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Every Drop Counts: A Century of Hydraulic Infrastructure Development in Turkey

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<A>Introduction

Turkey has a rich hydraulic history. From the second millennium <sc>BC</sc>, the Hittites, Urartus, Romans, Byzantines, Seljuks and Ottomans built various dams, irrigation canals, aqueducts and similar waterworks to meet their water needs (Tigrek & Kibaroglu 2011: 33–4). However, it is the establishment of modern Turkey that took hydraulic infrastructure development to a different dimension. In this chapter, I provide a concise overview of hydraulic infrastructure development and, relatedly, water resources development in Turkey since 1923. By focusing on the major dam, hydroelectric power plant (HEPP), irrigation and water transfer projects implemented across Turkey, I discuss the continuities, changes and challenges in the way the country has conceived of and approached infrastructure, water and the politics of both throughout its developmental history. In this way, I seek to present a synoptic piece that benefits particularly those students, researchers and practitioners who are new to, or interested in expanding their knowledge on, the topic. Overall, I argue that Turkey has made significant progress in hydraulic infrastructure development in 100 years, but the time is ripe to abandon the dominant techno-economic perspective on water and instead adopt a socio-political perspective that captures the complex web of relations between infrastructure, nature, society, politics and water.

<A>Water Resources at a Glance

Turkey has a semi-arid climate with an average annual rainfall of 574 millimetres and a total annual volume of precipitation of 450 billion cubic metres (DSİ 2023: 38). The country is split between twenty-five river basins. Five of these basins, the Euphrates–Tigris, Kura–Araks, Maritza, Orontes and Chorokhi, are transboundary and cover around one third of Turkey’s land surface. Even though the country’s average annual runoff is 185 billion cubic metres, the annual exploitable potential is 112 billion cubic metres, including 18 billion cubic metres of groundwater. Annual freshwater consumption amounts to 57 billion cubic metres, 77 per cent of which is used for agriculture and the rest for domestic and industrial uses (DSİ 2023: 44). It is a ‘water-stressed’ (Falkenmark 1989) country with 1,322 cubic metres of available water per capita per year (DSİ 2023: 15).

Turkey has stored 182.79 billion cubic metres of water in 992 dams and 709 ponds built around the country (DSİ 2023: 15). Turkey’s gross theoretical, technically exploitable and economically feasible hydropower potentials are 433, 216 and 180 billion kilowatt-hours per year respectively (DSİ 2021: 40). The country has developed more than 50 per cent of its hydropower potential through 740 HEPPs with an installed capacity of 32,334 megawatts with 111,660 gigawatt-hours of annual production. There are also 22 HEPPs under construction and 498 in the planning phase (DSİ 2023: 49). In addition, Turkey’s total arable area amounts to 24 million hectares of land. The ‘economically irrigable’ portion of this area amounts to 8.5 million hectares, 6.96 million of which is open to irrigated agriculture (DSİ 2023: 44).

<A>Taming Nature, Capturing Water

In the early years of the new Republic, the processes of the social and political construction of the nation-state and the material construction of public works were deeply intertwined (Kurtiç 2019: 93). Hydraulic infrastructure development played a key role in facilitating the control over water resources and the making of the nation-state and its nature (Kurtiç 2019: 94). In other words, hydropower was a crucial tool employed by the state towards transforming society according to a set of modernist ambitions (Akbulut et al. 2018: 96). Therefore, the state began surveying, developing and managing its natural resources both to meet its water needs and to expand its reach, control and legitimacy (Bilgen 2021).

In 1925, the Water Directorate, as well as regional directorates in Adana, Ankara, Bursa, Edirne and Izmir, was created under the Ministry of Public Works. The General Directorate of Waters was established in 1929 and, later, transformed into the Directorate of Water Works in 1939 (Altınbilek & Hatipoğlu 2020: 64–5). In the early 1930s, preliminary studies on river basin planning began. In 1935, the Electrical Power Resources Survey and Development Administration (Elektrik İşleri Etüt İdaresi Genel Müdürlüğü, EİE) was established. The Ministry of Public Works and EİE were tasked to explore the country's hydropower potential, conduct hydrological surveys, and carry out engineering works (Tigrek & Kibaroglu 2011: 27). These early attempts showed that water would be used towards economic growth, social progress and similar modernisation goals (Sayan 2016: 7).

