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Managing Water Scarcity in an Age of Climate Change:

The Euphrates-Tigris River Basin

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The Euphrates and Tigris Rivers are the lifeblood of the Eastern Mediterranean. They span several countries, bringing life—both physically and economically—to one of the most water-insecure regions in the world.¹ Yet the same region is also a climate hot spot and warming at a much faster pace than the rest of the world—a trend which will only accelerate in the absence of serious climate action.

With conditions in the region changing so significantly, cooperative and sustainable management of the Euphrates-Tigris River Basin carries an even greater urgency, as these rivers become even more critical sources of water for the countries that depend on them for prosperity and growth.



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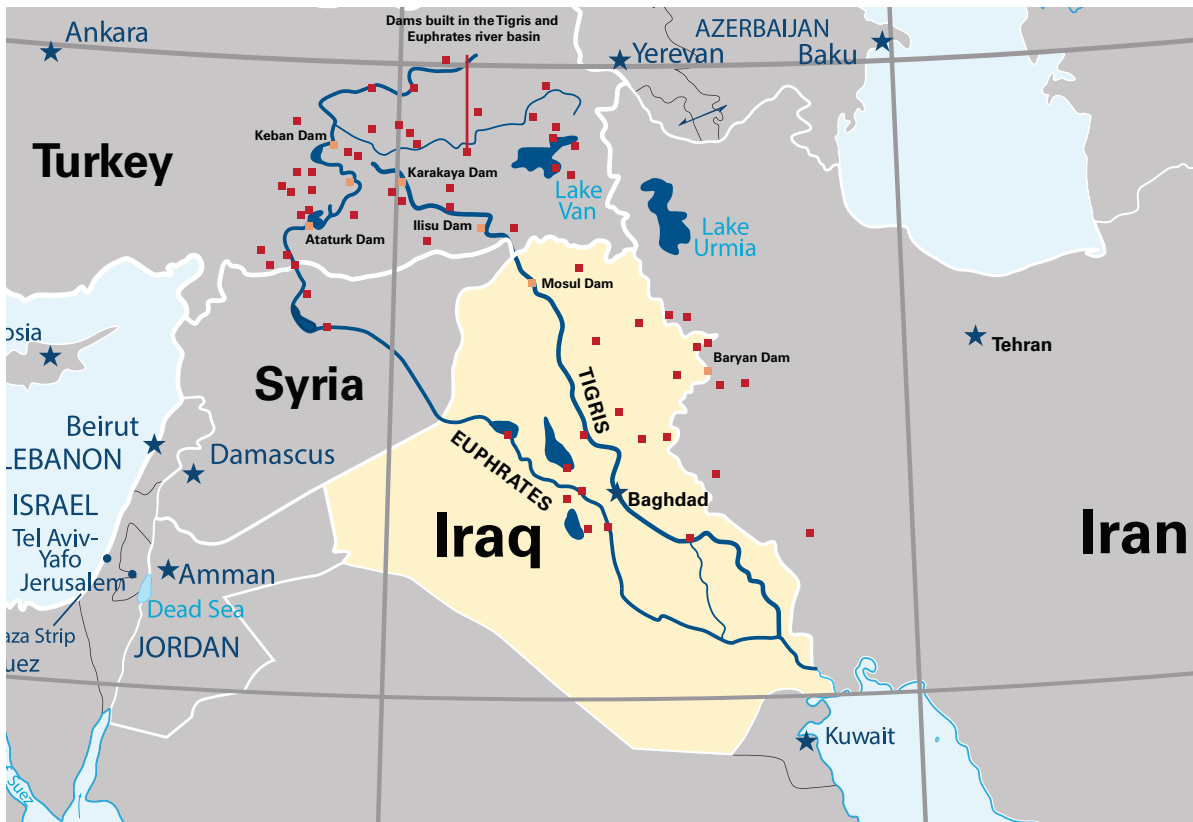


Figure 1: Map of the ET basin countries.²

The Euphrates originates in Turkey and flows through Iraq and Syria before converging with the Tigris River, which has tributaries in both Turkey and Iran and flows towards southeastern Iraq. The two rivers converge to form Shatt al-Arab before discharging into the Persian Gulf.

