

Environmental Cooperation in Conflict Zones: Riparian Infrastructure at the Armenian–Turkish Border

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Abstract

Due to historical grievances, Armenia and Turkey experience severe international conflicts and do not maintain diplomatic ties. Yet, as a vestige of the Soviet period, when Armenia was not an independent country, both nations share the Arpacay/Akhuryan Dam, and riparian cooperation exists at the local level. We observed that local cross-border water institutions are authorized to manage the dam and do so via polycentric management principles. We suggest that such a devolved model of governance facilitates this unique cooperation. Furthermore, there is a positive relationship between private management of water resources in such areas and the ability to sustain cooperation. However, so far, the positive impacts of this cooperation on improving international relations have been little, if any. We suggest that what makes cooperation possible in this context also inhibits its expansion to broader peacebuilding. We also suggest that increased localization of management, coincident with improved relations, maximizes cooperation potential.

Keywords

Kura–Araks, Arpacay/Akhuryan Dam, transboundary water management, Armenia, Turkey, USSR, severe international conflicts, water cooperation, polycentric management, devolution

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Introduction

Primarily due to human-induced factors, stress on water resources is globally increasing at an alarming rate. In addition, the majority of surface and groundwater resources traverse national boundaries during their hydrologic cycle (Wolf, 2007). Transboundary freshwater systems thus establish hydrological interdependencies between countries. The use of the shared waters in one country may affect water availability for use in another country: seasonally (e.g., in case of flow changes through storage or other flow management infrastructure), quantitatively (e.g., in case of consumptive use), qualitatively, and over time (downstream development or water resources may foreclose future use upstream). These cross-border impacts invariably affect relations among the countries sharing and depending on the same water resources. They may catalyze cooperation, which Wolf, Yoffe, and Giordano (2003) categorize as verbal, political, and military support, where it is perceived as mutually beneficial. Navigation for river transport and trade is one of the oldest and most established forms of cooperation along transboundary rivers. Other issues of country cooperation include information exchange for flood forecasting and early warning systems to prevent damage, and coordination on upstream storage and flow releases to smoothen seasonal hydrologic extremes and ensure water availability in dry seasons. Furthermore, preventing collective flood risk and water quality management, through wetland restoration and green infrastructure, are important vehicles of cooperative conservation (Conca & Weinthal, 2018).

Enabling Conditions for Cooperation

A simple hydropolitics approach would indicate that countries cooperate when the net benefits of cooperation are perceived to be greater than the net benefits of noncooperation and when the distribution of these net benefits is perceived to be fair.

The benefits and costs considered in this calculation are not only of a financial or economic nature; they may also involve considerations such as national security, stability of a government, and social and environmental well-being. For in-country water-related activities with transboundary impact, such as the construction of a hydropower dam plus reservoir, which can provide flow control, cooperation may happen when mutual benefits outweigh the costs of cooperation. Furthermore, cooperation may be galvanized when the benefits that can be achieved for the country in whose territory the operation is located are greater than when acting unilaterally. This may be possible if the downstream country offers payment, for example, for flood prevention or other benefits received through upstream flow management. Cross-country projects involving the territory of two or more countries generally take place only in the presence of a joint understanding between those who agree to it that the benefits outweigh the costs (Subramanian & Brown, 2012).

Perceived Risks and Opportunities

Countries consider not only access to benefits but also exposure to risk. They may therefore discount benefits based on perceived risks of engagement in cooperative solutions (Subramanian & Brown, 2012). When faced with opportunities for cooperation that would bring benefits to their country, policy makers decide whether to cooperate based on their risk analysis, political base, and alliances. Individual decision makers in riparian countries operate within the political context of their countries and consider external and internal drivers of decision-making. Decisions are informed by the perceived risks of engagement, that is, the perception that an act of cooperation will expose the country to harm, will jeopardize something of value to the country, or will threaten the political future of individual policy makers (Subramanian & Brown, 2012). For instance, in the mid-1980s, when the riparians of the Danube River came together, they faced not only the possibility of improved water-quality water quality monitoring (and subsequent improvement) but also the opportunity for the long-sequestered Western and Eastern European countries to intensify communication, at least at the technical level. Likewise, the cooperative stance of Aral Sea riparians in the early 1990s has been attributed to their decision to seize the political opportunities for investments in environmental remediation (Subramanian & Brown, 2012).

For each country, the possibilities of cooperation and the discussion of benefits can trigger an analysis of benefits and costs as well as a consideration of risks and opportunities; the higher the benefits and opportunities relative to costs and risks, the greater the likelihood of sustained cooperation (Subramanian & Brown, 2012). Perceptions of political risks and opportunities might influence country decisions over cooperation, and risk reduction and opportunity enhancement might change those perceptions over time (Subramanian & Brown, 2012).

The level and type of risks will likely vary depending on both the scope of the agreement and the hydro-political context of the basin in question. In cases, where an in-country project involves the risk of significant transboundary harm, other affected riparian countries may demand some sort of guarantee from the implementing country that these risks are mitigated. For instance, affected countries may ask for a guarantee that any harm that occurs will at least be repaired or compensated for. They may also ask for the establishment of a mechanism that would guarantee that large storage and flow regulation of dam infrastructure be operated to mutual benefit. Thus, depending on the tools that are used, the costs of risk of harm may be turned into transboundary benefits (Leb, Henshaw, Iqbal, & Rehberger Bescos, 2018).

Tools that promote compliance or that can effectively hedge risks may help tip the balance toward cooperation among riparian countries on operations with transboundary impact. This may be the case where the mutual benefits that can

be achieved through cooperation are greater than benefits that can be achieved through unilateral action. Hence, it is important that riparian countries cautiously examine the benefit and cost potential and identify suitable tools that can facilitate optimization of benefits, even when there is ingrained international conflict (Leb et al., 2018).

Identifying Effective Cooperation

There is no recipe for cooperation on transboundary waters projects. In real life, there are numerous ways of cooperation that countries can undertake to their mutual advantage, each of which contains different costs and benefits (Leb et al., 2018). In fact, each basin is unique, and the type of proper cooperation should be considered accordingly (Leb et al., 2018). The appropriate type of cooperation depends on many factors, such as hydrological characteristics, the economics of cooperative investments, the number of interested or affected riparian countries, the costs of engaging, and any potential risks (Leb et al., 2018). According to Grey, Sadoff, and Connors (2016), these factors play a significant role for countries to determine whether they should cooperate. For example, in some cases, information sharing and basinwide strategic assessments may be sufficient to promote cooperative management, while in other cases, joint actions may be needed on environmental flow regulation, water storage, and drought and flood mitigation to yield significant net benefits (Leb et al., 2018).

