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Framing Water Through Oil: How Hydrocarbons Shape Water Governance in Algeria

Selma Benyovszky

Human Geography, School of Archaeology, Geography and Environmental Sciences, University of Reading, UK;
s.benyovszky@pgr.reading.ac.uk

ABSTRACT: This study advances social science research on water by providing insights into the interplay between water and energy politics in Algeria, contributing to broader discussions on water governance in fossil-fuel-dependent nations. Using frame analysis, this research examines how water politics is positioned in relation to Algeria's dependence on fossil fuels. The findings reveal that, despite policy rhetoric emphasising water as a national priority, hydrocarbons remain central to the state's political strategies. Water issues, such as access and pollution, are often viewed primarily as risks to social stability rather than as ecological challenges. Consequently, water management is dominated by short-term, reactive strategies, often aimed at mitigating social discontent rather than achieving sustainable solutions. This dynamic is evident in municipalities like El Harrach, where promises of improved water quality and access are undermined by the prevailing prioritisation of hydrocarbon interests. By examining energy-water interdependencies not only as technical linkages but as key elements of statecraft and territorial control, the article shows how water governance is shaped also through lived experiences, contested meanings, and power-laden relations embedded in its hydrosocial territory.

KEYWORDS: Water governance, hydrosocial territories, hydrocarbon sector, frame analysis, Algeria

INTRODUCTION

In the busy municipality of El Harrach, Algiers, the wadi[1] Oued El Harrach flows as a constant reminder of Algeria's struggle with water. For decades, residents lived beside its foul waters while also grappling with irregular access to drinking water in their homes. These twin challenges point to a deeper issue at the core of Algeria's water governance: While the state possesses both the technological capacity and the financial means – largely derived from hydrocarbon revenues – to address these problems, progress has been partial, uneven, and slow. This article argues that one key reason for this, beyond mismanagement, is the hydrocarbon sector itself. While the sector enables investments in water infrastructure, it also appears to shape national priorities in ways that directly influence water politics. Therefore, the aim of this article is to demonstrate how water is framed in Algeria and how this framing is shaped by the hydrocarbon sector. In this regard, El Harrach is particularly revealing, as it exemplifies both the neglect of aquatic environments (water quality) and the everyday struggles to access drinking water (water quantity) in urban areas. Together, these tensions expose the contradictions of a rentier model[2] that funds water projects while simultaneously contributing to their failure.

While previous research has shown that in Algeria, the wealth coming from the hydrocarbon revenues does not significantly contribute to the increased quality of Algerian life (see Arieff, 2013), less attention has been focused on the urgent questions of drinking water access and aquatic environmental pollution.

[1] In North Africa, a *wadi* – or *oued* in Algerian Arabic – is a water channel that is dry except in the rainy season.

[2] A rentier state is a country that obtains a substantial portion of its income from sources other than taxes – primarily hydrocarbons such as crude oil or natural gas (Luciani, 1990; Zakaria, 2007).

While the Algerian government presents water as a national priority, its approach remains shaped by the logics of a rentier state centred on oil and natural gas, which contribute nearly 80% of the state's revenues (Desponts and Prinz, 2024). This article explores how the Algerian government frames water and how these framings – shaped by the state's dependence on the hydrocarbon sector – influence water politics, particularly in relation to pollution and access. By doing so, it highlights how pollution and supply shortages are not isolated technical problems but part of a broader story about how water is framed and prioritised by the state. With that being said, while water in Algeria is important both for domestic purposes and for agriculture, this article focuses primarily on its usage in urban areas.

To analyse these dynamics, the study draws on hydrosocial territories, a concept developed by Boelens et al. (2016), which refers to contested spaces where water flows, infrastructure, social practices, and power relations intersect. Following that, methodologically, it applies frame analysis, a method used to examine how actors interpret, communicate, and legitimise particular understandings of the world, to uncover the discursive logics underpinning Algeria's water governance (Goffman, 1986). In so doing, it reveals how the government's emphasis on maintaining social stability frequently takes precedence over meaningful efforts to tackle water scarcity and pollution, with significant implications for local communities.

To date, while water governance in the Middle East and North Africa (MENA) region has gained increasing academic attention (cf. Dahou et al., 2011; Hussein, 2018; Mustafa and Talozi, 2018; Pardoe et al., 2018; Yousefi et al., 2024), Algeria remains underexplored in this context. This gap is particularly striking, considering the wealth of literature on other environmental resources such as oil and gas, which highlights how fossil-fuel wealth shapes governance and state-environment relations in rentier states (Jones, 1998; Jones, 2010; Mayorga Alba and World, 2010; Koch, 2021). In the North African context, Dahou et al. (2011) further highlight how state-led resource management functions as a form of political control, with environmental policies serving not as neutral tools but as means to assert authority over resources and populations. These findings, therefore, underscore that environmental governance is also about consolidating state legitimacy through control over essential resources.

In the case of Algeria, research has explored the environmental legacies of colonialism and the historical roots of ecological degradation (cf. Davis, 2004, 2007, on eco-governance and environmental history), alongside the later interdependence of the hydrocarbon sector with the state (Malti, 2012; Boucetta, 2016; Musso, 2017, 2018). This research has highlighted a defining feature of Algeria's postcolonial development: The discovery of oil in 1956 was swiftly framed by the nationalist movement as a symbol of future prosperity and sovereignty (Boucetta, 2016; Musso, 2017). In other words, for the leaders of the anti-colonial resistance, oil was not merely a resource but a strategic asset, central to their vision of building an independent, self-sufficient nation through energy-powered industrialisation. Following independence in 1962, this vision was carried forward by the National Liberation Front (FLN), the political party born out of the independence movement, which continues to dominate Algerian politics to this day. However, while this research has shed light on the influence of the hydrocarbon sector in the decolonisation process and international relations, the extent to which this sector influences water politics and governance has remained underexplored until recently. By addressing this gap, this study offers insights into the complex interplay between current water politics in Algeria and contributes to broader discussions on water governance in rentier states.[3]

The first section provides a comprehensive literature review, situating the research within broader discussions on hydrosocial territories. This is followed by a methodology section, outlining the method of frame analysis and the ethnographic approach used, including interviews, media analysis, and the

[3] It is worth noting that, while rentier state theory suggests that resource dependence often produces weak diversification, economic distortions, limited accountability, and precarious long-term governance (Luciani, 1990), in Algeria, hydrocarbons have been framed as the foundation for sovereignty, industrialisation, and self-sufficiency. This contrast highlights the importance of examining how Algeria's hydrocarbon wealth has shaped governance logics in practice, including in the water sector.

examination of policy documents. The case study of Oued El Harrach is presented next, followed by a discussion of the findings and their implications for environmental governance in hydrocarbon-reliant states.

CONCEPTUALISING HYDROSOCIAL TERRITORIES

Technocratic approaches to water governance have long treated water as a neutral, physical substance, i.e. something that can be measured, managed, and allocated without reference to its social or political context (Mollinga et al., 2008). In response, hydrosocial scholarship (e.g. Bridge, 2006; Linton, 2010; Reddy and Syme, 2014) has questioned this depoliticised framing, emphasising that water is also shaped through its entanglements with society. Building on this foundation, Boelens et al. (2016: 1) introduced the concept of 'hydrosocial territories' to define spaces that are (re-)created through the interactions amongst human practices, "water flows, hydraulic technologies, biophysical elements, socio-economic structures and cultural-political institutions". These hydrosocial territories, however, are not fixed; instead, they are continuously reconfigured through political struggle, negotiation, and resistance across multiple scales. 'Hydrosocial territories' thus refers to the contested socio-natural configurations that emerge when actors with competing interests attempt to define, access, and control water. In other words, water is not just a resource, but part of a socio-natural assemblage through which various actors, institutions, and infrastructures interact to define its meaning, distribution, and control (Boelens et al., 2016). This is why, for example, Götz and Middleton (2020) ask: When different groups speak of 'water', are they even referring to the same thing? As Linton and Budds (2014: 175) observe, "Different kinds of waters are realised in different hydro-social assemblages", meaning that in one setting, water may be treated as a public good, while in another it may be commodified. The concept of hydrosocial territories thus helps to account for these plural meanings and spatialised contestations by foregrounding the configurations of power, identity, and access through which water is governed and experienced.

Building on this, scholars have also examined how infrastructure shapes urban water politics (Kaika and Swyngedouw, 2000; Gandy, 2014; Rusca et al., 2017; Millington, 2018). Meehan (2013, 2014), connecting urban infrastructure to hydrosocial territories, goes further and argues that when analysing these territories, we should also consider how infrastructure shapes possibilities, regardless of original state intentions. In traditional accounts, infrastructure such as pipelines or water treatment plants is often treated as a passive instrument, built and used by the state to bring water to specific areas. Hydrosocial scholarship, however, argues that infrastructure is not only about transferring water but also a means of exercising control. For example, if a government builds a pipeline to deliver water to certain neighbourhoods, the pipeline becomes a channel through which the state decides who receives water, how much, and when. In turn, a leaking or ageing pipe may force residents to create informal connections, producing new patterns of access and conflict. Or a water treatment plant with limited capacity might restrict access for some communities, not because of deliberate exclusion but due to infrastructural limits tied to broader power dynamics. In response, such infrastructure may fail, be repurposed, or be adapted by communities in ways that open up new claims to water. This is why Meehan argues that infrastructure is not just a tool but an active element that shapes outcomes, generates social relations, reinforces inequalities, and structures everyday experiences of water access. As such, hydrosocial research foregrounds infrastructure as a political and relational actor that both enables and constrains how water is distributed, used, and contested.

