



Water Resources of the City of Constantine in Medieval Historical Sources and Modern Stratigraphic and Geological Studies

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Abstract: The subject of this article, entitled “Mention of the Water Resources of the City of Constantine in Medieval Historical Sources and Modern Geological Stratigraphic Studies,” is a historical approach proceeding from the inseparable bond between humankind and water – the “blue gold,” as it is termed in our age – the perennial dilemma humanity has faced since antiquity; strategic necessity has always required the search for water resources, the hydrographic wealth, in order to achieve what is called “water security.”

Through this research paper we aim to bring out the scholarly value of historical sources and of the geographical literature of the Middle Ages, as well as of modern stratigraphic studies, in that they have revealed to us the sources of Constantine’s water resources in the medieval period and their intersection with modern geological stratigraphic studies.

Among the findings of this study is that it has allowed us to gain insight into the sources feeding Constantine’s water network despite the difficulty of the city’s rocky geological terrain, and the effect of this on the continuity of its urban and civilizational character as an ancient city that has known development and prosperity across the ages down to the present day.

Keywords: City of Constantine, water resources, Wadi al-Rummel, medieval sources, geological stratigraphic studies.

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Introduction

The city of Constantine, like other ancient Algerian cities rich in history, was a vital regional station and center that knew the succession of diverse civilizations from the dawn of its ages – specifically since the Neolithic period, as archaeological studies have shown. On the strength of this historical standing, it attracted the attention of numerous historians, geographers, and travelers, among them Greeks, Latins, and Muslim Arabs; most of these, in mentioning the city of Constantine – Qarta, Cirta – left us important scholarly material, particularly on the subject of its hydrographic aspect (water), through their descriptions of the rivers and springs of this city that granted it life, development, and continuity.

The problem of this paper’s subject centers on the following questions:

- How did the historical and geographical sources describe the water resources of the city of Constantine – Cirta – despite the difficulty of its rocky topography?
- What is the role of modern geological stratigraphic studies in revealing the sources of groundwater beneath the city of Constantine, and in benefiting from them?

Our aim in answering these questions is to bring out the scholarly value of both the ancient historical sources and the modern ones, and the extent of their contribution to understanding the dynamic and vital role of Constantine’s water resources despite the difficult rocky geological character of this city. To

complete this paper we have drawn on numerous historical sources and references as well as modern geological studies. In this study we have followed the descriptive method to describe the natural, geographical, and geological features of the city of Constantine, the analytical method to analyze certain texts, while the chronological method was adopted as a methodological necessity for employing the historical source material.

1. Introducing The City Of Constantine

The city of Constantine occupied a foremost position among the cities of Algeria, and its location and water resources played a vital role in the ancient civilizational and historical character it possessed and still possesses.

1.1 The Site of the Founding of the City of Constantine

The city of Constantine was founded upon a high rocky mountain, encircled on most of its sides by the gorge¹ of Wadi al-Rummel (the Rhummel Gorges), known in antiquity as Wadi Massaga – Ampsagaflumen.² Archaeological research findings have confirmed that primitive man inhabited the caves of the Constantine region since the Lower Paleolithic period, as attested by the remains of the stone industries of the Mousterian and Neolithic cultures widespread across North Africa.³ The orientation of this city was a matter dictated by natural conditions: the rock is connected to the neighboring lands to the north by a strip of land some 300 meters wide, linking it to the depression of La Brèche, which leads to the Koudiat plateau, while its other sides overlook Wadi al-Rummel directly, giving it the appearance of a peninsula.⁴

On the banks of Wadi al-Rummel there stretched a dense forest extending eastward beyond Jabal al-Mansoura and the heights of Jabal al-Wahch, northeast of the city; this forest provided a vital habitat for numerous animals, as attested by the skeletal remains found there of species such as the rhinoceros, the wild ass, the wild boar, gazelles, camels, and wild cattle, which gives us an idea that the region's climate was, at that time, similar to that of a (present-day) tropical zone in terms of humidity and vegetation.⁵

After the unification of the Numidian kingdoms, King Massinissa (202–148 BC) made the city of Qarta – Constantine – the capital of his great kingdom on account of its impregnability.⁶ The Roman historian Strabo (58–25 BC) described it as a fortress unassailable to anyone who sought to take it.⁷