A cooperation continuum can be conceived, from unilateral action (independent, nontransparent national planning and management) to coordination (sharing information regarding national planning and management) to collaboration (adaptation of national plans for mutual benefits) to joint action (joint planning, management, or investment; Sadoff & Grey, 2005). It is vital to underline that this continuum is nondirectional, as more cooperation is not always better. It portrays increasing levels of cooperative effort but does not suggest that this is a goal in all basins. The continuum is dynamic, as various points are appropriate for different activities at different times. Countries may adapt their activities to increase or decrease the intensity of their cooperation in response to new opportunities or developments within or outside the cooperative process. Finally, the continuum is also iterative. There are repeated, discrete opportunities for cooperation, and the success of earlier cooperation, particularly in terms of realized benefits, will likely promote increasing cooperation. In this iterative context, riparian countries are aware that noncooperative actions may impact on and may diminish future cooperation (Grey et al., 2016).

Cooperating Despite Conflicts

Cooperation over transboundary waters is complex, as it depends on many variables. However, one of the most important variables is international

relations, as the management of transboundary waters is often considered high politics.¹ Transboundary water cooperation usually occurs in cases where sharing countries have favorable relations, while transboundary water conflicts, which Wolf et al. (2003) categorize as verbal, political, and military hostile actions, are common among countries that have strained relations. Most of the earth's surface waters are transboundary (Wolf, 2007), while many countries sharing those resources have ongoing disputes. Hence, it is vital to generate knowledge regarding initiating and sustaining transboundary water cooperation among conflicting countries.

The literature on hydropolitics has revealed several examples of transboundary water cooperation despite severe international conflicts (e.g., Altingoz et al., 2018; DeStefano et al., 2012; Wolf et al., 2003). However, these instances have almost entirely been limited to systems where national or provincial governments are negotiating through high-level diplomacy, except for a few cases, for example, Israel–Jordan picnic table talks (Jagerskog, 2003) and the India–Pakistan Indus River Basin Commission (Biswas, 2011). Thus, there is a knowledge gap regarding how transboundary water cooperation can arise when national governments have little or no diplomatic dialogue (e.g., closed borders, unrecognition, no embassy), which is the case in some shared basins where political tensions among riparian countries are high.

Very few studies have considered examples of cooperative management of transboundary waters despite severe international conflicts and absence of diplomatic dialogue. Some of these studies revealed that the perception of how vital transboundary water resources are for the concerned countries does play a significant role in engagement. For instance, in the Enguri Dam² (Sabonis-Helf, 2017) and Jordan Basin (Lowi, 1995) cases, the shared waters are jointly managed mainly due to the importance of the source, while the parties have experienced severe conflicts over time with each other, and they do not have formal diplomatic dialogue. In other cases, such as between India and Pakistan, there may be conflict, but—at least—there are diplomatic relations between the antagonists (Adeel & Wirsing, 2017). Some studies underlined the significance of a mediating third party. For instance, the Tirifoni Canal (Aptsiauri, 2015), Nicosia sewerage system (United Nations Development Programme, 2018), and the Gazivoda Lake (Krampe, 2017) are managed cooperatively with the arrangements of the European Union and the United Nations, while at the same time, there have been instances of interparty conflict, such as violence, closed borders, and sanctions.

Constructing Hypotheses

In this section, we consider the structural aspects of the aforementioned example cases and review the relevant literature to craft testable hypotheses. The cases are presented as a heuristic way without detailed analysis due to space

limitations, and more in-depth description of the cases can be found from the citations provided.

Hypothesis 1: Management scale has an influence on cooperation outcome.

The aforementioned cases suggest that where the focus is on technical discussions rather than politics, is common, and usually done by decreasing management level from high politics (i.e., foreign affairs or defense ministry) to lower politics (i.e., water-related ministries,³ branches of water ministries, local water departments, etc.). In fact, the literature argues that the management scale of transboundary waters is significant for cooperation to occur and sustain.

The literature around the end of the Cold War deemed water as a source of future wars. For example, Homer-Dixon (1994) studied the links between environmental scarcity and violent conflict and underlined that scarcities of natural resources could contribute to violent conflicts in poor countries. In fact, many authors considered water to be the *new oil* and predicted water as a potential source of future wars (Bullock & Darwish, 1993; Homer-Dixon, 1994a, 1994b; Starr, 1991). In addition, the literature deemed transboundary water management as a political boundary matter and considered national governments to be capable of administering any agreements (Akamani & Wilson, 2011; Blatter & Ingram, 2000). Furthermore, the literature considered smaller scale management problematic, as there was a perception that as geographic scale decreases, water conflict possibility and violence intensity increase (Wolf, Kramer, Carius, Dabelko, & Crawford, 2005). Hence, water conflicts were supposed to usually occur on smaller scales such as among tribes, water sectors, cities, states, provinces, and so forth (Wolf, 1998). For instance, Vinogradov (1996) considered the dissolution of the Union of Soviet Socialist Republics (USSR), a source of transboundary water conflicts in the future among the newly formed former soviet countries. Nonetheless, only a few transboundary water conflicts occurred in those regions (Water Conflict Chronology, 2018), such as the conflicts over the Aral Basin among its various riparians, and there has been cooperation via joint management committees and agreements (United Nations Economic Commission for Europe, 2009).

In the past two decades, the literature began arguing that actually national-scale management might be problematic due to its scale mismatch problem (Akamani & Wilson, 2011; Cash et al., 2006). For instance, involvement of national government authorities in local water management issues may create additional challenges, as it brings the international politics into the negotiations, which at times gridlock progress by limiting technical discussions and promoting political debate instead. In addition, state-centric management might limit effective communication among concerned parties for joint decision-making, as it may not involve concerned stakeholders in the process.⁴ Furthermore, the scale mismatch problem of the state-centric systems might cause resilience

issues (Bodin & Crona, 2009) to long-term structural changes (Rijke et al., 2012) due to potential lack of stakeholder interactions (Akamani & Wilson, 2011).