In terms of the evolution of the concept, Liao and Schmidt (2023) show how hydrosocial scholarship has expanded beyond treating water as simply clean, flowing freshwater. As they demonstrate, many studies have traditionally focused on freshwater, i.e. rivers, drinking water, or irrigation. But now scholars are examining more complex and 'messier' water forms, such as stagnant water, canals with sediment buildup, flooded urban areas, and hybrid spaces where water and land are entangled. Liao and Schmidt describe this as "water's many materialities", meaning that water is not just a clear liquid resource but

also includes muddy, polluted, or sediment-filled water along with wetlands, flood zones, and drainage canals – places where it is hard to say where land ends and water begins. Thus, the physical forms of water – its 'materialities' – are diverse, and they both shape and are shaped by social life and governance in different ways.

This diverse materiality of water forces researchers to think about how various forms of water (not just flowing water) interact with people's lives, infrastructures, and vulnerabilities. A good example of this shift is the research by Ley (2022), who explores stagnant waters in Indonesia, where urban flooding caused by poor infrastructure, political neglect, and rising coastal tides leads to stagnant water collecting in homes and streets. These stagnant waters are not just a technical problem but very much reflect social and political dynamics. This is similar to the El Harrach case study that is shortly to be discussed in this paper.

Linking debates on hydrosocial territories and discourse, an abundant literature discusses how narratives around water are constructed and contested (Hommes and Boelens, 2018; Rocha López et al., 2019; Ženko and Menga, 2019). Most recently, Tullio and Zannini's (2025) analysis of water politics in the Chilean region of Peña Blanca illustrates how discourse and power shape hydrosocial dynamics. In their study, the authors explore how conflicting understandings of water – its value, purpose, and rightful users – emerge from and reinforce broader political struggles. Their study describes a conflict between local communities and state authorities over a government-backed dam project intended to supply water for mining and export-oriented agriculture. While state and corporate actors were framing the project as a solution to scarcity and a means of promoting economic efficiency, local residents contested that narrative by emphasising water's cultural value and ecological role and their collective right to access it. Their analysis, thus, highlights that water governance in Peña Blanca is not simply a matter of resource distribution but a contested social process in which state actors, private companies, environmental groups, and local communities all advance competing claims. Through critical discourse analysis, the authors show how dominant framings – grounded in technocratic and economic logics – helped legitimise the dam while marginalising alternative claims. The counter-narratives, rooted in community knowledge and everyday experience, were often dismissed as emotional or unscientific, illustrating how power operates not only through infrastructure but also through the exclusion of alternative ways of knowing and valuing water.

Overall, the concept of hydrosocial territories has gained traction over the past decade as scholars have moved beyond narrow technical framings of water governance. In that sense, Alba et al. (2025) provide a much-needed synthesis of this growing body of work. Drawing from earlier debates on the hydrosocial cycle (Linton and Budds, 2014) and the critical study of infrastructure, territory, and environmental governance, Alba et al., trace how this concept has been applied across diverse empirical contexts, from inter-basin transfers and contested dam-building to urban infrastructure conflicts, illustrating its analytical versatility. Importantly, they identify four core dimensions that structure any hydrosocial territory: material infrastructures (e.g. dams or canals), institutional arrangements (laws, norms, and bureaucracies), symbolic and epistemic representations (maps, technical expertise, and discourses), and the broader power dynamics that shape differential access to water. At the same time, Alba et al., warn against a superficial or overly general use of the term 'hydrosocial territory', as while the concept has become increasingly popular, many studies fail to engage with the political processes through which hydrosocial territories are constructed and contested. They therefore call for more reflexive and grounded research that combines ethnography with institutional and discursive analysis and pays close attention to whose knowledge, values, and interests shape the production of territory.

Considering the application of this concept in the Middle East and North Africa (MENA) context, there is a solid body of research showing how state agendas reshape water geographies through strategic priorities (Hussein, 2018; Mustafa and Tillotson, 2019; Closas et al., 2021; Eid-Sabbagh, 2023). Ženko and Menga (2019), for example, examine the case of Lake Urmia in Iran, demonstrating how powerful hydrosocial imaginaries and infrastructure projects such as irrigation systems can reshape water flows in

ways that marginalise only specific regions. As they argue, these changes often lead to the territorialisation of manufactured water scarcity, with uneven distributions of burdens and benefits that mirror existing social and political hierarchies. In Lake Urmia's case, this remaking of the hydrosocial territory has produced not only environmental degradation but also severe impacts on the psychological well-being of local communities, inducing stress, depression, and social isolation.

Similarly, in a hydrocarbon-rich but water-scarce context, the study by Rachel McDonnell (2014) in Abu Dhabi provides a valuable point of reference. Using the hydrosocial cycle framework, she shows that water in Abu Dhabi is not simply a biophysical resource but a socio-political artefact, produced through energy-intensive desalination and wastewater recycling powered largely by natural gas. Water infrastructure in this context is thus shaped less by hydrological considerations than by the layout and availability of energy infrastructure. Moreover, McDonnell further argues that subsidised water provision functions as a tool of state legitimation, enabled by hydrocarbon wealth and used to maintain stability. In this sense, while El Harrach differs in terms of its institutional setup and regional context, McDonnell's work offers useful insights for tracing how hydrocarbon wealth materially enables, politically legitimises, and spatially organises water governance. In other words, it highlights the importance of examining energy-water interdependencies not only as technical linkages but as key elements of statecraft and territorial control.

In summary, the hydrosocial framework offers a powerful critique of depoliticised approaches to water governance. By highlighting the relational, contested, and socially constructed nature of water, it foregrounds the ways in which dominant actors seek to shape both physical landscapes and socio-political relations. This approach is particularly useful for exploring how water governance is influenced not only by local environmental concerns but also by broader political-economic priorities. As such, it offers critical conceptual tools for analysing cases like Algeria's, where the hydrocarbon sector plays an important role in shaping water governance decisions.

Nevertheless, although existing studies have illuminated the political and spatial dynamics of water infrastructure and discourse, little attention has been paid to how fossil fuel priorities influence state framings of water – particularly in MENA contexts. Algeria thus represents a compelling and under-researched case: Although rich in hydrocarbon resources, the country faces chronic water stress and pollution, while scholarship rarely examines how these sectors intersect. This research addresses this gap, tracing how the Algerian government's prioritisation of the hydrocarbon sector shapes water policy, depollution planning, and everyday water access. By drawing on the hydrosocial territories framework and integrating critical discourse analysis, the study contributes to broader debates about the politics of water in rentier states, offering new insights into how energy regimes co-produce water governance.

METHODOLOGY

This study adopted a qualitative research design, which was considered the most suitable approach because it provided a focused and manageable strategy for producing grounded insights within the timeframe of the project. In terms of data collection, this research adopted ethnographic research methods, comprising interviews, media articles, policy documents, and archival data gathered over a three-month fieldwork period in Algeria in 2022, as well as desk-based media monitoring and policy documents. The 23 interviews were conducted with research participants, including local residents of El Harrach municipality, water experts, journalists, and leaders of civil society organisations working in El Harrach. Experts and public sector employees were included because of their direct involvement in shaping, implementing, or commenting on water and hydrocarbon policies, as well as their perspectives on institutional decision-making, state priorities, and the intersections between water and energy governance. As for the El Harrach residents and civil society activists, they were included because the municipality has long suffered not only from an insecure drinking water supply, like much of Algeria, but

also from extreme wadi pollution, making it a critical site for examining the local impacts of national water strategies.

Additionally, 2209 newspaper articles from three primary sources – *Horizons*, *L'Expression*, and the Algeria Press Service – were analysed. *L'Expression* is a privately owned newspaper founded by Ahmed Fattani, a former editor-in-chief and co-founder of the daily *Liberté*. It is known for being closely aligned with the former President Bouteflika and having a clear and well-designed website, considered one of the most modern amongst the Algerian press.[4] *Horizons* is a broad-based Algerian daily newspaper in French and one of the six state-owned press titles in Algeria. While it is not typically branded as overtly biased, it is subject to the constraints and influences of state control, which can impact its editorial stance (Mostefaoui, 2019). Finally, the Algeria Press Service (APS) is a national news and information agency, established in 1961, one year before the country gained independence. It operates under the authority of the Ministry of Information, which places its editorial independence under state oversight (Rebah, 2022).

The articles analysed were in both English and French and focused on the keywords 'water', 'water pollution', 'oued', 'Oued El Harrach', 'El Harrach', and their French equivalents. If an article linked water to the hydrocarbon sector or fossil fuels, it was also included in the analysis. The media data collection was facilitated by the Gale OneFile News Database, which provided access exclusively to the archives of these newspapers. Other media sources, such as TV or radio, were not included due to access limitations. Similarly, due to the extensive time requirements it would have involved, social media was not included in this analysis. The media monitoring spanned from 2009 to 2022, the largest timeframe permitted by the database. Policy documents and grey literature were collected online or on site in Algerian archives.

This study employed 'frame analysis', defined as a research method used to study how issues, events, and situations are structured and presented in discourse (Goffman, 1986). Developed by Erving Goffman (1986), frame analysis examines how people interpret and make sense of their experiences through particular 'frames' or lenses. Overall, 'framing' is an analytical tool through which the discursive practices of actors are examined and described and, as such, its main purpose is to analyse the relationship between texts[5] and their contexts. In other words, it describes how the meanings of situations emerge by analysing the relationship between texts and the wider socio-political context.

THE DISCURSIVE FRAMING OF WATER IN ALGERIA

In line with the focus of this study, the analysis is organised into two sections: issues related to drinking water and those concerning aquatic environments. Each section examines the relevant frames identified in the data; some frames appear in both sections, while others are specific to one.