Figure 2: Percentage of flows by country in the Euphrates-Tigris Basin³

% of flows	Iraq	Iran	Syria	Turkey
Euphrates	-	-	11%	89%
Tigris	39%	10%	-	51%

Unfortunately, the rivers themselves also suffer from the ramifications of climate change—in addition to the already existing problems like waterlogging, pollution, ecosystem degradation, and high salinity. As the climate warms, the basin stands to lose anywhere from 10-60% of its snow-water availability according to one study⁴ (and 55-87% according to another study), while its flows could decline by 25-55% and the timing of flows could shift to 18-39 days earlier in the year,⁵ which would have serious implications for agriculture in the region.

This is more bad news for a region already going through a devastating drought (since 2020) and experiencing extreme water stress.⁶ In both Iraq and Syria, the water available for human consumption is already below the WHO recommended level of 1,700 cubic meters (cbm) per capita annually (355 cbm per capita in Syria and 847 cbm per capita in Iraq).⁷ Turkey is currently at 2,719 cbm per capita, but this number has been declining exponentially since the 1960s—and the local average in its arid southeastern parts, where the Euphrates and Tigris originate, could be even lower. In either case, Turkey is projected to experience high water stress by 2040.⁸

At 80% of total usage, agriculture is the largest water consumer in the region,⁹ and it could significantly suffer from the loss of river flows. Crop yields in Iraq might decline nearly 20% by 2035 due to water deficit.¹⁰ Increased water demand from agriculture due to higher temperatures and expanded irrigation will also worsen the water scarcity for the whole basin.¹¹

Coupled with poor water management, the real-world impacts of these changes already can be observed in this fragile basin, where the risk of sociopolitical conflict is growing because of increased competition over dwindling water resources.¹² Iraq has repeatedly asked Turkey to release more water in 2018, 2022, and 2023 due to drought conditions.¹³ Although the risk of military conflict between the countries is currently low, tensions between Iraq and Iran are also elevated due to Iraq's claim that Iran is cutting off river flows into Iraq and diverting them to a receding Lake Urmia.

Current problems and their historical context

Historically, there have been attempts to establish a management framework in the Euphrates-Tigris River Basin to alleviate uncertainty and scarcity, but most of these efforts have failed for various reasons. These failures can be linked to a lack of trust, domestic politics, and disagreements over legal assumptions.

Up until the 1970s, the main challenge in the basin was flooding, and the relative abundance of water both minimized the conflict over sharing it and negated the need for a water sharing structure.¹⁴ After the countries began constructing large dams in the 1960s, claims over water rights on the rivers grew more competitive.

When the construction of the Keban Dam began on the Euphrates in 1966, Turkey guaranteed an average of 350 cbm/s of flows to Iraq and Syria—a step taken in response to project donor USAID's desire to avoid downstream harm. After the Keban Dam was completed, however, its filling coincided with a drought and the filling of the Tabqa Dam in Syria. This led to the first major water crisis between the countries in 1975, when Iraq blamed Syria for the dramatically reduced river flows, and Syria defended its position by accusing Turkey of holding back the water.¹⁵ As Karakaya Dam construction began in 1976, Turkey increased its promised flows to 500 cbm/s to guarantee the World Bank funding for the project.¹⁶

In the 1980s, even amidst the political turmoil in the region,¹⁷ there were still attempts to build dialogue around water issues. Turkey and Syria signed protocols on water for the first time in their history in 1987. Syria agreed to cooperate

with Turkey on security matters and accepted Turkey's "first right to use" the Euphrates-Tigris waters; in exchange, Turkey guaranteed 500 cbm/s of flows directly to Syria.¹⁸ Turkey later claimed that Syria was not abiding by the protocol's terms, however, and argued that it was not obliged to follow its commitments either. Syria and Iraq also signed an agreement on sharing Euphrates River waters in 1989 in which Syria agreed to release 59% of its flows from Turkey to Iraq.