In the past few decades, despite the fact that in many cases transboundary water management is still conducted by state-centric systems, the literature began promoting the polycentric management systems (see Akamani & Wilson, 2011; Dietz et al., 2003; Ostrom, 1999; 2012; Pahl-Wostl, 2013; Rijke, 2012), in which there are multiple centers of decision-making authority with no dominating central authority (Ostrom, 1999). This wave of the literature discusses that allocation of decision-making and implementation authority among different scales addresses the state-centric approaches' scale mismatch problem (Akamani & Wilson, 2011). It also grows communications and interactions among parties to build trust, which is needed for increasing cooperation (Ostrom, 2012). In addition, according to the literature, polycentric systems are assumed to have a higher resilience, defined as the ability to maintain its structure, identity, and function during a disturbance as well as the capacity to reorganize, learn, and adapt (Folke, 2006), to uncertainty and future changes (Pahl-Wostl, 2007, 2009). The polycentric management does this via its trust and communication (Dietz, Ostrom, & Stern, 2003; Folke, Hahn, Olsson, & Norberg, 2005), devolution in management, joint decision-making, and accountability components (Akamani & Wilson, 2011).

Upon considering the examples we mentioned previously as well as the theoretical findings, we hypothesize that polycentric management enables transboundary water cooperation in cases where there are interparty conflicts and no diplomatic dialogue.

Hypothesis 2: Increased localization of management, coincident with improved relations, maximizes cooperation potential.

We also noticed that in our example cases, similar level of cooperation occurs even though the management scales vary in size. For instance, in the Nicosia sewerage system, the management scale is relatively higher than the other cases, while the interparty relations are more favorable. In the other cases, it is the opposite. For example, the Enguri Dam and the Tirifoni Canal are being dealt with at a lower management scale and within worse international relations. Hence, perhaps management scale and international relations alone are not determinant of cooperation likeliness, rather their combination is. We argue that as management scale increases and international relations worsens, cooperation likeliness decreases accordingly and vice versa (supported by the literature such as Wolf et al., 2003). Based on the examples analyzed, the second hypothesis is that increased localization of management, coincident with improved relations, maximizes cooperation potential in case of severe international conflicts and the absence of diplomatic dialogue between parties.

Figure 1 lays out a heuristic stylized diagram of the insights derived from our analysis and shows the spectrum of cooperation when international relations are

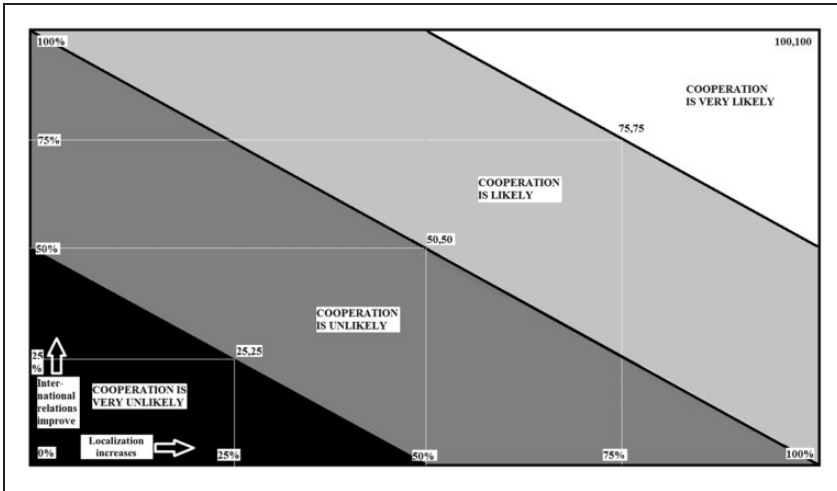


Figure 1. Correlation of warmth of international relations, management scale, and transboundary water cooperation.

favorable and transboundary water management is conducted at relatively smaller scales (the higher the value on the x-axis is the smaller, the management scale is, while the higher the value of on the y-axis is the better, the international relations are). As management scale increases and international relations worsens, cooperation likeliness decreases accordingly.

One could use this diagram to also generate an index of cooperation that could be linked to survey data or other metrics, similar studies of which have been conducted by some researchers (e.g., see Wolf et al., 2003). In the white triangle of the diagram, cooperation is very likely, as international relations are good while management scale is low. In the light gray triangles, cooperation is likely, as good international relations and high-level management or low-level management and unfavorable international relations or medium international relations and management scale exist simultaneously. In the dark gray triangles, cooperation is unlikely, as bad international relations and low-level management or high-level management and good international relations or medium international relations and management scale exist simultaneously. In the black triangle, cooperation is very unlikely, as international relations are bad while management scale is high level.

Hypothesis 3: Polycentric governance can sustain local cooperation but does not lead to national-level environmental peacebuilding (EPB).

Polycentric management might be key to the cooperation in this context; however, it might have weaknesses. For instance, there is extensive EPB literature

suggesting that cooperation over transboundary waters might extend to broader contexts as well as improve relations among sharing countries (Ali, 2007, 2018; Conca, 2012; Conca & Dabelko, 2002; Khagram & Ali, 2006; Pahl-Wostl, Conca, Kramer, Maestu, & Schmidt, 2013; Wolf et al., 2005). All the cited examples have severe interparty conflicts and no diplomatic dialogue. However, involved countries manage their waters cooperatively with polycentric management principles. However, no apparent improvement of international relations has been observed (see Alharmoosh et al., 2014, for a discussion supporting this claim on the Jordan Basin). The reasons behind this problem could be affiliated to many distinct parameters. However, perhaps one of the most significant reasons is the disconnection among the central governments and the water managing units, caused by the polycentric management. Therefore, our third hypothesis is that polycentric management inhibits cooperation to expand to broader settings of conflict resolution. Thus, the localized cooperation remains an issue of *low politics* and does not translate into instrumentally changing the high politics of war and peace.

Testing the Hypotheses

To test these three hypotheses, we use a case analysis of the shared Arpacay/Akhuryan Dam on the bordering Arpacay/Akhuryan River between Armenia and Turkey, as both countries have had severe conflicts with each other and have no diplomatic dialogue, while they cooperatively manage the dam via polycentric management, where the local cross-border water institutions are authorized to manage the dam.

First, we provide background information regarding the border area as well as the Arpacay/Akhuryan Dam. Next, we present a brief description of the regulatory and institutional frameworks that govern the management of the Arpacay/Akhuryan Dam. Then, we analyze the current implementation of these frameworks and discuss the effectiveness of the joint management. Subsequently, we assess the reasons behind the resilience of this cooperation. Next, we discuss the qualitative correlation between management scale, international relations, and cooperation likeliness. Then, we deliberate its role for an improvement of relations between adversarial neighboring states. To conclude, we summarize our findings.