Among the oldest Islamic historical documents attesting that the city of Constantine possessed great natural impregnability and defensibility is the book of al-Waqidi (130–207 AH/747–843 CE), where its inhabitants, taken by surprise by the Islamic conquest led by Uqba ibn Nafi al-Qurashi (622–683 CE), are quoted as telling their king that there was “no land more fortified than ours, nor men stronger or wealthier than we, and we have nothing to do but fortify ourselves within our land, and we shall never fight them.”⁸ In this context Yaqt al-Hamawi (d. 626 AH/1229 CE) mentions it, describing it as a city and citadel called “Qusantina al-Hawa” [Constantine of the Air], a fortress on the borders of Ifriqiya, high and impregnable, scarcely reached by birds.⁹ The author of the Maghribi travel account, for his part, was struck by the wonder of its situation, describing it as a land of marvelous situation and fertile site, a wondrous and fortified city containing remains and buildings of the ancients of strange perfection, most of hewn stone whose craftsmanship defies description.¹⁰

Al-Himyari (d. 900 AH/1495 CE) adds that Constantine is fortified to the utmost degree, with nothing in Ifriqiya known to surpass it in impregnability – indeed it has no equal except the city of Ronda in Andalusia, which resembles it in its situation, its surrounding moat, and the cliffs enclosing it; yet Constantine is greater, larger, and higher, standing upon an immense mountain of solid rock which God Almighty cleft, making it among the most impregnable lands on earth.¹¹ The city of Sirta was renowned, during the period of the Numidian kings (202–40 BC), for the abundance of its wealth, having been the hub of economic activity and a principal market for the neighboring regions, as noted by the Roman historian Strabo; Sirta thus surpassed the contemporary kingdom of Carthage¹² both economically and culturally.¹³

In confirmation of the economic activity for which the city of Constantine was renowned, and its agricultural produce, the geographer al-Sharif al-Idrisi (d. 548 AH/1153 CE) described it as overlooking continuous plains, with fields of wheat and barley extending in every direction; a flourishing city with markets and merchants, its people prosperous and possessed of ample wealth, trading with the Arabs and sharing in ploughing and storing grain – wheat kept in its underground granaries remaining unspoiled for a hundred years – with abundant honey and clarified butter (samn) exported to other lands.¹⁴ Nevertheless,

being high and elevated, its climate is extremely cold, with abundant snow and strong winds owing to its altitude.¹⁵

1.2 The Historical Development of the Name of the City of Constantine

The name of the (present-day) city of Constantine underwent numerous changes across the historical eras and its political development. According to archaeological studies, it is believed that the first name of the city appeared on a bronze coin found in its outskirts, dating to the Neo-Punic period, bearing the name "KRTN" (crtn).¹⁶ The ancient city, as discussed by the historian Strabo,¹⁷ bore the name "KRTN – Qirta – Cirta"; it is believed that this name is of Semitic origin, a corruption of the true name "KRTN," which meant, in the official Punic language of the Numidian kingdom, "city" or "citadel."¹⁸ As for the development of the name to "Cirta," this dates to the beginning of the Roman occupation of the Numidian kingdom, dated to 46 BC, when the Romans, pronouncing it according to their Latin tongue, rendered it "Cirta," in contrast to the ancient name Qarta, which was "KRTN."¹⁹

With the beginning of the fourth century CE, the name of the city of Sirta changed to its present name, "Constantine" – a name deriving from the era of the Roman emperor Constantine the Great (306–337 CE), Flavius Valerius Aurelius Constantinus.²⁰ This emperor undertook the rebuilding and restoration of the city of Sirta after the destruction it suffered in the wars of 311 CE, granting it his name, "Constantine," in 313 CE, and administratively attaching it in 314 CE to the province of Numidia Constantina.²¹ He made it his capital, and under his rule the city knew prosperity and flourishing, until it came to be called "Splendid and Fortunate Constantina" – Colonia Felicitas Splendida Constantina.²² The city of Constantine has retained its name down to the present day, as the historian Mubarak al-Mili (1898–1945) tells us: the Arabs simplified this name, saying "Qusantina," while the common people today say "Qusmantina."²³ The city of Constantine has occupied a foremost position among the cities of Algeria since its ancient history, having been at times the capital of a kingdom and at times the capital of a province.²⁴