Drinking water issues

Water security for drinking purposes is the most emphasised frame across all datasets. Across official documents, interviews, and media reporting, drinking water is consistently framed as a priority for national security and an immediate crisis, which aims to draw attention and mobilise resources. The portrayal suggests that addressing water problems is a top priority for national stability. The frame of 'water as a national security issue' is consistently articulated in documents from the Ministry of Environment and Renewable Energy and the Ministry of Hydraulics, and it is prominently featured in speeches by President Tebboune. This framing, however, must be understood in the context of a policy shift that began in the 1980s, when Algeria started reallocating surface water from agricultural irrigation towards domestic use. Later, in the 2000s, the focus shifted toward desalination as a key strategy for

[4] Courrier International. (n.d.). *L'Expression*, https://www.courrierinternational.com/notule-source/l-expression

[5] Text is understood as both written and non-written speech acts.

securing the urban water supply (Yamao, 2011). This official narrative – water security as both a national and global challenge – was also strongly reflected in interviews (e.g. Participant 17, an employee of the Department of Water Resources Management, 2022).

Interviewees generally positioned water scarcity as a strategic challenge best solved through technical interventions while sidelining questions of social or political restructuring, thus reinforcing a state-centric and technocratic logic in which water is treated as a resource to be secured, produced, and managed through large-scale projects. This framing supports a depoliticised narrative that obscures questions of power or social inequalities (Swyngedouw and Williams, 2014; Allouche et al., 2015; Boelens et al., 2023). Crucially, Algeria's approach to desalination ties its water security strategy to the hydrocarbon sector. Desalination is an energy-intensive process, and although the government has promoted solar-powered alternatives, most desalination plants are still powered by natural gas (Algeria Press Service, 2025). This dependency directly links water production to energy infrastructure. More broadly, hydrocarbons account for approximately 78% of Algeria's national revenue (Desponts and Prinz, 2024), underscoring the structural importance of the sector. The expansion of desalination capacity, therefore, depends not only on hydrological planning but also on fossil fuel wealth and energy.

All this means that water infrastructure planning in Algeria is deeply tied to hydrocarbon revenues, making environmental and water management programs vulnerable to abrupt interruptions when oil prices fall and illustrating the precariousness of long-term governance in a rentier state. In this sense, hydrocarbons are not merely a parallel priority but the structural enabler of water governance, shaping which technical solutions are feasible – or politically desirable. While the data do not provide for a detailed comparison between the importance of water and other pressing issues such as housing, employment, or social stability, it is clear that water is a priority for the government. This is demonstrated not only in speeches but also through substantial investments in high-energy-consuming water-related projects such as desalination plants and dams. Through these plans, the government aims to showcase a dedicated approach that integrates water management into broader development initiatives, simultaneously addressing multiple challenges.

The theme of water security was also echoed in the news on various topics, including climate change, drought, water cuts, etc. For instance, an article titled *Water Security: Mega-Transfer Projects to Win the Water Battle*, published in *Horizon* in March 2023, during a severe drought, outlines how water resource mobilisation, distribution, and infrastructure development have been ongoing challenges since Algeria gained independence. The article reflects on Algeria's post-independence water mobilisation efforts – particularly through dam and inter-dam transfer projects – in a narrative that resonates with more recent state initiatives under President Abdelmadjid Tebboune to secure the country's water future. In doing so, the article frames drinking water development as a 'battle to be won':

> After gaining national sovereignty, the mobilisation of drinking water for the population, its equitable and balanced distribution and its availability for agricultural and industrial activities, particularly through major inter-dam transfer projects, has constituted (…) the other battle to be won to ensure sustainable water security (*Horizon*, 2023a).

This metaphor of a 'battle' reinforces the securitisation of water, suggesting that overcoming scarcity requires large-scale, state-led interventions. Yet both inter-dam transfers and mega-dam construction are highly energy-intensive, implicitly revealing how Algeria's water strategy is deeply entwined with its hydrocarbon economy. While the influence of the hydrocarbon sector may not appear directly in water policy documents, it becomes visible in the discourse and priorities promoted by state leaders. For instance, presidential speeches by both Bouteflika (1999-2019) and Tebboune (2019-present) emphasise large-scale technical solutions to water scarcity, including desalination and inter-basin transfers. These initiatives are often framed as national achievements that symbolise state strength and modernisation. Bouteflika repeatedly described water as "the foundation of all civilisations and development, especially in a semi-arid country like Algeria", calling for "further modernisation and expansion of networks to

provide all citizens the same water utility" (Algeria Press Service, 20108). More recently, President Tebboune has echoed this framing, calling for "a national mobilisation at all levels to optimise the use of wastewater and preserve other resources" while presenting desalination as "a point of pride" that showcases the state's capacities (*L'Expression*, 2023a). These recurring references frame water not only as a development priority but as a strategic asset closely tied to sovereignty, energy governance, and regime legitimacy. Frequent allusions to large-scale projects such as the Salah-Tamanrasset water transfer launched in 2016 illustrate a hydro-developmental paradigm in which hydrocarbon-backed infrastructure is presented as both a technical and a symbolic response to national insecurity.

Closely linked to security, scarcity emerges as another prominent framing across documents and speeches. Since 2019, Algeria has implemented a national rationalisation plan, resulting in frequent water cuts. Consequently, water scarcity has become a central theme in governmental discourse. Policy documents and media reports frequently emphasise Algeria's location in arid and semi-arid regions, making it particularly vulnerable to water shortages. The discourse on climate change has become more prominent, especially after the 2015 COP 21 conference, which culminated in the Paris Agreement. Water scarcity is often linked to climate change and economic risks, particularly in agriculture (Takheroubt, 2023).

This narrative positions Algeria as a victim of external climate forces, reinforcing a sense of inevitability and urgency while abstracting the problem from nation-level decisions around infrastructure, regulation, and distribution. At the same time, it reinforces a top-down vision of state-led response, where energy-intensive technologies are presented as rational solutions. Although often implicit, in a rentier context these energy-demanding projects place Algeria's hydrocarbon sector in a central role, enabling the country's technical and infrastructural response to climate-induced scarcity. Moreover, while vulnerability to climate change is real, this framing can obscure questions of governance, access, and uneven impacts, all of which are central to a more politicised understanding of water scarcity (Hussein et al., 2018; Mehta et al., 2019).

While the specifics of these challenges and mitigation strategies vary, storage and supply metrics feature prominently as the primary indicators of water governance success. For example, a 2023 report from the Water Resources Directorate in Jijel highlights that "more than 40 million m³ of water were mobilised across four dams in the wilaya following recent rainfall", detailing volumetric increases in each facility with precise percentages of fill capacity (*L''Expression*, 2023b).

The framing of drinking water quality in Algeria is largely centred on consumer protection and individual responsibility, with a consistent emphasis on detecting pollutants in water sources and implementing measures to prevent contamination. This includes both laboratory monitoring and public health messaging aimed at individual responsibility (SEAAL, 2022a). By highlighting strict laboratory controls and transparent communication, the message aims to build public confidence in the safety of tap water, presenting the state as both attentive and proactive in managing water quality.

In terms of tap water pollution, for instance, in the summer of 2023, an outbreak of gastroenteritis in Beni-Douala in Tizi Ouzu affected 75 people who had consumed water from an unregulated source (*Horizon*, 2023b). Health officials responded by urging citizen vigilance, recommending chlorination at the point of use, and advising villagers to add bleach drops to spring water. Notably, the article does not address the underlying issue of limited access to tap water and broader questions of water infrastructure and state provision, which is what led residents to rely on unregulated sources. Instead, it framed the issue as one of individual responsibility and private hygiene, with health authorities offering advice on how to disinfect water rather than addressing the structural conditions that make such measures necessary.

This focus on individual responsibility also appears in local narratives. In an interview, a retired doctor from El Harrach reflected on the health implications of pollution from Oued El Harrach:

> Here in El Harrach, there are no official studies [about diseases related to the domestic water supply] (…). When Gorias still existed, there were cases of bilharzia because kids used to swim in the river. (…) Since the shantytown was demolished, there haven't been any more cases. (…) To my knowledge, there haven't been any cholera-related deaths (Participant 13, doctor of medicine, 2022).

This statement should be understood as a personal observation rather than an authoritative account of health records. Nonetheless, it illustrates how health risks are often narrated as isolated, past events rather than ongoing concerns, particularly when no visible or large-scale outbreaks occur. The framing implicitly interprets pollution as not linked to structural causes or industrial activity, but rather as a residual issue of the past, seemingly resolved through the removal of informal settlements rather than broader environmental measures.

These examples show that concerns over water quality are often framed around microbial risks, household practices, and consumer behaviour. However, this focus conceals more systemic or industrial sources of pollution. Despite the presence of industrial effluents and petrochemical runoff (see for example the study by Arab et al., 2019), such pollution sources are largely absent from official narratives. Instead, pollution is depoliticised, individualised, and disconnected from state-linked industries, obscuring the broader political ecology of water contamination in Algeria.

Another prominent way the government frames drinking water is through a technical lens. This framing of water supply and consumption follows a technocratic-managerial perspective on water management and is deeply rooted in a neoliberal perspective, focusing on the dynamics of supply versus demand and emphasising the quantification of water resources by highlighting how much water various reservoirs can hold. For instance, a media article titled *Our Dams Are All Secure* reports that the Beni-Haroun dam in the *wilaya* (or 'province') of Mila can provide water to inhabitants simply because it has accumulated a certain amount of water:

> According to Lachehab, the volume of water received by the dam during the second half of May was around 60 million cubic meters, contributing to a "significant increase" in water reserves now (…) at 76% of the total capacity. (…) The director also stressed that the volume stored "guarantees a comfortable supply to the inhabitants of the wilayas served by the Beni-Haroun dam" (*L'Expression*, 2023c).