Megadams were built around the world in the early twentieth century. The construction of the Hoover Dam in the United States in the 1930s was a crucial event with global implications for infrastructure-building (Tozoğlu 2021: 384). The US Bureau of Reclamation and the US Army Corps of Engineers gained a global reputation with their expertise in water resources management. The initiation of the Tennessee Valley Authority (TVA) in the same

decade took river basin development to a new level. The TVA combined the idea of ‘unified development (the damming of all the streams of a given river basin to bring the river under total control), the benefits of multi-purpose dams (hydropower, flood protection, transportation, irrigation [etc.]), and the idea of regional development’ (Molle 2009: 333). Over time, the TVA ‘became the preferred model for how nation-states – particularly those endowed with ample water resources – might best exploit their rivers to achieve economic and social goals’ (Sneddon 2015: 55).

The Çubuk Dam was opened in Ankara only a few months after the Hoover Dam in March 1936. While the primary functions of the dam were to control floods and supply drinking water to the capital, it also served as an important symbol of modernisation, nation-building and control over nature (Kurtiç 2019: 97). Initial studies of the Euphrates–Tigris basin were also conducted in the 1930s (Topçu et al. 2019: 190), one reason being Mustafa Kemal Atatürk’s fascination with the Soviet plans for the river Dnieper (Turgut 2000: 47). The feasibility studies for the Seyhan, Sarıyar, Hirfanlı, Kesikköprü, Demirköprü and Kemer dams and HEPPs were also conducted between 1935 and 1953 (Altınbilek & Hatipoğlu 2020: 68). Since Turkey followed the principles of Keynesian economics until the 1980s, the state was the primary actor that invested in and provided infrastructure and public services during this period (Kibaroglu et al. 2009: 288).

In the Cold War geopolitical context of the 1950s, both the US and the Soviet Union built large-scale infrastructure projects to showcase their supremacy in many domains including hydrology (Molle et al. 2009: 333). In the context of decolonisation, newly independent states also built such projects to stimulate their national development, strengthen their national unity and shed their colonial past. Jawaharlal Nehru, for example, likened dams to ‘new temples of modern India’ and Gamal Abdel Nasser put the Aswan Dam at the centre of Egyptian development, progress and nation-making (Biswas & Tortajada 2001: 11). The

US especially provided generous water sector-related aid and technical assistance to the ‘Third World’ to prevent the expansion of communism (Molle et al. 2009: 335), strengthen its geopolitical alliances and create a ‘fraternity’ of non-American engineers who would play important roles in the water bureaucracies of their countries and, thus, benefit American interests (Sneddon 2015: 80).

It was in this context that Turkey adopted the US model of dam-building and watershed management (Kurtiç 2019: 99). According to the Marshall Plan, Turkey would be a good fit to supply war-torn Europe with agricultural products, but its agricultural sector had to be developed. The infrastructure sector of the country had to be developed too. To achieve this, financial and technical support was provided to construct dams, build granaries and modernise harbour facilities all around the country. For example, the construction of the Sarıyar and Seyhan dams was initiated with the help of American aid and expertise in 1951 and 1953, respectively (Tozoğlu 2021: 387–8). More importantly, the General Directorate of State Hydraulic Works (Devlet Su İşleri, DSI) was established by Law No. 6200 of 1953, based on the model of the US Bureau of Reclamation. Arguably from then onwards, Turkey’s hydraulic efforts transformed into a ‘hydraulic mission’ – ‘the strong conviction that every drop of water flowing to the ocean is a waste and that the state should develop hydraulic infrastructure to capture as much water as possible for human uses’ (Wester 2009: 10).

