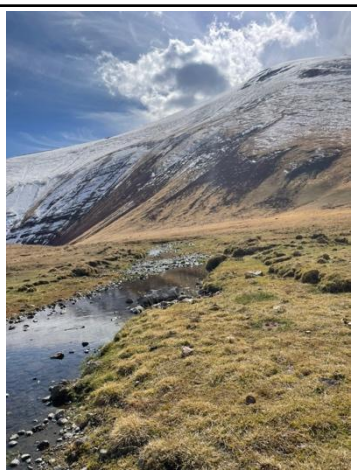
Leaving aside the important trans-boundary issues for now, within Armenia there are two aspects of water stress. The first is quantity, or the rate of water supply, which must not be exceeded by water withdrawal, as indicated above. The second is water quality, as polluted water is not useful to anybody. With regard to quantity, one must consider what Armenians (and everyone else) use water for- Sure, we drink it (and this part had better be clean), and we use it for industry, but the vast majority of water is used for irrigation of agricultural fields. In effect we do not drink our water resources- we eat them. Nearly 90% of Armenian water consumption goes to crop irrigation (and some aquaculture) and virtually all of Armenian agriculture is irrigated. Consequently, when considering ways to reduce water stress, we look at where most of the water is going and work to reduce that. Clearly, Armenians need food and have arguably the finest cuisine in the world.

How might this wealth of delicious food be maintained in the face of reduced water supplies and growing population? The first place to look is in water waste (as opposed to wastewater). Irrigation can be (and currently is) a very leaky proposition, and Armenian farmers have not been concerned with lost water because it has been provided essentially for free. This stands to reason given the well-known tenet of business- Internalize profits while externalizing costs. The costs of providing water are not borne by the farmer, nor, in large part by the consumer, as water that is wasted simply deprives someone downstream of as much water as they may need. Further, the cost to the ecosystem that relies on a certain level and flux of water is not even considered.

A “poster child” of water depletion downstream is the case of the Azat River that drains into the Ararat Valley. Dammed water of the Azat is transported to the Ararat Valley for irrigation in semi-arid region. Most of the water evaporates and this thus lost from the system altogether, leading to the drying-up of the Azat river. Having been dammed to create the Azat Reservoir in 1976, and then irrigated almost to death downstream, the Azat river is no longer “azat” at all. The problem of water overuse and competition for water flow is most notable in Goght, where two hydropower plants compete with downstream farmers for diminishing water resources.

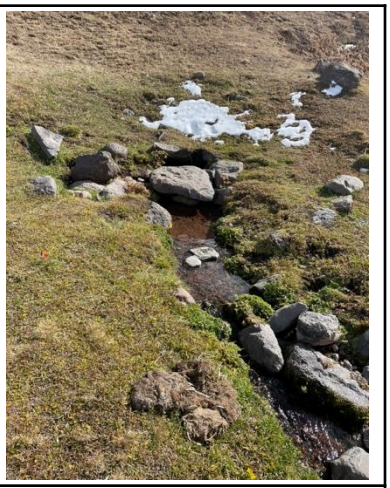
If you trek up to the mountains that are the headwaters for the Azat river, you will see steep, snow-covered slopes overlooking broad, flat wetlands. These wetlands are fed by innumerable springs from the mountains and normally fill with water in the spring and then slowly release that water into the Azat river during the summer. In Fall, the rains begin to fill the wetlands again until they freeze into a thick layer of ice that delays melting and water release so that it can persist

through the summer growing season downstream. However, the need for electricity (and sustainable energy in general) led to the installation of water-catchment basins at the base of the springs feeding the wetlands, from which two major pipes lead the water downstream to a series of hydroelectric power plants.





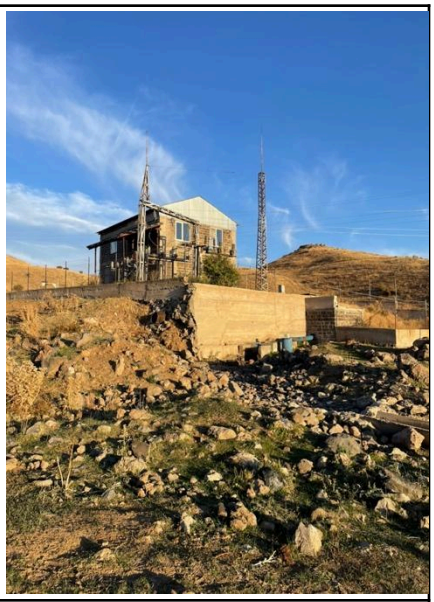
Broad wetlands, now mostly dry.