However, a month later, the local community of Sidi Merouane in the same wilaya complained in a petition about receiving less than one hour of water supply every two days (*L'Est Republicain*.; 2023). This example underscores a key point highlighted by critical water literature: the importance of equity. A discursive focus on technical aspects often sidelines the crucial issue of access. Critical scholars on water politics (e.g. Allouche et al., 2019; Mehta et al., 2019; and others) rightly emphasise that 'supply' is not the same as 'access'; having a large supply of water does not guarantee that all communities will have equitable access to it.

When it comes to consumption, the government's perspective also remains largely technocratic, presenting water scarcity as a matter of mismanagement by users rather than structural failures. In 2021, amid a worsening water crisis, the Director of Water Resources in Algiers stated: "Given the irrational use of water by some citizens, even all the water in the world would not be enough to meet demand" (*L'Expression*, 2021).

This emotionally intense quote exemplifies how state actors frame water scarcity as a behavioural issue, placing blame on individuals rather than addressing governance failures or infrastructure deficits. While earlier reports (e.g. the 2007 National Environmental Report) noted climate change and economic crises, the current discourse tends to moralise consumption and shift responsibility onto citizens. This case also illustrates an interesting clash of hydrosocial imaginaries between the government and local inhabitants. On the one hand, the state portrays water as a controllable resource, with scarcity solvable through large-scale dams and energy-intensive technologies, yet when these strategies fall short, citizens are blamed for mismanagement and overuse. This imaginary contrasts with the lived realities of many

residents who experience chronic inequalities in access despite official claims of universal provision. Moreover, when citizens adopt the very technical-managerial logic promoted by the state, they are then held responsible for unsustainable consumption, and any expressions of dissatisfaction are reframed not as evidence of governance failure or infrastructural neglect but as signs of irresponsibility or irrational behaviour. This disconnect thus reveals the contested hydrosocial imaginary where state-led visions of water security obscure the socio-political dimensions of distribution and depoliticise accountability. Ultimately, the framing is underpinned by the logic of the rentier state, in which water provision is imagined as something that can be guaranteed simply through revenue and energy from the hydrocarbon sector. It reinforces a depoliticised hydrosocial order that limits public engagement and suppresses alternative discussions of justice and sustainability.

Concerns about water pricing were the last prominent frame that occurred. Policy discussions frequently centred on the gap between the real cost of water production and distribution versus the heavily subsidised public tariffs. Concerns were specifically raised about the long-term financial sustainability of these subsidies, with some actors acknowledging the possibility of future price adjustments to better reflect production costs. As a rentier state, Algeria has historically relied on hydrocarbon revenues to subsidise essential services, including water. These subsidies allow the state to maintain low public water prices, especially in urban areas, while continuing to invest in infrastructure, meaning that hydrocarbon wealth plays a direct role in shaping both the affordability and accessibility of water.

At the same time, these macroeconomic concerns coexist with more immediate challenges for many households. Due to frequent water cuts and irregular supply, residents with limited access to reliable public provision are often forced to rely on bottled water, yet the price of bottled water has also increased significantly in recent years. In 2021, the cost of a six-bottle pack rose to DZD190-200, an average increase of about DZD3 per bottle.[6] This price rise prompted complaints from consumer associations who described it as "unfair and anti-competitive" (*Horizon*, 2021). This situation illustrates the compounding effects of infrastructural unreliability and market pricing on household water security. As one El Harrach resident noted, "It's expensive, you know? A family needs three or four jugs of water! If everyone drinks three litres a day, that's 300 dinars per day. (…) It's expensive!" (Participant 21, resident of El Harrach, 2022).

The combination of intermittent public provision and rising private water costs reveals how economic pressures can undermine equitable access, particularly for lower-income and marginalised households. This reflects broader critiques of commodification, which argue that treating water as an economic good often reinforces inequality and marginalisation, especially when public systems fail to guarantee reliable service (Bridge, 2006; Linton, 2010). On the other hand, the government keeps highlighting that it actively invests in water projects, prioritising rural areas through communal development programs. This means that it acknowledges the challenges in water supply, with infrastructure improvements seen as essential to enhancing distribution efficiency. The Algerian Water Company (Algérienne des Eaux, or ADE) plays a key role in water management, including efforts to sustain operations through debt recovery. However, public perception of ADE is mixed. Many criticize it for neglecting the population's needs, as citizens often resort to purchasing water due to perceived supply inadequacies.

Pollution of aquatic environments

Regarding bodies of water such as wadis, discussions are generally communicated through a commitment to safeguarding water quality through rigorous monitoring and regulatory frameworks. A notable example is the proposal to increase the pollution tax in the 2016 Finance Bill, presented not only as a

[6] In 2021, the Algerian dinar (DZD) averaged an exchange rate of ج.د135:US$1 or ج.د160:€1. See https://www.exchange-rates.org/.

means of regulation but as a way to guarantee citizens their right to a clean environment. As the Minister of Environment and Renewable Energy, Fatima Zohra Zerouati, stated:

> The pollution tax proposed in the Finance Bill 2020 has been raised from DZD13,000 to DZD26,000. Economic companies, factories and production units that do not regularly dispose of their stored waste will have to pay twice as much as they used to (APS, 2016).

Another topic linked to water bodies and water pollution is flood management. In flood-prone areas such as El Harrach, the overflow of drainage systems, inadequate stormwater infrastructure, and occasional malfunctioning of wastewater treatment plants contribute to increased contamination risks. During flood events, pollutants from industrial zones, untreated sewage, and urban waste are dispersed into residential areas and surface water bodies, posing a threat to public health (Hamed et al., 2018). In this context, the government discourse emphasises the responsibility of local authorities to manage flood risks and maintain drainage networks. For example, during a technical meeting, an official stressed: "The objective is to improve technical and infrastructure management tools, as well as to design other tools for asset management of infrastructure" (Algeria Press Service, 2013).

This reflects a governance approach that frames risk in managerial and infrastructural terms. Plans for flood prevention and the introduction of prediction systems are presented as crucial strategies to reduce urban vulnerability, while infrastructure development is consistently framed as a sign of state responsiveness and modernisation. Government discourse highlights inspections and technical upgrades to water-related projects as means to improve operational efficiency and ensure sustainability. These efforts are portrayed as pragmatic responses to increasing demand and water stress. However, by focusing on technical fixes (such as rehabilitating pipelines or deploying advanced treatment technologies) the framing remains managerial, overlooking deeper governance issues such as enforcement failures or pollution linked to industrial activity.

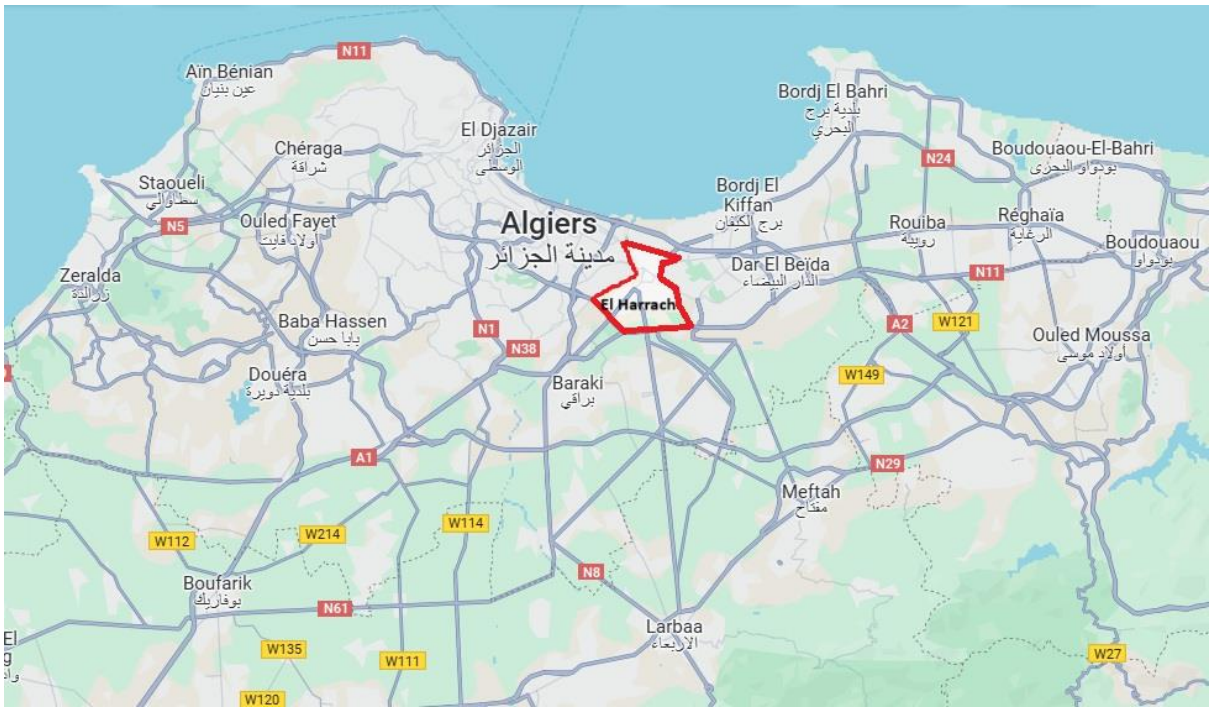
The emphasis on financial investment reinforces a narrative in which pollution is treated as a problem that can be solved by injecting capital. The narrative signals both the state's economic capacity – largely enabled by hydrocarbon revenues – and its willingness to act, but it also serves to obscure deeper governance issues, delays in implementation, and the disconnect between official declarations and actual outcomes (Participant 2, journalist, 2022).