Methods

Initial archival research on the Arpacay/Akhuryan Dam was performed through a detailed forensic review of the agreements between Turkey and the USSR as well as regulatory decrees and journalistic coverage of the case. During the review of secondary sources, a number of initial contacts were identified. Semistructured interviews were conducted with individuals selected among the

initial contacts and snowball sampling of additional individuals were contacted for further interviews. The interviews were based on the current and past management practices of the dam. All the interviewees were kept anonymous due to political sensitivities on the topic. Because all interviews had to be anonymized and deidentified in terms of origin and date, we will not provide individual interview citation information for each statement made but will rather provide the content analysis directly. Backup of all interview transcripts and translations are maintained by the research team for verification by future researchers if required.

The Arpacay/Akhuryan Case

In this section, first, we provide background information regarding the border area as well as the Arpacay/Akhuryan Dam. Then, we explore regulatory and institutional frameworks governing the dam and their application to reveal the reasons behind the resilience of this cooperation.

The Armenian–Turkish Border

The border is about 204 miles (328 km) in length and continues in a vertical direction. It is very windy, as it goes through various mountains and rivers. The border has been closed since 1993, after the armed conflict between Armenia and Azerbaijan, a country in the Caucasus that has very close ties with Turkey.

The northernmost quarter of the border goes through mountains and is sparsely inhabited. The quarter below it is formed by the Arpacay/Akhuryan River, the dam and its reservoir, into which the Camizbogan, Karahan, and Kars creeks from the Turkish side and the Akhuryan creek from the Armenian side discharge. This quarter is more densely populated. According to the Köppen climate classification, the region near the dam has humid continental climate. The temperature in the region is ranging from up to $-35^{\circ}\text{F}/-37^{\circ}\text{C}$ in winter to up to $96^{\circ}\text{F}/35.4^{\circ}\text{C}$ in summer (Turkish State Meteorological Service, 2018). The region is high steppe with grassland and has growing water need while experiencing water scarcity. In the region, animal husbandry and farming are the main source of income, both of which place pressure on regional water resources. There is a nearby Ramsar site named Kuyucuk Lake, a stop for migratory birds during their travel from Africa to Europe (Ramsar, 2009). The area is attractive for birdwatching and nature tourism. In 2009, it received the European Destination of Excellence award (Ramsar, 2009). However, overgrazing, disturbance for birds caused by cattle, pollution from surrounding areas, and livestock farming harm this lake (Ramsar, 2009). In addition, the Kuyucuk Lake is impacted by the water scarcity in the region. The depth of the lake was 13 m in 1997 (Hurriyet Daily News, 2014). However, the water depth decreased in years, and the lake entirely dried up in 2014 and 2018. The region needs water

due to growing demand and water scarcity, and construction of new dams is discussed. However, due to the water scarcity, a new dam on the Arpacay/Akhuryan River could greatly harm the birds that use this Ramsar site (Sekercioglu, 2014). After flowing for about 30 miles (bird's eye distance), the Arpacay/Akhuryan River joins the Aras River, a major river making the south half of the border between Armenia and Turkey.

There is no other major water infrastructure other than the dam on the shared Arpacay/Akhuryan River as well as its tributaries. To date, no remarkable upstream or downstream opposition regarding this dam has occurred nor consequences of this dam for the region have been a discussion point.

The Arpacay/Akhuryan Dam

Before the USSR dissolved, a few of its constituent republics shared many water bodies with Turkey in the Southern Caucasus region. Turkey and the USSR signed numerous agreements regarding the management of these water bodies. One of the most significant outcomes of these agreements was that Turkey and the USSR jointly constructed a dam on the boundary Arpacay/Akhuryan River and cooperatively managed it with joint institutional frameworks, formed by the local cross-border water institutions located nearby the dam, between the completion of the construction in 1983 and the USSR's dissolution in 1991. Turkey and the USSR equally shared the dam's water, which they primarily used for irrigation, fishing, and domestic purposes. This dam holds 525 million m³ of water, irrigates approximately 104,000 ha of agricultural land in Armenia and Turkey, and comprises 20 km of the border (Soghoian, 2009). It is the main water source for this water scarce region (Altingoz et al, 2018).

Upon the dissolution, many nations under the administration of the USSR declared their independence and founded new countries. Because those newly founded countries were found along the former USSR borders, they replaced the USSR in many transboundary water basins. As a result, Armenia became the new managing party of numerous water bodies and infrastructure including the Arpacay/Akhuryan Dam shared between Turkey and the USSR between 1983 and 1991. While Armenians and Turks have had severe conflicts (closed borders, hostile statements, no embassy, etc.) since World War I, the cooperation initiated in the Soviet era continued at the same level, if not more, between them (Figure 2).

Regulatory and Institutional Frameworks

The regulatory and institutional frameworks that provide a foundation for the joint management of the Arpacay/Akhuryan Dam center on treaties established in 1927, 1963, 1973, 1990, and 2009. All the treaties were signed between Turkey and the USSR, except for the 2009 agreements, which were signed between Armenia and Turkey. These frameworks are summarized in the following:

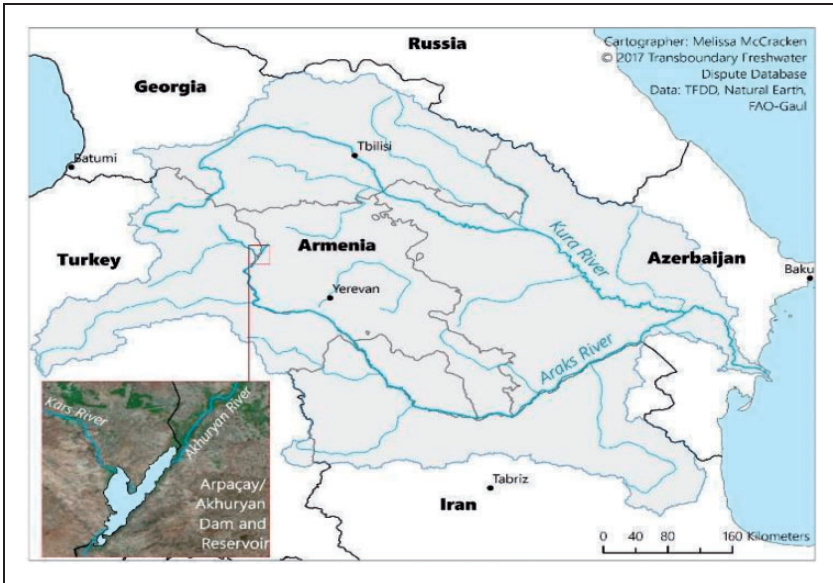


Figure 2. The location of the Arpaçay/Akhuryan Dam in the Kura–Araks River Basin (Altingoz et al., 2018).