Tensions continued to increase in the 1990s. Iraq demanded several times that Turkey increase promised flows from 500 to 700 cbm/s. While the Atatürk Dam was filling, Syria claimed that the flows had fallen well below the agreed 500 cbm/s, to 300-350 cbm/s. In 1996, Syria and Iraq, with the backing of the Arab League, campaigned to stop the construction of Birecik Dam in Turkey.¹⁹

In the 2000s, there was a brief period of enhanced dialogue and attempts for basin-wide initiatives. In 2009, Turkey and Syria agreed to pursue joint projects like the Friendship Dam on the Orontes River, which signaled improved trust and goodwill. They also agreed to cooperate on water quality, drought, flooding and climate change issues.²⁰ However, with the outbreak of the Syrian civil war in 2011 and Turkey's support for Syrian rebel factions, all diplomatic dialogue between Turkey and Syria was suspended indefinitely and the construction of the Friendship Dam was halted.²¹

Iraq and Turkey's dialogue from 2000s onwards similarly focused on cooperation over water resources, drought and flood management, irrigation efficiency, business partnerships, data collection and exchange,²² with a desire to

include Syria in some of these efforts.²³ However, some advocacy groups criticized this cooperation effort as opportunistic on Turkey's part. Several of them argued that it mainly serves the economic interests of Turkey, because Iraq would have to directly invite Turkish conglomerates, which are usually known for their close ties to the Turkish government, to participate in the bidding processes for joint projects.²⁴

Domestic politics and legal assumptions

With the headwaters of both rivers mainly within its borders, Turkey has an upstream advantage over Syria and Iraq, which removes most of the incentives for Turkey to cooperate with them. Indeed, some commentators have argued that this hydro-geographic advantage elevates Turkey to the status of a hegemon.²⁵

The three countries also have fundamental disagreements over applying the international water law and sharing the flows of the Euphrates and the Tigris. Turkey advocates for the "no significant harm" and "equitable utilization" principles—which assert that the distribution of water should be determined based on needs, productivity, and utilization, and aim to maximize the basin-wide benefits.²⁶

Turkey also argues that it has sovereignty over all natural resources within its boundaries—including waters that eventually cross borders—and liberally exercises its upstream advantage. One example is the Southeastern Anatolia Project, an expansive hydropower, irrigation, and socioeconomic development project that aims to boost the economy of Turkey's historically underdeveloped and underinvested Kurdish-majority southeastern region.²⁷

Iraq and Syria argue that they have co-sovereignty over the rivers' governance, and claim "historical equal rights" over water quantities as Turkey does.²⁸ Agricultural water is strongly associated with the two countries' national identities, and they argue that, until the construction boom, they could use the river waters without any limits whatsoever. Hence, any new reduction in water quantity represents a loss of their historical entitlement. This situation also triggers Iraq and Syria's fears of food security, as both regimes (especially Syria) have historically relied on the rivers' water to a great extent to maintain food self-sufficiency,²⁹ survive embargoes, and preserve their alliance with farmers.³⁰

The countries disagree on the hydrology of the river system as well. Turkey treats the rivers as a single system, claiming that they are connected via Iraq's Tharthar Channel and merge before discharging into the Persian Gulf. Iraq and Syria both object to this approach and seek to negotiate the waters of the two rivers separately.³¹ Iraq, in particular, claims that the single-system approach would disproportionately benefit Turkey, and it believes that the separate-systems approach would result in more water allocations to Iraq and Syria.

There is also disagreement over whether the rivers are international or transboundary resources. Syria and Iraq view the Euphrates and Tigris as "international," whereas Turkey defines them as "transboundary." For Syria and Iraq, the international designation subjects the rivers to international water law and third-party intervention. From Turkey's perspective, the rivers are transboundary resources. Thus, any disputes over them should be resolved among the three countries without third-party involvement—as demonstrated by negotiations over the con-

struction of Keban and Karakaya dams, when USAID and the World Bank requested minimum flow commitments from Turkey.³²

There is also contention over the applicable legal framework for the river systems, which stems from Turkey's opposition to the UN Watercourses Convention of 1997. The UNWC provided a foundational framework for transboundary water management and promoted institution-building, cooperation and environmental protection, but has been criticized for having a limited scope and failing to address climate change.³³

Turkey voted against the UNWC due to Article 7 of the agreement, which emphasizes "avoiding causing harm" to other countries that use the same transboundary water resource, and "eliminating or mitigating such harm" if it is unavoidable.³⁴ In its objection, Turkey argued for "reasonable and equitable utilization" of the water sources and only avoiding "significant"³⁵ harm" to other riparian countries.³⁶ It is highly likely that this objection was influenced by the UNWC's possible ramifications for Turkey's development projects on the Euphrates-Tigris, such as the Birecik Dam, which was subject to an aggressive cancellation campaign by Syria and Iraq in 1996—the year before the UNWC passed.