While this section has revealed the national-level framings, the following section turns to El Harrach to examine how these framings manifest on the ground – in infrastructure deployment, environmental management, and residents' lived experiences.

THE HYDROSOCIAL TERRITORY OF EL HARRACH: ACCESS, POLLUTION, AND STATE-CITIZEN TENSIONS

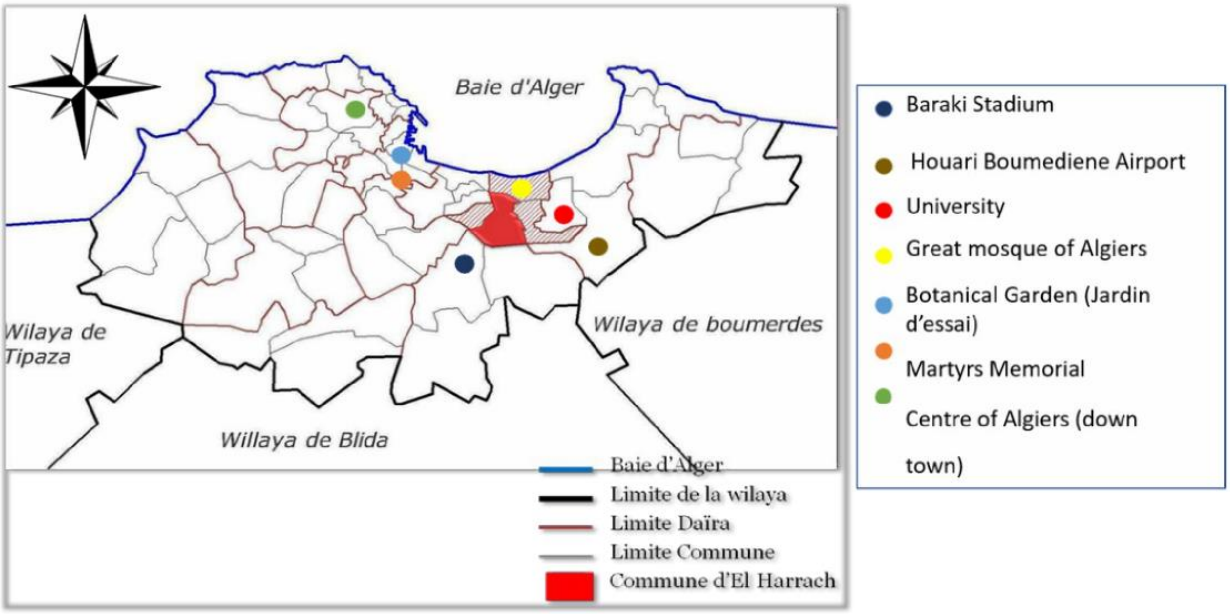
El Harrach, a municipality (*commune*) in northern Algiers (Algeria's capital city) through which the Oued El Harrach flows, is notable for its historical and industrial significance. Today, El Harrach has transformed into a densely populated urban municipality (see Figure 1 and Figure 2) that embodies many of the challenges and complexities faced by Algerian cities, particularly with regard to environmental issues, industrial expansion, and urban planning. As such, it serves as a compelling case for examining both drinking water supply issues and surface water source pollution.

Figure 1. Location of El Harrach municipality (highlighted in red).



Source: Google Maps.

Figure 2. Map of El Harrach municipality within the wilaya of Algiers.

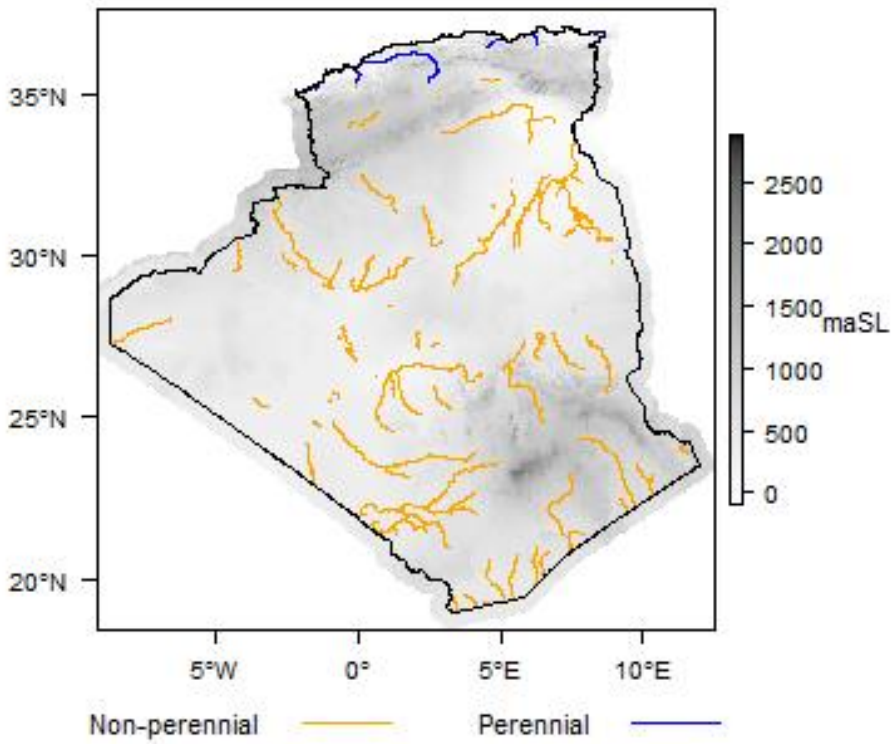


Source: Souidi et al., 2025.

Household drinking water supply

Algeria has an arid to semi-arid climate which results in mild, wet winters with hot and dry-but-humid summers on the coast, while there is a drier climate with hot summers in the centre of the country and on the plateau (Peel et al., 2007). Although Algeria is the tenth largest country in the world,[7] 80% of its area is desert,[8] and (after Libya) it is the second most water-scarce country in Africa, with no large rivers and water sources unevenly distributed around the country. This is easily seen in the geography of the country, where there are 17 major ephemeral watersheds[9] (see Figure 3) but the only significant perennial stream is the Chelif River in the Saharan Atlas. Therefore, while most regions suffer from water shortages, heavy rains cause yearly floods in some areas (Al-Amin, 2018; Chabour, 2018).

Figure 3. Major surface water features of Algeria.



Map developed from World Wildlife Fund HydroSHEDS; Digital Chart of the World drainage; and FAO Inland Water Bodies. Source: British Geological Survey, http://earthwise.bgs.ac.uk/index.php/File: Algeria_Hydrology.png

Algiers' drinking water issues are exacerbated by multiple factors, including rapid population growth, industrial activities, and the effects of climate change. Currently, the city faces an increasing domestic demand for drinking water, particularly due to significant demographic expansion (Desponts and Prinz, 2024). While government subsidies for groundwater extraction, financed by hydrocarbon revenues, keep water costs low, this policy discourages conservation and sustainable water management practices (Chabour, 2018).

[7] World Population Review, online: https://worldpopulationreview.com/country-rankings/largest-countries-in-the-world, 13.09.2021

[8] The World Factbook, online https://www.cia.gov/the-world-factbook/countries/algeria/#geography, 13.09. 2021.

[9] Ephemeral watersheds are surface streams that flow only after large rainfall events.

As for the drinking water supply, this comes both from conventional sources (surface water and groundwater) and non-conventional sources (seawater desalination plants), especially in coastal cities such as Algiers or Oran. Renewable water resources are estimated at approximately 450 m^3/capita/year, which is below the recommended 500 m^3/capita/year recognised as the scarcity limit indicating a water crisis.[10] To date, 11 desalination plants have been constructed in the whole country and produce 17% of the total amount of drinking water consumed nationally.[11] According to the Minister of Water Resources and Water Security, the government estimates that, when all desalination plants are completed, they will cover 130% of the needs that are currently filled by surface water.[12]

Between 1995 and 2005, Algeria underwent a series of institutional and policy reforms in the water sector. These included the creation of the Ministry of Water Resources (*Ministère des Ressources en Eau, MRE)* and the establishment of both national and regional agencies to oversee water governance. The reforms aimed to prioritise the provision and distribution of drinking water, introducing updated regulatory frameworks and pricing mechanisms. At the same time, responsibilities previously held by provincial and municipal authorities were gradually transferred to Algérienne des Eaux (ADE), a management agency tasked with the production, transfer, treatment, storage, and supply of drinking water, and the National Sanitation Office (Office National de l'Assainissement, ONA), in charge of sanitation services (Ghosn, 2013). In 2000, Algeria adopted multiple strategic plans for sustainable development,[13] and these plans were then followed by the implementation of laws, decrees, and regulations aimed at protecting water resources and ensuring sustainable water management.