The DSI became the leading state agency mandated with the planning, design, construction and operation of hydraulic structures across the country. Dominated by civil engineers and water bureaucrats, the DSI considered water management an overly technical matter and adopted an exclusively technocratic perspective on water policy (Sayan & Kibaroglu 2016: 1288–9). The influence of the US on Turkey’s hydraulic infrastructure development persisted in the following years. For instance, modelled on US higher education system, Atatürk University, Black Sea Technical University, and the Middle East Technical

University were established to meet the shortage of architects, engineers, and other technical staff in the field of public works construction (Tozoğlu 2021: 391). Many Turkish engineers and experts in the field, some of whom would become politicians and technocrats later, were trained by the US Bureau of Reclamation (Sneddon 2015: 182–3). As a well-known example, Süleyman Demirel, who enjoyed the nickname ‘King of Dams’ throughout his political career, spent a year at the Bureau between 1949 and 1950 and another year at the Morrison-Knudsen company as an Eisenhower fellow between 1954 and 1955 (Tozoğlu 2021: 405). Upon his return, he served first as the head of the Department of Dams and, later, as the director general of the DSİ until 1960. The DSİ spent most of its budget on building dams in the 1950s. As a result, hydroelectric power supply in Turkey increased from 4 per cent to 30 per cent of the country’s electric capacity between 1950 and 1960 (Nestmann 1960: 220). The influential status of the DSİ was strengthened by the enactment of the Groundwater Law No. 167 in 1960, which allowed the agency to distribute licenses for groundwater use (Topçu et al. 2019: 191).

Hydraulic infrastructure development gained momentum in the 1960s. Following the 1960 coup, import-substituting industrialisation became the primary state strategy for economic development. The State Planning Organisation (Devlet Planlama Teşkilatı, DPT) was founded by Law No. 91 in 1960. This not only institutionalised the intervention of the state in the economy, but also introduced five-year development plans as a means to manage public investments, including those in the water sector (Kibaroglu et al. 2009: 288). In order to extend the development of water and land resources to the rural parts of the country, the General Directorate of Rural Services was also established, by Law No. 7457 in 1961 (Topçu et al. 2019: 191). The integration of the DSİ and DPT into the policy process made hydraulic infrastructure development an indispensable part of the country’s overall development policies (Sayan 2016: 8). For example, preliminary studies to develop the hydropower

potential of the Çoruh River basin were initiated in the early 1960s (Akbulut et al. 2018: 105). The Keban Dam, the first large dam to be built on the Euphrates, was initiated in the mid-1960s (Öktem 2002: 315). The Lower Euphrates Project was also initiated as a bundle of thirteen hydropower generation and irrigation projects on the Euphrates around the same period. In the 1970s, the coverage of the Lower Euphrates Project was expanded to include projects on the Tigris as well. Eventually, all hydropower and irrigation projects on the Euphrates and Tigris were combined and put under the umbrella of the Southeastern Anatolia Project (Güneydoğu Anadolu Projesi, GAP) in the late 1970s.¹

GAP consisted of the construction of twenty-two dams and nineteen HEPPs with an established capacity of 7,640 megawatts to generate 27 billion kilowatt-hours of energy annually (Öktem 2002: 317) as well as of extensive irrigation and drainage networks to irrigate 1.7 million hectares of land in southeastern Turkey (Topçu et al. 2019: 192). In the 1980s, GAP was expanded to include additional sectors such as agriculture, education, healthcare, transportation and tourism, and thus was transformed into a multisectoral and integrated regional development project. After this expansion, the responsibility to administer the project shifted from the DSİ to the DPT. In 1989, the GAP Regional Development Administration was created by Law No. 388 to coordinate the development activities in the region by engaging in cooperation with governmental and non-governmental actors involved in the project. In the 1990s, GAP was redefined as a ‘sustainable human development project’ (Topçu et al. 2019: 192). The liberalisation of the economy and the European Union accession process brought additional changes to the project framework in the 2000s.

¹ The Eastern Anatolia Project (DAP), the Eastern Black Sea Project (DOKAP) and the Konya Plain Project (KOP) are the major irrigation projects implemented after the launch of GAP. Since 2011, each project has had its own regional development administration. When completed, DAP, DOKAP, and KOP will respectively irrigate 1,377,656, 477,970 and 1,647,239 hectares of land (DSİ 2023: 52–5).