Establishing a trilateral management framework

Iraq, Syria, and Turkey currently do not have a formal framework to manage the Euphrates and Tigris Rivers. The closest proposal to such a framework was Turkey's Three Staged Plan, which included provisions on independent data collection, taking inventory of land resources, and evaluating the water supply and demand.

This plan was strongly opposed by Iraq and Syria on the basis that the framework would benefit Turkey the most. They instead proposed their own “mathematical formulas” to determine the allocations based on self-reported water use and demand.³⁷

Iraq’s pleas with Turkey for increased water releases from the Turkish dams at least three times in the last five years demonstrates the urgency of the need for a formal water sharing protocol.³⁸ Disconnected from the region’s intensifying climate swings and droughts, this unstructured “pleading” method is becoming increasingly unsustainable and diminishes the likelihood of achieving a sustainable water agreement,³⁹ as the risk of conflict and severe loss of livelihoods is escalating.⁴⁰ However, there are still opportunities for cooperation among riparian countries, as evident from the past bilateral agreements, despite the detrimental impact of climate swings on negotiations.⁴¹

Flexibility and specificity through a basin-wide management framework would encourage cooperation.⁴² Such a framework would also provide a sense of certainty to all parties, especially during droughts, and allow for better planning under worsening circumstances. Given the opposing perspectives over the basin, however, such a framework is not possible without compromises, goodwill, and trust. It is also critical to acknowledge the Syrian civil war’s role in obstructing dialogue, as well as the animosity between Syria and Turkey. Without a clear communication channel between the two governments, a sustainable trilateral solution to the basin’s woes will be elusive.

Fundamental principles for a sustainable management framework

The countries need to be pragmatic about the basin’s political and climatic reality: A rigid water-sharing regime that does not account for climate swings will lead only to more conflict, rather than peace. Accounting for both rivers as a single basin would enhance the adaptability and flexibility of the management framework. Inclusion of third parties that previously influenced water regimes in negotiations would further exacerbate trust issues between the three countries, but neutral parties such as the United Nations (either as an observer or a communication channel) could encourage dialogue and compromise. Lastly, the status quo already favors Turkey, which has been aggressively pursuing dam and irrigation projects⁴³ and doesn’t have many incentives to forego its upstream advantage. However, Turkey still needs to recognize that water insecurity and consequent humanitarian crises in neighboring countries, like the war in Syria or ISIS on the Iraq-Syria border, engender a spillover risk that would eventually threaten its own citizens and national interests.

Considering an idealistic scenario where the diplomatic relations between Turkey and Syria are restored and there is goodwill on all sides, a Euphrates-Tigris Basin management framework should include three fundamental elements:

- **Equitable and adaptive distribution of both risks and rewards** means that the allocation regime should have flexibility to accommodate the needs and demands of countries, as well as the rivers’ ecosystems. Water allocations should not be bound by pre-set and inflexible quotas or minimum requirements, but instead tied to the hydrologic conditions of the rivers and chang-

ing demands of the countries. Efficiency improvements should be encouraged and rewarded.

- **Scientific and diplomatic transparency** emphasizes the importance of objective and independent data collection and scientific research to inform the water allocation process. Transparency in data and scientific methods would ideally bolster diplomacy by encouraging meaningful and lasting cooperation among the countries and reconciling different assumptions over the rivers.
- **The new, uncertain reality and scarcity in the basin caused by climate change** should be acknowledged and incorporated into the negotiations and management decisions. The three countries have to reconcile with the basin's climate reality: The rivers can no longer meet the current water demand. They will need to take individual responsibility in demand management while recognizing each other's needs and con-

straints and reach a compromise on their conflicting assumptions.