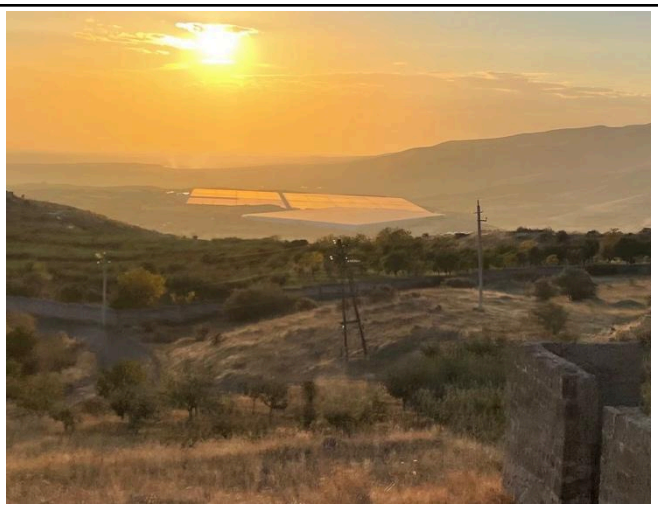


Spring emerging from steep slopes.

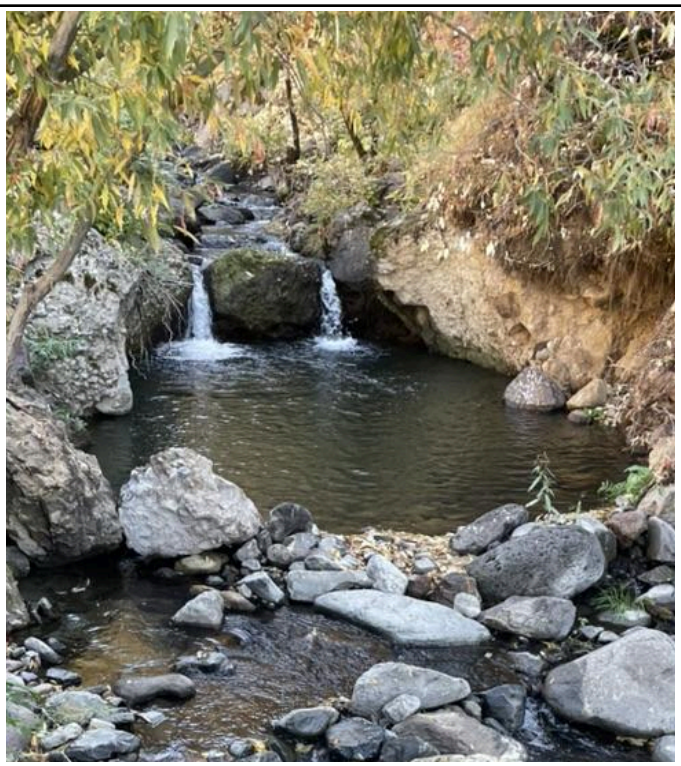
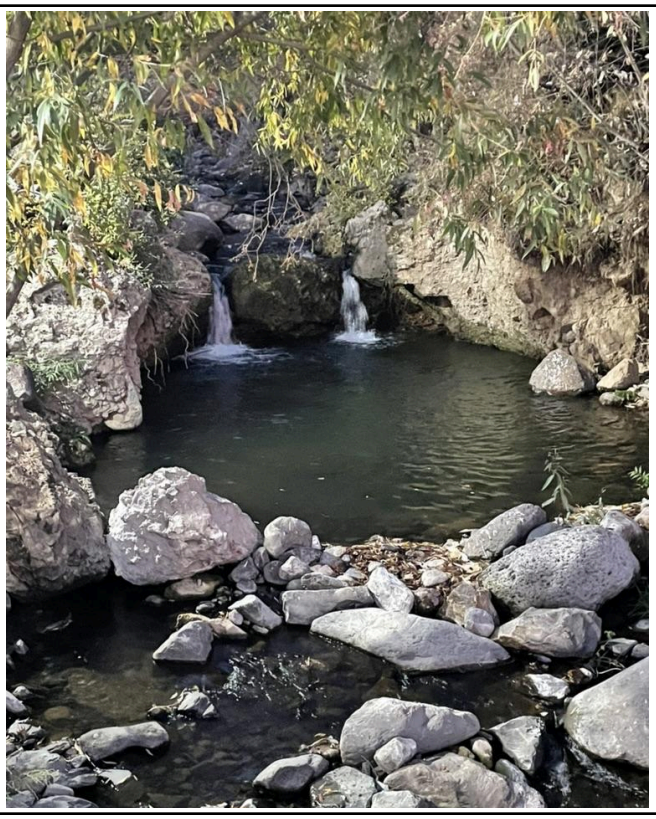
One pipe leads, after power plants, to a large greenhouse where flowers are grown for market, and to local farms for irrigation. The other pipe after power plants leads to the village where unmetered homes and businesses use as much water as they want. Some people leave their faucets open and running all the time, as there is no metering and no price assigned to the water- it is free and considered limitless. For them, it just keeps flowing without end. There is no direct path for the used (or wasted) water to return to the Azat river, and it essentially all evaporates and leaves the watershed (but a small fraction of it may rain/snow again in the mountains that feed the watershed, and another small fraction may enter the groundwater).