The 1927 agreement. In 1927, Turkey and the USSR signed the “Protocol on the Beneficial Uses of Boundary Waters” (Agreement, 1927). The 1927 agreement established the legal regulatory framework for future agreements over boundary as well as transboundary waters between Turkey and the USSR. The future agreements adopted many of the provisions from it (Agreement, 1963, 1973). Besides, according to the 1927 agreement, it was signed “for the friendship” between Turkey and the USSR. With this agreement, Turkey and the USSR agreed

- to equally share the water from their boundary water resources;
- to permit the parties to build water infrastructure including dams on internal waters as long as it would not “harm” the other country;
- to establish the “Joint Boundary Water Commission” (JBWC), composed of two members from each country, to manage the use of shared waters;
- the JBWC to meet at least twice a year (between June 15 and July 1 and between September 1 and September 15) to control the water levels of the transboundary waters;
- to require the parties to respond to meeting requests within 15 days and the JBWC to meet no later than 3 months after the request; and
- to have the governments settle any conflict that the JBWC fails to resolve.

The 1963 agreement. Turkey and the USSR established several protocols and memoranda of understanding for the establishment of a joint dam on the Arpacay/Akhuryan River, in the early 1960s. Finally, in 1963, they signed the “Protocol on the Joint Construction of the Arpacay/Akhuryan Dam” (Agreement, 1963). Per this protocol, Turkey and the USSR agreed

- to construct a joint dam on the Arpacay/Akhuryan River;
- to establish a joint committee with equal participation from both sides to manage the dam as well as the Arpacay/Akhuryan River;
- to put the joint committee in charge of preparing the annual and monthly operation schedules of the dam and overseeing the implementation of these schedules; and
- one of the parties to build the dam, while the other one would oversee the construction, which would be determined in a later agreement.

The 1973 agreement. In 1973, Turkey and the USSR signed the “Cooperation Agreement on the Construction of a Dam on the Bordering Arpacay River and the Constitution of a Dam Lake” (Agreement, 1973). The 1973 agreement acknowledged the validity of the 1927 and 1963 protocols. With the 1973 agreement, in addition to the provisions ratified in the 1963 treaty, Turkey and the USSR agreed

- the volume of the Arpacay/Akhuryan Dam to be 525 million m³ (138.7 billion gallons);
- to put the USSR in charge of building the dam, while Turkey was given the responsibility of overseeing the construction;
- to equally contribute to the construction expenses;
- to permit the construction workers to cross-borders when needed;
- to equally share the water allocated from the dam as well as the Arpacay/Akhuryan River;
- to establish the “Permanent Water Commission” (PWC) with three representatives from each side: a head engineer, an operation expert, and a hydraulic engineer for managing the Arpacay/Akhuryan Dam as well as the Arpacay/Akhuryan River;
- to replace the JBWC with the PWC;
- to establish a subcommission with three employees from the operations personnel of the two countries to execute the decisions of the PWC;
- that each country is responsible for implementing the PWC’s decisions concerning their side as well as operating and maintaining the dam facilities within their country;
- to settle any conflict that the PWC fails to resolve;
- to establish an inspection commission that meets once in every 3 to 5 years, decisions of which are implemented by the PWC; and

- to use internal waters at any place, in the time and quantity that they find appropriate without harming the other party.

According to the 1973 agreement, the main duty of the PWC is making the annual water usage schedule and overseeing its implementation. The PWC meets monthly; however, it holds extraordinary meetings upon the request of the parties. It meets both in Armenia and Turkey (the USSR prior to its dissolution in 1991) in the protocol rooms built on both sides of the dam. During its meetings, the PWC

- oversees the operation of the dam and its facilities;
- controls whether the parties are complying with the water usage schedule;
- investigates cleanliness of the dam reservoir;
- regulates fish production; and
- resolves of conflicts between the dam operation personnel of the two sides.

The 1990 agreement. In 1990, Turkey and the USSR signed the “Protocol Concerning Mainly Technical Cooperation, Riverbed Changes, and Construction of Joint Hydrotechnical Facilities” (Agreement, 1990). Per the 1990 protocol, the parties decided

- to take all necessary individual actions as well as cooperate with the other party over the correction of existing changes and prevention of future changes in the beds of the Arpacay/Akhuryan, the Caksu, the Coruh, and the Posof Rivers, some of the water bodies shared among the USSR (Armenia and Georgia since the dissolution) and Turkey; and
- to form the “Technical Work Protocol” to specify the details of the necessary works.

The 2009 agreements. In 2009, Armenia and Turkey signed the “Protocol on the Establishment of Diplomatic Relations” and the “Protocol on the Development of Bilateral Relations” (Agreement, 2009a, 2009b). These agreements aimed to open the borders, which have been closed since 1993 (Agreement, 2009a, 2009b). However, they were never ratified, and in 2018, they were annulled.

Analysis of the regulatory and institutional frameworks. The 1927 agreement, which initiated a long-lasting shared water cooperation between Turkey and the USSR, was perhaps the most significant agreement. This agreement offered the model of “equal share of benefits and costs with a joint technical committee.” This principle formed the foundation of shared water management between

Turkey and the USSR. It was recognized and successfully and peacefully implemented by all the successor agreements, even after decades. In addition, the later agreements even furthered this cooperation. For example, with the 1973 agreement, Turkey and the USSR built the transboundary Arpacay/Akhuryan Dam. This agreement created specific regulations for the dam's construction and management while following the 1927 model. These agreements and their underlying principle have survived many stress factors, such as the dissolution of the USSR and diplomatic impasse between Armenia and Turkey.