Regarding the management of water resources, the MRE remains the central authority responsible for crafting and executing national water policy. While some competencies have been decentralised to local directorates at the wilaya (provincial) level, the system remains largely centralised, with oversight and direction maintained by the MRE. Moreover, the governance of water is further distributed across several key institutions: the National Agency for Hydraulic Resources (*Agence Nationale des Ressources Hydraulique*, ANRH), which conducts research and evaluates water and soil resources for irrigation; the National Agency for Dams and Transfers (*Agence Nationale des Barrages et Transferts*, ANBT), responsible for mobilising and transferring water to demand areas; and ADE, which manages the entire process of delivering water for both domestic and industrial use. Additionally, ONA handles the development and operation of sanitation infrastructure, while the National Office for Irrigation and Drainage (Office National de l'Irrigation et du Drainage, ONID) oversees state-supported irrigation schemes and promotes more efficient irrigation practices. Additional reforms in 2008 led to the formation of two new entities: the National Advisory Council for Water Resources (*Conseil National Consultatif des Ressources en Eau*), intended to improve policy coordination, and the Water Public Services Regulation Authority (*Autorité de Régulation des Services Publics de l'Eau*), a regulatory body mandated to assess the quality and pricing of water and sanitation services.

Since independence in 1962, the city of Algiers experienced chronic water supply issues due to infrastructure deficits, including high rates of water loss and outdated networks unable to keep up with growing demand (Perennes, 1990). Later, in the 1990s, the government began to implement water-rationing plans in both urban and rural areas during periods of scarcity, typically prompted by droughts

[10] Fanack Water: Water in the Middle East and North Africa, online: https://water.fanack.com/algeria/water-resources/#_ftnref2, 16.06.2025.

[11] Algeria Press Service, online via VPN: https://www.aps.dz/economie/85461-ade-pres-de-17-de-l-eau-distribuee-provient-des-stations-de-dessalement, 16.06.2025.

[12] Ministry of Water Resources and Water Security, online via VPN (in Arabic): https://www.mre.gov.dz/?p=6714, 16.06.2025.

[13] See, e.g., The National Environmental Strategy (SNE, 2010-2011), The National Action Plan for the Environment and Sustainable Development (PNAE-DD, 2002), The National Strategy for the Environment and Development Sustainable Development (SNE-DD, 2017-2035), and The National Strategy of Ecological Transition towards Sustainable Development (2015-2020).

and declining reservoir levels. These measures expanded in scope throughout the mid-2000s and early 2010s, especially in years of low rainfall. More recently, in the summer of 2021, a more systematic approach was adopted in Algiers: The city was divided into three zones based on reservoir availability. According to this schema, Zone 1 receives a daily supply from 8am to 2pm; Zone 2 – which includes El Harrach – receives water every other day from 8am to 4pm; and in Zone 3, some municipalities receive water from 8am to 4pm and others from 9am to 2pm (Ait, 2021). However, during my fieldwork – which spanned all seasons – I observed further differences in water supply between municipalities. While my accommodation in Zone 1 (Hydra) experienced almost uninterrupted access, respondents living in El Harrach reported receiving water every other day, for only two hours in the early morning (around 4 am). Later, the timing of their supply began to shift to slightly later hours. This persistent discrepancy between official claims of equitable provision and the uneven reality on the ground fosters a deep sense of marginalisation and mistrust among residents. It also contributes to feelings of frustration and fatigue, as people are forced to continuously adapt their routines to manage an unreliable and unequal system.

Some problems with water supply date back to the days of French colonisation, where water infrastructure was deliberately re-constructed to favour French colonisers (Goubert, 2001; Cutler, 2010). However, present urban water challenges reflect the material and political logic of Algeria's rentier state through its reliance on large-scale projects such as dams and desalination plants alongside heavily subsidised water tariffs. These capital-intensive solutions are made possible by the country's hydrocarbon wealth, which enables both costly infrastructure investment and the political insulation of water users from its true cost. In this sense, the hydrocarbon sector does not merely fund water provision but also shapes the very strategies through which the state governs and imagines water. Water issues are, thus, treated as technical and depoliticised matters, to be resolved through engineering and financial outlays rather than through democratic engagement or structural reform. However, when water is framed primarily in terms of its materiality – as a commodity to be delivered – quick technical fixes do not automatically result in more reliable or equitable water provision. On the contrary, they risk obscuring the underlying governance failures that continue to produce uneven access and long-term insecurity.

These failures mean that residents have had to develop their own coping strategies, such as filling and storing containers to ensure household water security (Respondent 7). However, these coping strategies are themselves inefficient and environmentally unsustainable. The widespread practice of storing water in large containers, driven by uncertainty, often leads to over-consumption, as people continue refilling them and keeping extras 'just in case', which can result in significant water waste. In the long run, thus, such adaptation reinforces rather than alleviates the underlying problem.

Aquatic environmental pollution

Regarding surface water pollution, several studies illustrate that Algeria has one of the highest rates of pollution in the world (Abdeslem, 2019). In general, water is most polluted by industrial residues, insecticides used in agriculture, waste, hydrocarbons, and as a result of effluent being mixed with potable water (Hamed et al., 2018).

In ancient times, the Oued El Harrach supported early settlements, including those of Phoenician and Roman civilisations, who used its water for irrigation and agriculture. During the French colonial era (1830-1962), the wadi became integrated into the urban expansion of Algiers, with new railways and roads constructed along its path. This period also marked the beginning of the industrial activities that significantly contributed to its pollution (El-Watan, 2023). After Algeria gained its independence from France in 1962, the wadi became a key feature of the area, providing recreational opportunities such as swimming. Today, this wadi, which extends 67 km from the Blida Atlas to the Mediterranean Sea, intersects several municipalities including Mohammadia, Hussein Dey, El Harrach, and others (Berezowska-Azzag, 2014).

Over time, however, the once-vibrant Oued El Harrach has been severely affected by industrial pollution. In the late 1960s and early 1970s, Algeria pursued a state-led development strategy centred on so-called "industrialising industries", which refers to an ambitious plan to transition from an agricultural economy to one that prioritises heavy and capital-intensive sectors such as petrochemicals, metallurgy, and manufacturing (Haouas and Lin, 2024). This approach led to the establishment of major industrial zones around the wadi, contributing to economic growth but also accelerating environmental degradation (Algeria Press Service, 2022b). By the late 20th century, the environmental state of Oued El Harrach had deteriorated markedly. The wadi, now flanked by around 500 factories and warehouses, suffers from significant contamination. During periods of high pollution, levels of harmful chemicals such as lead, chlorine, zinc, and chromium have been found to exceed safe limits by as much as 30 times the acceptable averages and 400 times the WHO standards (Berezowska-Azzag, 2014). Moreover, research has identified the presence of pollutants such as suspended solids, organochlorine waste, hydrocarbons, and heavy metals from industrial discharges, untreated sewage, and urban runoff (Arab et al., 2019). The resultant ecological damage, including foul odours and polluted water, has had detrimental effects on public health and the surrounding environment, including the Bay of Algiers (Berezowska-Azzag, 2014).

Although Algeria has ratified laws on water protection, these commitments often serve more to signal alignment with global norms than to ensure consistent enforcement on the ground. In practice, state efforts to address water pollution have largely focused on visible, technical interventions such as wastewater treatment plants and urban beautification, rather than confronting deeper structural causes. A notable example is the revitalisation of Oued El Harrach under Algiers' 2009-2029 strategic urban development plan. Framed as a flagship project to modernise the capital, in 2012 the government committed 38 billion dinars through a partnership with a Korean consortium. This plan included riverbank consolidation, dredging, the creation of public green spaces, and depollution. It was followed by an environmental workshop involving national ministries, ONEDD (*Observatoire National de l'Environnement et du Développement Durable*),[14] and the Japan International Cooperation Agency, which confirmed severe pollution from factories producing paints, rubber, and pharmaceuticals (Hanifa et al., 2012). Analysis of both watercourses and sediments revealed that factories along the wadi, including those producing paints, rubber, and medicines, discharge their wastewater directly into the wadi. Recommendations included strengthening sewage treatment plants, using treated wastewater for agriculture, stricter industrial effluent controls, and developing a comprehensive pollution control strategy. To address these challenges, major projects such as systematic pollution monitoring and water pollution quality index mapping were initiated to clean up the wadi, improve water quality, and restore natural habitats. The plan envisioned restoring the wadi's hydraulic functions, creating recreational and green areas along its banks, and initiating depollution measures. These efforts were to be carried out in three distinct phases: (i) consolidation of riverbanks and dredging of the riverbed; (ii) development of public leisure spaces along the shoreline; and (iii) comprehensive depollution of the water body SEAAL, 2008).

However, implementation has been partial and slow. By 2013, just 15% of the planned works had been completed, delayed partly due to the presence of oil pipelines (Zehraoui, 2022). To date, while the wadi has significantly improved both visually and olfactorily (see Figure 5), the data shows that from the start of the works in 2012 only 18.2 km of the wadi's 67 km length – exclusively within the Wilaya of Algiers – has undergone rehabilitation, despite its course spanning three wilayas (Larbi, 2024). Moreover, reports have focused on odours and urban nuisances, with minimal attention to marine pollution (Hanifa et al., 2012). In April 2021, President Abdelmadjid Tebboune ordered the relaunch of the Oued El Harrach perimeter development project (Djallal, 2013). By early 2022, he further mandated the acceleration of the integrated Oued El Harrach project to ensure its timely completion. In 2024, another promise was

[14] The National Observatory for the Environment and Sustainable Development.

made, this time for the wadi to be cleaned in March 2025; however, to this day, the works are still in place (El-Watan, 2025).

Figure 4. Oued El Harrach during depollution works.

Source: Personal photography (2022).