The major objectives of GAP can be summarised as removing regional disparities, integrating centrifugal (Kurdish) groups, modernising land ownership, and developing the agriculture, energy and industry sectors (Warner 2008: 279). GAP has caused not only transboundary water issues between Turkey and its downstream neighbours Syria and Iraq, but also environmental, social and cultural problems such as soil salinisation (for example in Harran), the displacement of thousands of people (for example in Birecik), and the inundation of sites of historical importance (for example in Hasankeyf) (Bilgen et al. 2021: 1593–5). As of 2021, 91 per cent of the energy projects and 60 per cent of the irrigation projects under GAP have been completed (DSİ 2023: 51). Overall, GAP has arguably accomplished most of its technical objectives in the agriculture, energy and water sectors, but has failed to bring the promised political and social transformation in the region (Bilgen et al. 2021: 1595).

Turkey struggled with high inflation, high unemployment, oil scarcity, a shortage of basic items and a balance of payment crisis in the late 1970s. In 1980, the ‘24 January Decisions’ were announced to redesign the economy along neoliberal lines. Turgut Özal played a key role in making the transition from a state-led, inward-oriented development strategy to a private sector-led, outward-oriented one. Facilitated by the 1980 coup, the shift to a free-market economy brought many changes in the energy and water sector. Following the enactment of Law No. 3096 in 1984, for instance, the private sector became authorised to generate, transmit and distribute electricity through new models such as build-operate-transfer, build-own-operate, and transfer of operating rights (Kibaroglu et al. 2009: 291). In the water sector, this system was ‘extended to water supply and sanitation services in municipalities, and to the construction, operation and management of infrastructure, such as dams, hydropower plants and irrigation systems’ (Tigrek & Kibaroglu 2011: 29). The push for change came not just from the national elites, but also from international institutions such as the World Bank and the Organisation for Economic Co-operation and Development, and

various private corporations (Tigrek & Kibaroglu 2011: 29). Thus, the state assumed the role of a market regulator rather than a principal contractor in the water governance process (Sayan & Kibaroglu 2016: 1289).

Even though various economic and political crises, particularly the financial crises in 1994 and 1998, had adverse impacts on the economy, hydraulic infrastructure development continued in the 1990s. One of the most significant events of the decade was the opening of the Atatürk Dam, the key component of GAP, in 1992. The Atatürk Dam was one of the world's largest earth-and-rock fill dams, with a reservoir capacity of 48.7 billion cubic metres, an installed capacity of 2,400 megawatts and 8.9 billion kilowatt-hours of annual power production (Tortajada 2000: 454). The dam was a source of national pride. It was named 'Atatürk' to highlight the linkages between the size of the dam, the progress of the nation and the greatness of its founder (Bilgen 2021: 303). The Şanlıurfa Tunnels and Şanlıurfa–Harran irrigation system also became operational in the mid-1990s. Another significant development was the decentralisation of irrigation water management in the early 1990s. As part of the Irrigation Management Transfer framework, which was guided and supported by the World Bank, water user associations (WUAs) were created (Topçu et al. 2019: 198). In order to transition to a more bottom-up, participatory and cost-effective approach, the responsibility to operate and maintain the secondary and tertiary levels of nearly all large-scale irrigation systems was transferred to WUAs, irrigation cooperatives, and local authorities (Topçu et al. 2019: 198–9), which together operate and maintain irrigation systems across 2,877,441 hectares of land as of 2023 (DSİ 2023: 50).

In the early 2000s, the number of large dams around the world reached more than 45,000 (World Commission on Dams 2000: 8). From the 1980s onwards, however, an increasing number of scholars, experts and activists became more vocal about how dams led to extensive negative impacts on rivers, the irreversible loss of species and ecosystems, the

displacement and impoverishment of millions, the submergence of cultural resources, changes in land ownership patterns and so forth (World Commission on Dams 2000: 15–17). In the late 1990s, even the World Bank, the main financier of many controversial dams, could no longer stay indifferent and initiated the World Commission on Dams (WCD) as an independent committee to evaluate the social and environmental impacts of large dams and set international standards for dam-building (Evren 2014: 411). Even though hydropower-dependent countries such as China, India and Turkey opposed the recommendations of the WCD, the resistance against large dams made large-scale, state-led hydraulic structures less favourable (Sayan & Kibaroglu 2016: 1287). Instead, small HEPPs that required no damming or reservoir to hold large amounts of water and that could be easily funded, built and operated were promoted as cost-effective, eco-friendly and private sector-led alternatives (Erensü 2013: 64).