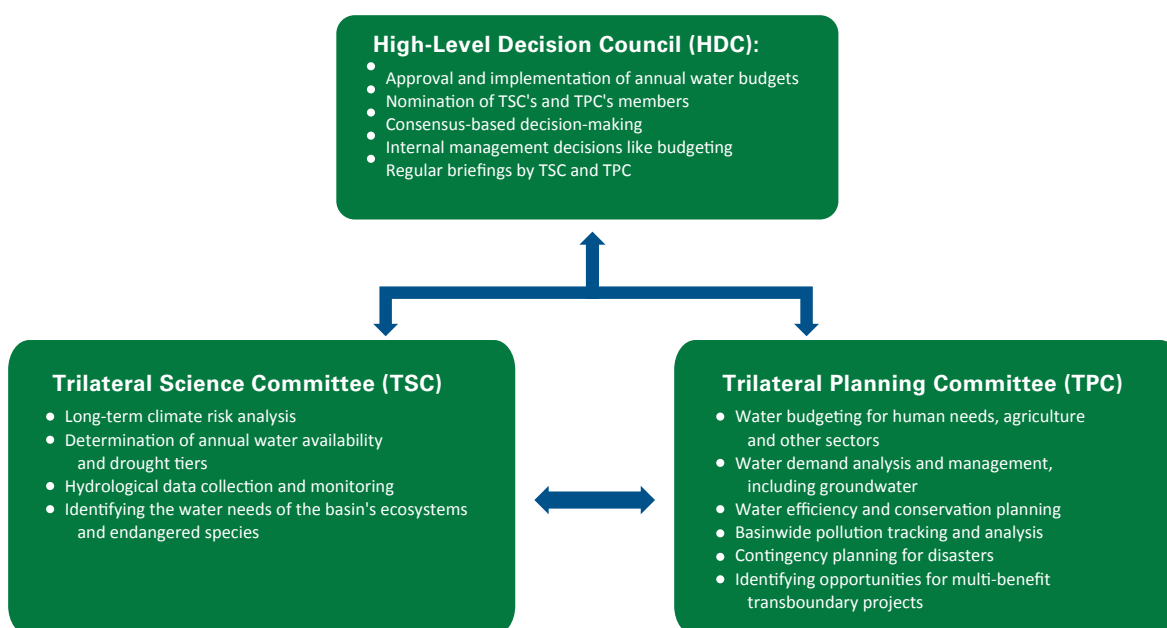
- **Structure of the management framework**

The management framework should have three pillars: (1) trilateral organizational structure; (2) transparency and trust-building reforms; and (3) cross-sectoral investments and regional development.

Trilateral organizational structure

A trilateral organizational structure should consist of (1) a High-Level Decision Council, (2) a Trilateral Science Committee, and (3) a Trilateral Planning Committee. All three organizational units would require consensus on their decisions. Central governments would pay an equal proportion into a common budget and cover the salaries of staff, as well as the technical infrastructure. Once placed in the committees, the members should have term limits and protections to shield them from political pressure.

Figure 3: Proposed organizational chart, with committee and council mandates



- High-Level Decision Council (HDC):** HDC should have cabinet leaders or their delegates from each country to oversee the implementation of the management framework with equal voting power. The members would be responsible for appointing and approving members of the Trilateral Science Committee and the Trilateral Planning Committee. The HDC would also make decisions on budget, receive briefs from the science committee and evaluate the partnership opportunities identified by the planning committee.
- Trilateral Science Committee (TSC):** This committee should consist of credible non-partisan scientists and scholars who are not public officials. The candidates for this committee would be nominated by their respective countries' representatives in the HDC and approved by the other two countries' representatives. The committee would be responsible for modeling and updating climate scenarios and identifying the risks for the basin. It would also create a drought tier system and determine both the annual drought tier and the expected water availability in the basin based on meteorological data. This would inform the water allocation decisions by the planning committee. The committee would also identify the water needs of the basin's ecosystems and endangered species and monitor the water levels throughout the basin to make sure all water users (including the ecosystems) receive their allocation.
- Trilateral Planning Committee (TPC):** This committee, following the same member nomination-consensus model as TSC would be responsible for translating the TSC's annual drought tier and water availability projections into annual water allocations and

planning the long-term water sustainability of the basin. The annual allocations would be calculated based on the TPC's independent estimates of human need for water in each country, as well as water demand from agriculture and other sectors. These demand estimates would also account for local water resources like rainfall and groundwater. As part of long-term planning, the TPC would identify opportunities for agricultural water conservation (crop switching, irrigation efficiency, fallowing etc.) and local water supply projects like wastewater treatment, recycling, and groundwater recharge, as well as other cross-sectoral and transboundary projects such as renewable energy-water exchanges, or investment in recycling in exchange for more water allocation or storage space.⁴⁴ The TPC would also identify pollution hotspots across the basin, plan and coordinate ecosystem restoration projects and create disaster contingency plans. And, finally, the TPC would also brief the HDC on project and partnership opportunities and projected water allocations in the basin.