Officially, these efforts signal a commitment to environmental protection and urban renewal. However, both the scope and implementation of these plans remain limited. In other words, the prioritisation of water in state rhetoric often does not translate into effective and sustained policy implementation. On the local scale, despite financial investments, the slow progress in the depollution of the El Harrach *wadi* reveals a significant gap between policy intentions and outcomes. This discrepancy can also be attributed to the state's dual focus on maintaining social stability and fostering economic growth through its hydrocarbon industry. As one hydrologist explained:

> For the state, what constitutes a problem at the moment is really not pollution, it is much more the water supply of citizens, so that they do not engage in major protests (…). The social problems in our country are employment; you see it in the government program. They must find (…) [or] create jobs for young people (Participant 5, hydrologist, 2022).

This testimony highlights how environmental concerns are subordinated to broader issues of political legitimacy and social control. In other words, water management in this context is primarily framed as a tool for ensuring political stability rather than as part of a comprehensive environmental strategy. Institutionally, the wadi cleaning project is managed by five national ministries: the Ministry of Environment and Renewable Energy; the Ministry of Industry and Pharmaceutical Production; the Ministry of Interior, Local Authorities and Spatial Planning; the Ministry of Public Works and Basic Infrastructure; and the Ministry of Hydraulics (Algeria Press Service, 2024). This means that although the Directorate of Water Resources of the Wilaya of Algiers (DRE) is formally involved in monitoring and local implementation, the planning, financing, and enforcement decisions remain under the authority of these national ministries, which seem to give preference to high-visibility, capital-intensive interventions such as the construction of wastewater treatment plants. As such, local authorities play an operational role but have limited power to initiate or enforce measures independently, particularly when it comes to industrial pollution regulation. This top-down structure reflects a broader logic where the state prioritises costly infrastructure, often made possible by hydrocarbon revenues, over long-term democratic engagement or regulation enforcement.

The Baraki Wastewater Treatment Plant (WWTP) is illustrative of these dynamics. Once ranked as the third largest wastewater treatment plant in Africa, Baraki WWTP resumed operations in 2008 after a period of closure (see Figure 6). According to official data, around 70% of this purified water is returned to a dam to irrigate the fertile plains in Mitidja in the south of Algiers, while the rest is returned to the Oued El Harrach (News, 2018). However, although designed to treat 300,000 m³/day of wastewater, including from Oued El Harrach municipality, recent data indicate that the plant now processes only 150,000 m³/day which is only 50% of water it receives, although the reasons for this remain unclear (SEAAL, 2022b).

Moreover, while environmental law[15] mandates that industrial companies construct their own wastewater treatment facilities, enforcement remains weak. In 2022, a hydrologist stated that according to their informal information, none of the factories has built a wastewater treatment plant and that this was particularly the case of the Sidi R'zine oil refinery, located near the Baraki waste water treatment plant (WWTP) which does not have a purification system and whose discharges are considered dangerous for the Baraki WWTP (Algeria Press Service, 2022a; Larbi, 2024). So far, despite warnings issued by the government to various companies, it is not clear whether this has changed. When questioned, officials from the Wilaya's Directorate of Water Resources neither confirmed nor denied this claim, stating only that companies in breach of the law are fined and that the directorate carries out regular inspections. Yet the erratic implementation and lack of transparency around enforcement, particularly in relation to hydrocarbon-linked entities, point to a disconnect between formal regulation and effective, sustained action. Currently, nearly 123 industrial companies located in areas surrounding Oued El-Harrach are concerned, and nearly 84 companies are already being supported in waste management (Directorate of Water Resources, Wilaya of Algiers). However, the enforcement of environmental regulations remains highly centralised, with oversight and sanctioning mechanisms ultimately residing at the national level.

Figure 5. Wastewater Treatment Plant in Baraki, Algiers (2019).

Source: SEAAL Facebook page. Online at: https://www.facebook.com/SEAALCorporate/posts/la-station-depuration-des-eaux-us%C3%A9es-de-baraki-est-class%C3%A9e-3%C3%A8me-en-afrique-avec-/2448991138444489/

[15] See Law No. 03-10, dated 19 Joumada El Oula 1424 [Muslim year], corresponding to July 19, 2003, concerning environmental protection within the framework of sustainable development. Online at: https://faolex.fao.org/docs/pdf/alg41657.pdf.

As a result, large volumes of untreated wastewater continue to be directly discharged into the wadi. Although discussions about establishing a second treatment plant for the area have been ongoing since 2015, it remains unclear why this has not been realised. In other words, although environmental laws and decrees are in place, they are not necessarily applied at all times. Instead, the government tends to resort to temporary measures that do not achieve long-term environmental sustainability – including the installation of perfume dispensers. The 2012 Jasmine Project aimed to 'solve' the issue of the river's bad odour by installing perfume stations, an approach which points to the limitations of symbolic or cosmetic interventions in the face of deeper infrastructural and environmental issues. These efforts highlight the inefficiencies and short-term approaches that have characterised water management in Algeria, underscoring the urgent need for more integrated, sustainable, and effective strategies to address long-standing environmental challenges.

This governance gap and lack of clear information is not only an environmental issue but has also been deeply felt at the local level. In a focus group with El Harrach residents who are also civil society leaders, participants reflected on growing up next to the wadi, associating its foul odour with home:

> *Respondent 10*: We grew up practically next to the Oued [because] we didn't have a playground. Now, children no longer play behind the oued because they're currently making improvements.
>
> *Scholar*: And did you play there even when it smelled bad?
>
> *Respondent 11*: Yes, yes, it was normal. When we were away, we missed it (laughs). No, but it's true! When we smelled the stench, we realised we were at home. People ask us why we don't get sick, but we're used to it.
>
> *Scholar*: And you don't get sick?
>
> *Respondent 6*: When I worked in Gorias [a former shantytown], the children used to swim in the oued. They caught borrelia, and that was the main issue. Children from El Harrach also had problems, but it was much worse for the children from Gorias.
>
> *Respondent 10*: We used to go play there because (…) there was the stadium, and it was right behind us. And for a while, we had fish! I don't know, it was around 1970 or 1972.
>
> *Respondent 8* (to Respondent 6): Remember everyone used to fish there?
>
> *Respondent 6*: Some people ate those fish!
>
> *Respondent 10*: The connection to the oued was like an umbilical cord. Everyone mocked us because it smelled bad.
>
> *Respondent 11*: Now, it has changed, right? [Ironically]
>
> *Respondent 10*: That's not true. Now they've called it the Bay of Algiers! [Ironically]

These reflections underscore that, despite health risks, including reported cases of borrelia among children swimming in the river, the polluted waterway remained a central feature of daily life. The statement of one participant describing their relationship with the polluted wadi as "an umbilical cord" symbolises both attachment and neglect with special accuracy. When asked what comes to mind when we say "Oued El Harrach"', another local resident replied, "When we mention Oued El Harrach, I think of pollution (…). However, it should be noted that the [government's] project aimed at cleaning it is an old one, dating back to 1963, I think" (Participant 8, 2022).

These accounts illustrate how environmental degradation becomes normalised within everyday life, creating a paradoxical sense of belonging rooted in the very signs of pollution. The participants' attachment to the smell and their ironic references to the "Bay of Algiers" reveal both a deep familiarity with environmental decline and a form of local resilience. Rather than simply rejecting the polluted wadi,

the residents' narratives show how historical and emotional ties continue to shape their relationship to a profoundly altered environment. Such dynamics reflect broader patterns observed in environmentally degraded contexts, where toxic landscapes become entangled with local memory, identity, and affect, naturalising long-term exposure while embedding pollution within everyday life.

In fact, the bad smell of the wadi – a strong odour of putrefaction and sewage – has been an issue for decades, becoming associated with the municipality and having significant social consequences. "Now, we don't smell it anymore. Back then, we used to smell it at midnight, we used to say that the wadi was burping. We used to sit at home and smell it; we'd say, 'Oh yeah, it burped'!" [laughs] (Participant 10, resident of El Harrach, 2022).

This particular memory highlights how sensory experiences – even unpleasant ones – become embedded in local narratives and everyday life. Rather than seeing the odour solely as a marker of degradation, residents incorporate it into shared humour and collective memory, reinforcing a familiar-if-challenging relationship with their environment. Moreover, the way the residents spoke about it as if it were a human being demonstrates a strong attachment to the river that goes beyond considering it a detached, neutral, natural water body. Instead, they have a strong emotional connection to it, and to some, paradoxically, the more the residents of other municipalities mock them, the more the smell of the oued unites them. Ultimately, it becomes a shared experience of resilience and adaptation to the state's uneven water governance. This sense of navigating a politically charged environment, marked by the presence of numerous strategically important industries along the river, yet also by persistent neglect in terms of environmental protection, was echoed by another resident, who reflected on the complex relationship between the community and the wadi:

> Before, you wouldn't tell everyone that you live in El Harrach. Me, I'm not ashamed to say that I come from El Harrach because I love my neighbourhood. But others don't say where they come from because [public] image is important. (…) Now it's fine, they started cleaning and (…) it's okay. But that's out of our control. It's when El Harrach [wadi] burps. It's important to know when it burps (Participant 7, resident of El Harrach, 2022)

This participant's statement reflects the attitude of Algiers residents who hold the people of El Harrach responsible for its odour, attributing it to the river's condition rather than their own actions. This perception aligns with broader social associations linked to people's housing situation where pleasant smells are linked to positive attributes like trust, health, and social status, while bad smells are often connected to negative traits such as poor hygiene, illness, or poverty (Auyero and Swistun, 2009). This applies to people from El Harrach municipality as well, who have frequently been the subject of urban jokes and mockery from residents of other municipalities. However, the residents emphasise that the wadi has significantly improved, and the smell is no longer as intense as it once was. "It's improved. Although there are still quite a few sources of pollution (…). On the water intake side, they've made many improvements now", (Participant 9, resident of El Harrach, 2022).