Both these global development trends and the official recognition of Turkey as a candidate for EU membership in 1999 brought additional changes in the water policy in the 2000s. While gradually recovering from the effects of the 2001 financial crisis, Turkey adopted critical institutional elements of the EU Water Framework Directive (WFD), including river basin districts, river basin management planning, water quality monitoring and public participation processes, and integrated them in its water policy, albeit in a hybrid manner and with limited success.² Simultaneously, the country took a more ambitious approach to utilise its hydropower potential to the maximum extent possible. An important pillar of this policy was the construction of hundreds of small-scale run-of-the-river-type HEPPs through a partnership between the DSİ and the private sector, where the former took

² The WFD's transboundary water management component has not been fully applied. Similarly, the Draft Water Law, prepared to reformulate Turkey's water policy in line with the WFD, has not been adopted yet. See Demirbilek & Benson (2019).

on the planning responsibilities while the latter took on the construction and operation responsibilities, except for a few projects (İşlar 2012: 382). In this process, also referred to as the ‘privatisation of Turkey’s rivers’, private enterprises were granted the right to use rivers for a 49-year period to build HEPPs (İşlar 2012: 376). In economic terms, these projects were promoted as solutions to reduce Turkey’s energy dependence, meet the country’s energy demand, and meet its need for cheap energy to support its industrial sector (İşlar 2012: 378). At a local level, however, there was a widespread backlash against the detrimental socio-ecological effects of HEPPs, in which an environmental movement formed that brought together a diverse group of rural populations, urban environmental activists, and translocal, regional and national networks (Akbulut et al. 2018: 98).

Given Turkey’s strategy to cope with climate change through increased involvement of the private sector, more funds became available for hydropower projects after the country signed the United Nations Framework Convention on Climate Change in 2004 and ratified the Kyoto Protocol in 2009 (İşlar 2012: 382). Turkey received funding from the World Bank’s Clean Technology Fund, which was provided to developing and middle-income countries with an agenda to become low-carbon economies, and spent almost all of it on financing its energy efficiency and HEPP projects (İşlar 2012: 383). The EU process also made it necessary for Turkey to undertake reforms to streamline its energy sector according to the EU energy directives. To this end, for instance, Electricity Market Law No. 4628 was enacted in 2001 to create a competitive electricity market, overseen by the Energy Market Regulatory Authority (Erensü 2013: 70). Similarly, Law No. 5346 on the Utilisation of Renewable Energy Resources for the Purpose of Generating Electrical Energy was enacted in 2005 to provide the private sector with generous incentives such as eminent domain rights and purchase guarantees to bring investment to the renewable energy sector (Sayan & Kibaroglu 2016: 1290).

Despite the waves of liberalisation in the field since the 1980s, arguably the state-centric and centralised nature of decision-making has not completely disappeared, with the central government being the main actor in controlling and coordinating the process. The state retains its control over the private sector by, for instance, playing the major role in introducing global financiers to local capital, guaranteeing the purchase of excess electricity from private plants, granting permits and licences, and trying to convince the public of the economic and social benefits of HEPPs (Erensü 2013: 73). For example, The DSI played a key role in the realisation of the Melen Project, which was initiated in 2007 to transfer 1.18 billion cubic metres of water from the river Melen each year to meet the water needs of Istanbul until 2040 (Altınbilek & Hatipoğlu 2020: 72). When the ‘1,000 reservoirs in 1,000 days’ project was implemented between 2012 and 2016 to expand irrigation to rural areas located outside the scope of large-scale irrigation schemes, it was again mainly the DSI that planned, supervised and implemented the project in a technocratic and predominantly top-down manner (Le Visage et al. 2018: 427). In other words, the neoliberal mission has not replaced, but rather complemented the hydraulic mission (İşlar 2012: 382).