Implementation of the regulatory and institutional frameworks. According to the interviewees, the PWC is in charge of the management of the dam and meets once per month from April to December, which is the peak irrigation season. However, there have been times it met more frequently. Armenia and Turkey alternately host the PWC meetings, and the PWC has met both in Armenia and Turkey in the protocol rooms built on both sides of the dam. In the PWC meetings, Turkish and Russian soldiers are also present. The environment during the meetings is very calm and friendly. The interviewees claimed the reason why the soldiers are present in the meetings is that the countries do not have formal diplomatic relations. The Turkish side brings along a Russian interpreter to the meetings, while the Armenian side brings a Turkish interpreter. The PWC meetings are held in Turkish and Russian, and the interpreters concurrently translate the discussions.

In the PWC meetings, both parties state how much water they wish to use in the following month. The water is allocated based on available water and the demand of the parties. From time to time, monthly allocation for each party is not in the same amount; however, the annual allocation amounts to an equal share. In addition, unused water amounts cannot be used after the end of the allocation calendar, which is December 31. On the first day of every allocation year, January 1, the usage quotas are renewed. It is supposed that each country withdraws between 10 and 15 million m³ (2.65–4 billion gallons) per month. The parties withdraw water from the dam via the Serdarabat (Turkey) and Talin (Armenia) regulators. The Turkish side's water gauges are located on the Armenian side, and the Armenian side's water gages are located on the Turkish side. In this way, the parties constantly monitor each other's consumption. The subcommittees from both sides gauge water usage together. They hold mini protocols at water intake locations (up to eight times per month). In addition, the committee members from both sides instantly communicate on a constant basis via written and verbal means of communication such as via e-mails and phone calls.

The PWC meetings continue until a final decision is made by consensus, regardless of their duration; there have been times that the meetings continued until close to midnight. Thus far, the parties have not experienced any intractable issues in the meetings. In the case of a conflict during committee meetings, the head of the PWC resolves the conflict. To date, the governments have not yet been notified due to an issue not being able to be resolved by the PWC.

The PWC also takes measures that are not laid out by the regulatory and institutional frameworks when needed. For instance, during a severe drought in 2014 the PWC decided that the parties would alternately withdraw water. During a given week, one side withdrew water, while the other side decreased its water withdrawal; the next week the arrangement was reversed. In addition, the parties took internal drought measures to reduce overall consumption. For example, when it was Turkey's turn to withdraw water during the 2014 drought, the Turkish irrigation districts that were allocated water also alternated their use. In addition, to decrease evaporation, they practiced nighttime irrigation. The scenario was similar on the Armenian side; the water institutions and locals from both sides were cooperative.

The polycentric management of the dam is executed by the PWC, which in this case was a top-down approach. Turkey and the USSR's central governments formed the PWC. They kept their interference option; however, they never used it. Today, the polycentric nature of the management makes this collaboration mainly local because the PWC, members of which are appointed by the cross-border local water institutions, are the decision makers as well as executors of these decisions. PWC member's duties are limited to the Arpacay Dam. They are holding various positions at the local Armenian and Turkish water institutions and therefore receive salaries from their government. Furthermore, the benefits are mainly, if not only, shared by the locals.

In short, the dam is operational and is managed via the local collaborative management mechanisms specified in the 1963 and 1973 agreements. Despite the severe international conflicts and the fact that there is no diplomatic dialogue between Armenia and Turkey, so far, no notable conflict over the Arpacay/Akhuryan Dam has occurred. However, no notable improvement in interparty relations due to the water cooperation (EPB) has been noticed as well.

Discussion

Analysis of Benefits and Costs in the Arpacay/Akhuryan Case

As noted previously, from a purely linear economic perspective, cooperation occurs when net benefits (present and perceived costs are discounted from total benefits to calculate net) of cooperation are greater than net benefits of noncooperation, and mutual benefits are split fairly. The benefits of cooperation in the Arpacay/Akhuryan case are irrigation, fishing, and domestic water use. Those benefits are shared equally, considered fair by the interviewees. The benefits of noncooperation would be similar but dramatically reduced, as those benefits require a dam expanding on both countries, which would not exist in case of noncooperation. The present and perceived costs, which are mainly the interparty conflicts and nonexistent relations over 25 years between Armenia and Turkey, are very high. However, in the Arpacay/Akhuryan case, it appears cooperation occurs, as benefits are higher than costs and they are shared fairly.

The Polycentric Management of the Arpacay/Akhuryan Dam's Resilience to Conflicts Between Armenia and Turkey

Transboundary water cooperation on the entire Kura–Araks basin between Turkey and the USSR did not continue after Armenia was founded, while cooperation over the Arpacay/Akhuryan Dam, a small portion of the basin, continued. This was perhaps due to national-level cooperation, which had high political costs, while the local Arpacay cooperation did not due to its private management caused by its polycentricity. In addition, the polycentric management of the Arpacay/Akhuryan Dam⁵ offered extensive local authority, which provided extensive privacy. Furthermore, the managing institutions purposely kept this cooperation low profile, as they feared that the involvement of higher politics and the public could hinder this cooperation. Therefore, the cooperative management of the dam is almost entirely unknown by the public and politicians. In addition, the Arpacay/Akhuryan case has a well-structured polycentric management system, which enabled it to survive numerous disturbances, such as the *East-West* tensions,⁶ USSR's dissolution and Armenia's foundation, Armenian–Turkish political crises over the years, and the 1993 border closing. Our first hypothesis, polycentric management enables cooperation in cases where there are interparty conflicts and no diplomatic dialogue, is confirmed by the Arpacay/Akhuryan case.

Correlation Between International Relations, Management Scale, and Cooperation Likelihood

Figure 3 and Table 1 lay out our example cases in comparison with our central case study of the determining factors that predict cooperative outcomes (values assigned with them are for example purposes only).

The analysis can be further refined to consider different scenarios under which a particular case might have a change in dynamics. In Table 2, we present such a range of scenarios in our central case of the Arpacay/Akhuryan Dam.

For the Arpacay/Akhuryan Dam case, while the management scale remains the same, if international relations went below 5% (e.g., serious threats regarding military intervention), cooperation would be unlikely. In this situation, for cooperation in the Arpacay/Akhuryan Dam, the management scale (there is not much room for improvement there) should not be disturbed before international relations improve. This would increase cooperation likelihood. In addition, it would make testing EPB more possible as is explained later.