While no current official open-access documents or media articles provide concrete evidence of improved water quality of the wadi, improvement is nonetheless perceptible from both the reduced odour and the visibly cleaner appearance of the river, as observed during fieldwork. These local improvements reflect broader national efforts to address environmental degradation, even if challenges remain.

DISCUSSION

In El Harrach, the coexistence of limited access to drinking water and severe river pollution vividly illustrates the limits of Algeria's water governance within a hydrocarbon-dependent political economy. In this regard, Algeria's approach to water management reflects a broader logic characteristic of a rentier state: Instead of addressing root causes through structural reforms, the state often opts for technocratic

quick fixes funded by hydrocarbon revenues. This mirrors what Arieff (2013) described as the "trickle-down effect", i.e. a dynamic in which the country's substantial energy wealth fails to translate into consistent or equitable improvements in services such as water access and environmental protection.

Regarding drinking water, the access to piped water is highly rationed: During the fieldwork, residents reported receiving water only every other day for a two-hour window during the night. This temporal choreography, where entire households coordinate laundry, bathing, and cleaning within a short span, reveals how energy-backed infrastructure dictates social rhythms. Drawing from Meehan (2013, 2014), this dynamic illustrates how infrastructure in hydrosocial territories is not a neutral medium but a political instrument – in this case, one that reflects the tensions of an energy-rich yet water-poor state. In particular, while pipelines and treatment plants are funded through hydrocarbon revenues, their deployment does not necessarily guarantee equitable access; rather, it structures patterns of scarcity and frustration. These observations call attention to the role of discourse in shaping hydrosocial territories. As Tullio and Zannini (2025) argue, the governance of water is as much about who controls the narrative as it is about who controls the flow. In Algeria, official framings of water infrastructure as evidence of modernisation and development obscure the deeper issue: that hydrocarbon wealth enables a particular type of governance that privileges short-term technical fixes over long-term ecological responsibility. Citizens' counter-narratives, meanwhile, draw from lived experiences and challenge the technocratic imaginary, exposing the exclusionary effects of decisions made in the name of 'efficiency' or 'development'.

That being said, recent work by Alba et al. (2025) urges scholars to critically engage with the political construction of hydrosocial territories. Specifically, they call for an analytical framework that takes into account material infrastructures, institutional arrangements, symbolic representations, and power asymmetries. In this light, El Harrach is not merely a municipality in a water-scarce country with a polluted river, but a contested site where hydrocarbon wealth, state legitimacy, citizen demands, and environmental degradation intersect. This is particularly evident in the fact that the river's rehabilitation was initiated at the highest levels of the state and enabled by oil and gas revenues, which highlights how water policy in Algeria is deeply entangled with the imaginary that hydrocarbon wealth can resolve structural problems.

The partial rehabilitation of Oued El Harrach exemplifies this logic. The construction of a technologically advanced wastewater treatment plant in Baraki, for instance, symbolises state investment driven by resource wealth. However, this facility remains insufficient to treat the vast quantities of industrial and domestic wastewater reaching it – a gap that underscores the disconnect between investment in infrastructure and its actual functionality or reach. Similarly, although Algerian water law requires each factory to operate its own wastewater treatment system, it remains unclear how many, if any, have actually complied with this mandate. This demonstrates that the state's reluctance to enforce its own environmental regulations stems not only from a generalised governance weakness but also from its political reliance on the hydrocarbon sector. In other words, the state's inadequacy to confront these polluters reflects its need to maintain industrial productivity and social stability, both of which are pillars of its rentier bargain.

In this context, the decentralised Directorate of Water Resources (DRE) occupies a complex position. While it is tasked with monitoring and enforcement, it functions more as an ideological tool, a symbolic fulfilment of state obligations, rather than an institution with actual decision-making power or capacity. In other words, the DRE's operations are constrained by the boundaries of what the regime deems politically tolerable, and its engagement with local actors is shaped less by community needs than by the risk calculus of preserving regime stability. This asymmetry mirrors the larger state logic: water governance becomes a balancing act between superficial compliance and the avoidance of political unrest. The limited scope of the Oued El Harrach clean-up, which focused exclusively on the portion of the river visible from the Bay of Algiers and near high-profile urban development zones, further reflects this aesthetic and symbolic rationality.

This goes in line with the framing of water as an object of state provision, rather than a site of social or ecological entanglement, reinforced by a discourse that tends to treat pollution as a technical aberration, not a systemic outcome. Yet, as scholars of hydrosocial materiality (Bridge, 2006; Boelens et al., 2016; Liao and Schmidt, 2023) remind us, water exists in many forms, whether muddy, stagnant, or chemically contaminated, each reflecting particular governance failures and social relations. In that sense, the state's focus on high-visibility aesthetics (such as the beautification of riverbanks near tourist sites) stands in tension with the everyday experiences of residents who live alongside and interact with a visibly degraded river. This was clearly demonstrated in interviews, where residents of El Harrach showed a deep understanding of the river's degradation, often attributing the pollution to the indifference of both the state and industrial actors.

Furthermore, the strong smell of the wadi, long associated with the municipality, became normalised in everyday life. Residents joked about the river 'burping' at midnight and recalled being mocked by people from other neighbourhoods. Yet they also expressed a sense of attachment and resilience. This paradox, of environmental degradation becoming entangled with belonging, memory, and identity, illustrates how toxic water landscapes are naturalised over time. As Ley (2022) argues, long-term exposure to pollution often becomes embedded in local narratives and collective adaptation. Thus, the residents' accounts also reflect their awareness of the broader power dynamics at play. Some expressed pride that the area is finally being cleaned; others, more sceptical, pointed to the slow pace of change and the lack of control that local communities have over environmental decisions. While residents celebrate improvements, they are also aware that real authority resides in distant national ministries whose focus remains on capital-intensive projects rather than on confronting industrial polluters or ensuring long-term ecological health. Taken together, these findings reveal how Algeria's framing of water, anchored in engineering and large-scale building investments rather than structural accountability, is inseparable from its hydrocarbon political economy. The state's reliance on top-down, resource-intensive solutions both reflects and reinforces its rentier logic, in which key polluters might be shielded from sanction due to their economic importance. As such, water governance becomes less about safeguarding ecosystems and communities and more about maintaining political stability through spectacle, infrastructure, and selective enforcement.

Moreover, the spatial selectivity of the rehabilitation effort, focusing only on areas within the wilaya of Algiers while leaving downstream zones in Blida or Médéa unsolved, mirrors what McDonnell (2014) describes in other rentier-state contexts: the territorialisation of water access and protection along lines of visibility, political importance, and strategic value. The state's vision of a modern, globally presentable Bay of Algiers clashes with the realities of marginalised communities further downstream, where pollution continues and water access remains unreliable. This reveals a broader disconnection between public commitments such as national water policy and the on-the-ground realities of local water politics. Such dissonance is particularly pronounced in non-democratic settings, where limited platforms for public debate restrict the inclusion of diverse, often conflicting voices that could otherwise influence policies to better reflect local needs. Ultimately, the case of El Harrach underscores that water in Algeria is framed not only as a technical or security issue, but as a political commodity deeply shaped by the logic of the hydrocarbon state. This logic privileges one-off solutions over long-term strategy, visibility over equity, and symbolism over substance.

CONCLUSION

This article has examined how water is framed and governed in Algeria, with particular attention to the role of the hydrocarbon sector in shaping these framings. Firstly, drawing on ethnographic data from El Harrach, a municipality marked by both acute water shortages and chronic pollution, the analysis has shown that water is predominantly framed in material, security, and technical terms: as a resource to be delivered, purified, or controlled through engineering solutions and capital investment. This framing is

deeply embedded in Algeria's political economy, where hydrocarbon wealth underpins both infrastructure-heavy responses (such as dam and desalination plant construction) and heavily subsidised water tariffs that obscure the real costs of water provision.

However, as the case of El Harrach illustrates, these supply-side strategies often fail to deliver equitable or reliable outcomes. Despite repeated state announcements, extensive planning, and large-scale funding, often allocated through opaque and centralised mechanisms, water access remains irregular and pollution mitigation works along the wadi are still unfinished. This is because institutions tasked with implementation, such as the DRE and SEAAL, operate within a fragmented and top-down governance structure in which national ministries retain control over enforcement and budgeting. The disconnect between regulation and practice is particularly evident in the limited enforcement of environmental standards among industrial actors, including those in the hydrocarbon sector, whose effluents continue to pollute the Oued El Harrach despite formal legal obligations.

Secondly, this study has also highlighted how local residents, confronted with governance deficiencies, develop resilient but ultimately unsustainable coping strategies. From storing water in plastic containers to normalising long-term exposure to pollution, these practices reflect both the everyday consequences of systemic dysfunction and the social embeddedness of water in people's lived environments and identities. This way, residents' memories, humour, and attachment to the wadi reveal a complex and ambivalent relationship with a degraded landscape that is simultaneously a source of shame, nostalgia, and collective resilience.

Crucially, the case of El Harrach is not an isolated example but reflects broader patterns in rentier states where resource wealth facilitates infrastructural fixes while sidelining social and environmental accountability. By drawing on the literature on hydrosocial territories, this article has shown that the hydrocarbon sector does not simply finance water provision but fundamentally shapes how water is imagined, prioritised, and governed in a rentier setting. The result is a technocratic and depoliticised approach that continues to privilege visibility, surface modernisation, and control over long-term sustainability, equity, and democratic participation. Addressing Algeria's water challenges, therefore, requires more than technical solutions. It calls for a rethinking of the political logics that underpin them.

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