Turkey has also sought to instrumentalise hydraulic infrastructure development in its foreign policy. In 1986, Turkey proposed the construction of the Peace Pipeline Project, consisted of two pipelines to transport around 10 million cubic metres of water per day from the Seyhan and Ceyhan rivers to Syria, Jordan, Saudi Arabia and the Gulf states (Conker & Hussein 2019: 10). This proposal was rejected due to conflicting political and economic interests among the parties. A similar proposal for a smaller project that would carry 2.19 million cubic metres of water per year from Turkey to Jordan was also rejected for similar reasons (Conker & Hussein 2019: 10). In 1998, Turkey proposed a plan to transport 50 billion cubic metres of water per year from the river Manavgat to Israel. Even though the sides reached a deal in 2002, the plan was scrapped later due to broader political and

economic processes in both countries and in the region (Conker & Hussein 2019: 11). In 2009, Turkey and Syria agreed to jointly build a ‘Friendship Dam’ on the river Orontes. Even though construction of the dam began in 2011, the Syrian Civil War that broke out the same year made it impossible to continue with the project. In 2015, Turkey completed the Peace Water Project, to transport up to 75 million cubic metres of water per year from the river Anamur to the Turkish Republic of Northern Cyprus (Conker & Hussein 2019: 13). In recent years, the DSI has partnered with the Turkish Cooperation and Coordination Agency ([Türk İşbirliği ve Koordinasyon Ajansı, TİKA](#)) and carried out various dam-building, well-digging and training projects in many African countries including Burkina Faso, Djibouti, Ethiopia, Mali, Mauritania, Niger, Somalia, and Sudan, providing drinking and domestic water to approximately 2 million people (DSI 2021: 45). In Asia, TİKA also engaged in similar activities such as building water tanks in Mongolia and installing water treatment plants in Pakistan (TİKA 2021: 84–5).

<A>Conclusion

Turkey has made remarkable progress in hydraulic infrastructure development in the past 100 years. Despite their political, social and environmental impacts that permeate many layers of society, various dam, HEPP and irrigation projects have made significant material contributions to the economy and water security. Just like the megaprojects in the country, they have also been critical tools employed by the state to build its power, legitimacy and hegemony, generating consent through a powerful developmentalist and populist discourse that leaves little room for criticism, contestation or deliberation on the idea or the downsides of development (Paker 2017: 104–5). They have been both the means and the ends of a high-modernist ideology (Scott 1998) that encourages the ‘taming’ of ‘unruly’ waters via state-of-the-art technology to promote economic growth, political transformation and social progress towards building a modern, strong and unified nation-state. In that sense, state-centric,

technocratic and hierarchical discourses, practices and structures related to hydraulic infrastructure development still dominate the field.

Today, various factors such as ‘water scarcity resulting from fast increases in population, increased competition for water, urbanisation, industrialisation, agriculture, expansion of tourism, increases in economic activities, climate change, and resource depletion’ (Altınbilek & Harmancıoğlu 2020: 536) already pose challenges for the accessibility, availability, security, quality and quantity of water in Turkey. Therefore, Turkey is likely to concentrate its efforts even further around hydraulic infrastructure development to meet its future water needs. Its appetite to exploit every drop of water available within (and beyond) its borders is likely to persist. The question here is whether or to what extent Turkey will transform its technocratic and economistic water governance perspective into a socio-political and rights-based water governance perspective in the future. Water is not simply an economic commodity that flows in a hydrological cycle in an isolated manner. On the contrary, water is a complex construct that flows in a hydro-social cycle wherein water and society constantly constitute and reconstitute each other over space and time (Linton & Budds 2014). It is an increasingly politicised substance, creating disputes within and between different governmental, non-governmental and societal groups in the political, economic, social and environmental realms at a local, national, regional and international level. Therefore, rethinking, reformulating and transforming the discourses, policies and practices in the assemblage of infrastructure, nature, society, politics and water is an absolute necessity for Turkey, assuming that it conceives development as a process of positive and inclusive change for the people, not despite the people.

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