Transparency and trust-building reforms

For a long time, data in the basin has been treated as a strategic asset to use as leverage in negotiations, instead of as an essential element of collaboration and sound decision-making. Thus, an open data model needs to be embraced for the framework to function. The three countries should agree to freely sharing data, modernize data collection, make joint investments in water quality and quantity monitoring, and establish an online open data portal.

The data needs to be freely available not only to these governments, but also to the trilateral

committees and the public in order to encourage research, innovation, and better policymaking in the basin. The committees should be authorized to utilize, expand, and upgrade the existing data collection infrastructure if necessary.

Upstream countries should enable public input from downstream countries' civil societies for major projects. This can be achieved by allowing participation in domestic Environmental Impact Assessment processes for projects with potentially significant impacts for downstream countries.⁴⁵ In addition to encouraging democratic participation, this inclusive approach would give a voice to those who would experience the real-life impacts of these projects and foster goodwill and trust among the basin countries.

Cross-sectoral investments and regional development

Although climate change will challenge the Euphrates-Tigris Basin in many ways, there is also a great potential for the countries to develop their economies in collaboration and partnership with each other. One of the most evident areas of collaboration is on renewable energy. Climate-fueled droughts severely impact hydropower generation in the basin, which is becoming increasingly unreliable as a power source. For example, hydropower output in Turkey, which meets 20-30% of the country's electricity demand, was down 23% in 2021 due to dry conditions.⁴⁶ All three countries have noteworthy potential for non-hydro renewable energy, particularly solar, which is more reliable, scalable and less water-dependent than hydropower. A solar development strategy in the basin could boost energy security for all three countries, allow for more flexibility in water releases from dams, and enable a transboundary energy-water market where countries trade their excess solar energy.⁴⁷

Considering Iraq and Syria's approach to food security, the three countries could cooperate on food trade, especially during drought years, to ease these two countries' anxieties over food security, while building trust and goodwill among the basin countries. Another advantage of cooperation over food security would be for Turkey, which has been facing a food inflation crisis⁴⁸ and could benefit from Iraq's and Syria's milder winters and longer agricultural season. For example, water releases from Turkish dams could be increased in winter in exchange for produce from Iraq and Syria.

Conclusion

Climate-fueled droughts threaten the stability in the Euphrates-Tigris River basin, as well as the welfare of tens of millions of people whose lives depend on the rivers. The region is already suffering from the impacts of such droughts, like declining agricultural production and hydropower output, disruptions to urban water supplies, and drying marshlands in southeastern Iraq.

Iraq, Syria, and Turkey will need to resolve their current disputes over hydrological and legal assumptions. In this process, they will also need to reconcile their historical approaches to the rivers with the current reality and convince their water users to accept and prepare for the climate future of the basin.

A basin-level management framework, along with new transnational scientific, planning, and decision-making institutions will be needed in the basin for a unified response to climate change. This management framework will need to be based on impartiality, transparency, scientific integrity, and consensus-building to establish trust between the basin countries.

Additional cooperation on data-sharing, transparency and development projects on the energy-water-food nexus will also be needed to improve the livelihood of the basin's inhabitants and ecosystems.

Iraq, Syria, and Turkey should seize this moment to resolve their past disagreements, unite against climate change and droughts as a common adversary, and come to the table with

more willingness to cooperate and compromise. While the status quo benefits Turkey, all countries have more to win from a sustainable basin that fosters the economic and diplomatic ties in the region, certainty around water quantities, and reliable partnerships. It is also a moral obligation to ensure that everyone who calls the Euphrates-Tigris River basin home has access to adequate food, clean water, a livable environment, and a prosperous life.

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About the Author







Gokce Sencan is a climate and water policy researcher based in California. Her areas of expertise include droughts, water management, and public health impacts of climate change in Mediterranean climates. She has worked on issues like urban drought resilience, agriculture, freshwater ecosystems, water markets, groundwater management, and the energy-water relationship, and published various reports, policy analyses and fact sheets. In the MENA region, Gokce focuses on droughts, agriculture, food and water security, extreme heat, and green development. An active contributor to climate debates in Turkey, Gokce has previously worked as an intergovernmental affairs intern at the United Nations Environment Program in New York, and as a climate change research intern at the Istanbul Policy Center. She has bachelor's degrees in Chemical-Biological Engineering and Molecular Biology and Genetics from Koc University in Istanbul, and a master's degree in Environmental Science and Management from the University of California, Santa Barbara. Gokce speaks Turkish and English fluently, and Spanish with limited proficiency.

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