In the Arpacay/Akhuryan Dam case at the current situation, to improve EPB, the management would be publicized by media, politicians, public, and so forth, while friendliness of the relations remains the same. In this case, management scale could go below 95% because politics could begin getting involved in the management. As depicted in Figure 4, x plus y should equal more than

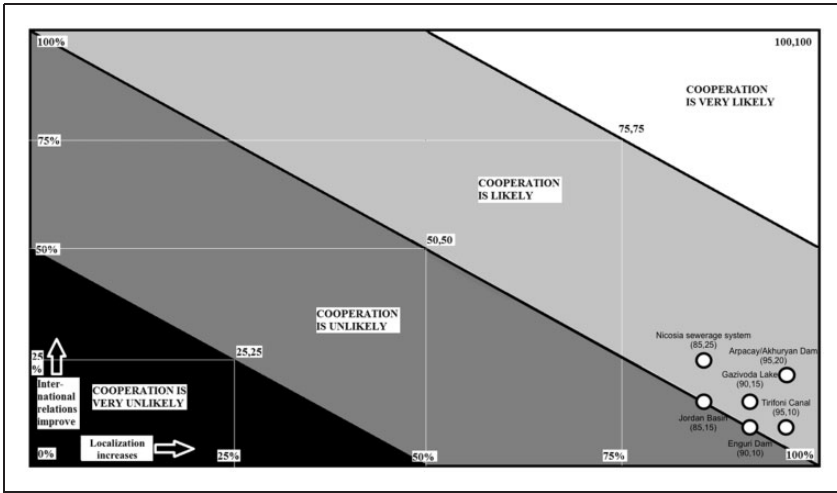


Figure 3. Example cases in comparison with our central case study.

Table 1. The Example Cases in Comparison With Our Central Case Study.

Shared water body	Sharing parties	Management scale % (x)	Warmth of international relations % (y)	Sum of x + y	Cooperation likelihood
Arpacay/Akhuryan Dam	Armenia–Turkey	95	20	115	Likely
Enguri Dam	Abkhazia–Georgia	90	10	100	Likely
Gazivoda Lake	Serbia–Kosovo	90	15	105	Likely
Jordan Basin	Israel–Palestine	85	15	100	Likely
Nicosia sewerage system	Cyprus–Northern Cyprus	85	25	110	Likely
Tirifoni Canal	Georgia–South Ossetia	95	10	105	Likely

100 for cooperation to be likely. In this case, cooperation would probably still occur until management scale drops to 80%⁷ ($20 + y = 100$; therefore, $y = 80$). However, because controlling the management scale after disturbing it might not be very possible,⁸ EPB should not be tested in Arpacay/Akhuryan Dam in the current situation. It should be waited until international relations improve, which would give more flexibility for increase in management scale. In addition, we discuss that there might an EPB testability range. For instance, testing EPB might not be preferred in cases where the sum is too close to

Table 2. Cooperation Likelihood in Different Scenarios for the Arpacay/Akhuryan Dam.

Scenarios for the Arpacay/Akhuryan Dam	Management scale % (x)	Warmth of international relations % (y)	Sum of x + y	Cooperation likelihood
Current situation	95	20	115	Likely
Higher scale management	Below 80	20	Below 100	Unlikely
Extra higher scale management	Below 30	20	Below 50	Very unlikely
Worse relations	95	Below 5	Below 100	Unlikely
Better relations	95	Above 55	Above 150	Very likely

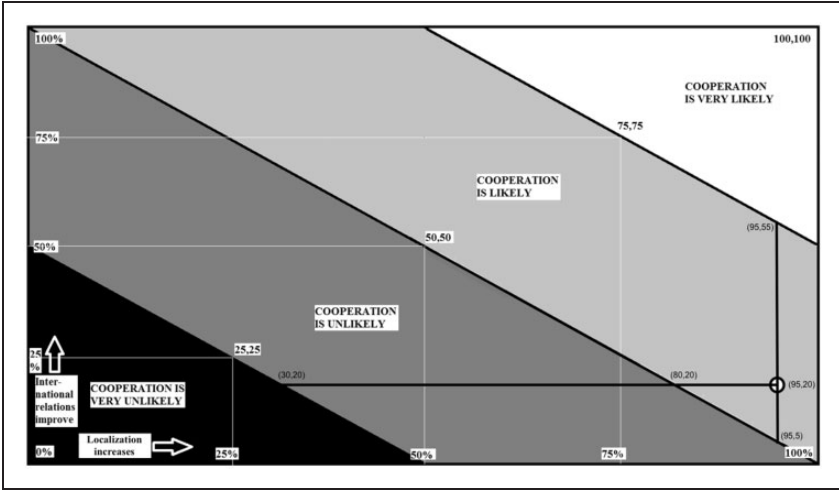


Figure 4. Cooperation likelihood in different scenarios for the Arpacay/Akhuryan Dam.

100 (i.e., between 100 and 125).⁹ Our second hypothesis that “increased localization of management, coincident with improved relations maximizes cooperation potential in case of severe international conflicts and the absence of diplomatic dialogue between parties” is confirmed by the Arpacay/Akhuryan case.

Inhibition of EPB Aspect of the Arpacay/Akhuryan Dam

The polycentric management in this case was top-down. Turkey and the USSR’s central governments formed this local management. They kept their interference

option; however, they never used it. In addition, Turkey and the USSR had the idea of EPB when they formed this water coalition, as they agreed to cooperate over their shared water resources “for the friendship” (improving relations). The USSR has similar border dams with many other countries. All those dams have similar polycentric management styles. According to an academician interviewee, “the USSR’s goal for the joint dams along its borders was not water or energy; it was having closer relations with its neighbors, actually much needed during the Cold War,” which confirms this ideal.

In fact, there is extensive literature suggesting that cooperation over transboundary waters might extend to broader contexts as well as improve relations among sharing countries (Ali, 2007, 2018; Conca, 2012; Conca & Dabelko, 2002; Khagram & Ali, 2006; Pahl-Wostl et al., 2013; Wolf et al., 2005). However, in the Arpacay/Akhuryan case, the efforts of the USSR and Turkey as well as the extensive local cooperation did not translate to broader water cooperation. For instance, there is no dam on any other shared river between Armenia and Turkey even though they face water scarcity, especially in the dam region during summer, which has had environmental and economic consequences. The interviewees suggested that building a new dam has become necessary. New joint dam ideas are discussed informally, but no solid actions have been taken thus far. In addition, this cooperation did not expand to water quality, as there is no transboundary cooperation agenda for water-quality issues, which has become an issue because water quality is poor (Exchange on Environment, Conflict and Cooperation, 2017).