Without the thick ice layer, Spring thaw quickly drains the source wetlands so that the Azat river has even less flow than it would in the presence of power plants, so there is a “double-whammy” with very little flow in summer.

		
Pipe from former wetland	Pressure relief station along pipeline.	Hydroelectric power plant.

	
Vast greenhouses below hydropower plants	Irrigated orchards in Azat river watershed

The first place to look when designing more effective water management policies is to reduce waste in irrigation and maximize water use efficiency in Armenian farms. There has already been discussion by the government and others of transitioning irrigation systems from mass flooding to drip irrigation, which is far more efficient, delivering water directly to plant roots, rather than over a broad area leading mostly to evaporation and loss from the watershed. The knowledge exists, but the issue is implementation.

	
Man-made pool in Azat River near Geghard one day after significant rain in October, 2025.	Same spot one week after rain. The similarity of flow indicates that immediate runoff is not the main source for the river, and that upstream springs control flow.

Clean water is a precious commodity, and the only kind we like to drink. Yet, about 70% of Armenian drinking water is lost somewhere between the source and the tap. Even though household and municipal water is a small fraction of total water use (only about 6% of total water use), the value of clean drinking water makes it worth saving rather than wasting. Further, most drinking water comes from springs (and some wells) that sourced from Armenia's aquifers. These aquifers are recharged by rain that percolates through the ground at a limited rate. As soon as the rate of water withdrawal exceeds that of recharge, this becomes water "mining" with the inevitable depletion and destruction of this critical water source. This is already happening in the Ararat Valley in particular with agriculture and fish farms, where the water level within the aquifer has declined by two thirds already due to excessive withdrawal from this artesian aquifer.

Another small amount of water is used by industry to make things, provide energy, and process food. While reducing waste in this sector could be desirable, the main issue here is industrial pollution of water emissions that contaminate water resources downstream. As mentioned above, clean water is precious- contaminated water is at best a nuisance, and at worst a hazard.

So what can we do to ensure continued availability of water for agriculture, industry and domestic use? The answer is technically simple: First and foremost, modernize irrigation systems to use far less water to grow more crops. Then extract water from aquifers only at the rate that they are recharged, especially for artesian systems. Also, reduce lost and thus wasted water from municipal drinking water supply. Finally, ensure that strict standards are enforced on industrial emissions and agricultural runoff to maintain the excellent water quality for which Armenia was once famous.

While technical answers are usually simple, political solutions are often far more complex. There are individuals and companies that profit from current wasteful and polluting practices, so tend to resist any changes in policies or procedures. If strict standards are enforced, these entities would profit less in the short term (but all would profit more in the long-term). Further, if water is considered a free commodity, there is no incentive to conserve it through more efficient practices. This leads directly to the “tragedy of the commons” in which anyone is free to exploit a common resource, but nobody is responsible for maintaining its preservation, leading to the loss of the resource altogether. This can be avoided by numerous approaches both regulatory and economic, if we have the political will to implement them.

For a very comprehensive treatment of the Armenian water situation regarding quantity, quality, economic and regulatory aspects, see the seminal 2024 report led by Alen Gasparian Amirkhanian, Director of the Acopian Center for the Environment at the American University of Armenia, under the auspices of the USAID.

https://drive.google.com/file/d/1o6BW49xL40sXC5_3_IRexC_eNQYuYSon/view