The Arpacay/Akhuryan cooperation does not seem to improve international relations as well. In fact, the relations have worsened. For instance, in 1993, 2 years after Armenia was founded and when the dam had been in use for 18 years, Armenia and Turkey closed their common borders. To date, diplomatic dialogue between Armenia and Turkey still do not exist. However, in 2009, Armenia and Turkey signed two protocols that would open their borders. However, these protocols were not ratified, and in 2018, they were annulled. In addition, during the reopening efforts, the cooperation over the dam was not emphasized by officials from Armenia or Turkey. Hence, the Arpacay/Akhuryan cooperation does not seem to have connections visible with the international relations.

Numerous studies also show that in some cases, cooperation remains limited to transboundary water management, and it does not translate to international relations. The reasons behind this disconnection could be affiliated to many distinct parameters, which is outside of our study’s scope. Nevertheless, perhaps one of the significant reasons why the Arpacay/Akhuryan cooperation has not translated to broader contexts is the disconnection caused by its polycentric management, which we also consider why this cooperation has sustained despite strained international relations and no formal relations between Armenia and Turkey. One of the other reasons is that water cooperation across borders is in

many cases essential to prevent damage—local communities and water managers are most aware of this and thus often find informal ways of cooperating (even if this is not officially sanctioned by national governments). The polycentric management of the Arpacay/Akhuryan Dam offered extensive local authority, which provided extensive privacy. In addition, the local cross-border water institutions purposely kept this cooperation low profile, as they feared that the involvement of higher politics and the public could hinder this cooperation. The privacy of the management disconnected governments from local water managing bodies. Therefore, the cooperative management of the dam is almost entirely unknown by the public and politicians, which inhibited interactions that could lead to EPB between Armenia and Turkey. Our third hypothesis, polycentric management inhibits cooperation to expand to broader settings of conflict resolution, is confirmed by the Arpacay/Akhuryan case.

Conclusion

With proper tools, extensive cooperation over transboundary waters might be possible even in the most troubled international relations settings. The Arpacay/Akhuryan case study is a cogent example of how transboundary water management could continue despite severe international conflicts and absence of international dialogue. Solid regulatory and institutional governance frameworks that Turkey and USSR created served them well and have been resilient to even the most major environmental and political stressors. Turkey and USSR created a local cross-border resilient institution, of which the decentralized governance structure is part of that resilience. This institution being authorized to manage the Arpacay/Akhuryan Dam via polycentric management principles is a key determining factor of the success of this cooperation. Our study revealed that this model of polycentric governance facilitates such cooperation despite severe international conflicts and in the absence of international dialogue. Devolution of authority to local water institutions has the ability to have autonomous cross-border interactions, which can allow for cooperation and the realization of benefits for adversaries. We suggest that what makes cooperation possible in this context also inhibits cooperation to expand to broader settings of conflict resolution. Thus, the localized cooperation remains an issue of *low politics* and does not translate into instrumentally changing the high politics of war and peace. Polycentric systems of governance require more research (Heikkila, Villamayor-Tomas, & Garrick, 2018) to further understand how they might also be moved to the next step of building trust to also help in broader peacebuilding activities. Ultimately, the role of effective transboundary water management should be to find such instrumental pathways that can sustain cooperation on scarce resources through broader regional end to hostilities between disputants. In fact, EPB was considered by Turkey and the USSR, perhaps not exactly the same way, much before the field emerged in the

1990s. However, local-level cooperation should not be disturbed for EPB purposes when there is not enough flexibility room for additional pressure, as it was the case in the Arpacay/Akhuryan case. In addition, our research revealed that the transboundary water cooperation that began with the 1927 *equal share of benefits and costs with a joint technical committee* did not continue on the entire Kura–Araks basin. Perhaps, this was due to cooperation costs being lower in smaller scales. Furthermore, we discovered that there is correlation between international relations, management scale, and cooperation likeliness. We suggest as the management scale decreases and international relations improve, the cooperation over transboundary waters will be more likely. Finally, we argue that there is need for better theoretical understanding of the coexistence of cooperative management of transboundary waters despite severe international conflicts and absence of diplomatic dialogue, as very few studies have considered examples of this vital coexistence.

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Notes

1. Transboundary waters are mainly managed by international affairs ministries rather than water-related ministries (Sevastianov, Laine, & Kireev, 2015). During an interview, an interviewee who worked at a water ministry responded, "... those are national security matters and they cannot be revealed," and pointed the international affairs ministry when asked to talk about cooperative water management between two conflicting nations.
2. In this study, Abkhazia, Kosovo, North Cyprus, Palestine, and South Ossetia, regions with limited sovereignty recognition from United Nations members, are included

- because they are de facto states. Languages regarding those regions were used as if they are sovereign countries for convenience of writing. The authors intended to remain politically neutral regarding the politics of these regions.
3. Although water-related ministries are often considered technical functions with minimal security influence, in some cases, water ministries have significant political power (e.g., in the Jordan Basin).
 4. For instance, concerned stakeholders for management of a local dam would be local water institutions and whoever uses the water, such as farmers. From experience, in practice, international ministry representatives act as the only parties to negotiations and exclude other relevant stakeholders. They usually do not even involve water-related ministries.
 5. Since Vincent Ostrom et al. provided the first definition of polycentricity in 1961, many more scholars have defined it. These definitions often contradict with each other (Schroder, 2018). These definitions have been diverse, with some of them even deemed as any management type that exists as polycentric (Schroder, 2018). An agreed upon definition of *polycentric management* does not seem to exist. In this article, we deem the management of the Arpacay/Akhuryan Dam as polycentric, as it is managed via consensus with lower level collaborative frameworks with little or no impact from central governments: with which the literature seems to agree.
 6. During the USSR administration, the border was heavily guarded, as the countries were members of two conflicting military blocs: The North Atlantic Treaty Organization and the Warsaw Pact. Due to the tensions between the East and the West, Turkey and the USSR experienced numerous conflicts during the period when the negotiations for building the Arpacay/Akhuryan Dam were continuing as well during the construction and management of the dam. Yet, those did not seem to negatively influence the dam and cooperation among them.
 7. Even if the management scale had a minor increase in the Arpacay/Akhuryan case, for example, from local water institutions to regional water ministry branches, cooperation could potentially be inhibited, as the new scale could easily pass the 80% threshold.
 8. Disturbing secrecy of cooperation could easily result in management at very high levels. Controlling this might not be possible in most cases. The ways to control the level of management could be a future study.
 9. The value 125 is not verified in any way. It is just used as an example.

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