2. MENTION OF THE WATER RESOURCES OF THE CITY OF CONSTANTINE

2.1 In Medieval Sources

Mention of the water resources of the city of Constantine appears in numerous historical and geographical sources, as well as in medieval travel accounts. Al-Bakri (d. 487 AH/1094 CE) describes its rivers, noting that the city stands upon three great rivers issuing from springs known as 'Uyun Ashqar' (meaning 'black'), lying in a deep ravine, at the bottom of which a bridge on four arches was built, with a chamber above level with both banks by which one crosses to the city, the water appearing at the bottom of the wadi like a tiny star owing to its depth; this chamber is called al-'Ubur (the Crossing), because it is suspended in the air.²⁵ Al-Idrisi, for his part, describes the wadi as encircling the city on all sides like a necklace, the water flowing at the bottom of the wadi and its arc; the wadi comes from the south, encircles the city's western side, passes eastward around its circumference, curves north, then passes west below the mountain before running north to empty into the sea west of Wadi Suhr.²⁶ Alongside this wadi there were also aqueducts which the inhabitants of Constantine used, drawing water from it and making use of it in times of war and siege.²⁷

The author of al-Rawd al-Mi'tar describes the wadi and the bridge: a great moat encircles the city on three sides, its great river entering that moat and encircling the city, the sound of its flowing within the moat heard as a great roar and fearsome sound; the ancients built upon this mountain a great tiered bridge by which one enters the city gate, connected to it, with a vaulted chamber at its end – called al-'Ubur by the people of the city, because it is suspended in the sky – such that one standing in the middle of the bridge to cross to the other bank would feel as though flying through the air, seeing the water of the great river at the bottom of the deep, plunging moat like a small stream; this city, he concludes, is one of the wonders of the world.²⁸ The Andalusian traveler al-'Abdari, for his part, describes the wadi of Constantine as one of extreme ruggedness and depth, encircling the city as a bracelet encircles the wrist.²⁹

2.2 In Modern Geological Stratigraphic Studies

The hydro-geomorphological features of Constantine's water sources are due, fundamentally, to its location in the northeastern part of the Mediterranean basin, as well as its proximity to the Tell Atlas mountains.³⁰ Consequently, the geological structure from which the hydrographic wealth springs has taken shape in the form of wadi and river courses and springs; this has also been aided by the Mediterranean climate factor of

Constantine, which brings winter rainfall ranging between 400 and 600 mm annually, in addition to the factor of elevation above sea level, which brings snowfall – and we have seen how the historical sources confirmed the city's altitude and severity of cold.³¹

The geological stratigraphic study of the Constantine region has shown that the collected waters seep into the subsoil, where limestone (calcareous) formations³² take shape, in turn forming important water reservoirs for a network of wadis, ravines, and springs.³³

The inhabitants of the city of Constantine have, since antiquity, made use of the waters of these springs for drinking purposes, and of the wadi waters for irrigation and agriculture; the problem of drinking water in Constantine is indeed an ancient one. Some historical writings indicate that the city's inhabitants during the Roman period brought drinking water from the springs of Bou Merzoug (about 15 km from Constantine) by means of channels across the plain of Wadi al-Rummel to the city.³⁴

According to the findings reached by the researcher Abdelhadi Laarouk regarding the sources of Constantine's water, based on numerous in-depth studies conducted by engineers, geographers, and geologists, it emerged that the limestone formations are concentrated in the south, in what is geographically termed the Constantine mountain region, which contains the most important water reservoirs of the area, chief among them:

a. The mountains of Sidi Rghiss, Oum Kechrid, Hanout, Nifen-Nser, Qalaat Ouled Salem, Guerioune, Fertas, and Chettabah. These contain the most important springs and water-bearing strata stored within the limestone rocks of the city's region, exploited for irrigation, as is the case for the plains of Ain Kechra, while the springs are also used for drinking purposes, especially Ain Fezguia and Ain Bou Merzoug in the mountains of Guerioune and Fertas, which constitute the principal source supplying the city of Constantine with potable water.

b. The plateaus of the city of Constantine: a source of several water springs, especially in the ravine of the Wadi al-Rummel gorge at the fault lines; most of these are mineral springs of relatively high temperature, reaching 28°C, exploited by the Romans in antiquity for therapy and leisure after they converted them into baths. There is also another spring on the Sidi M'cid plateau, the Ain al-Arab spring, with a capacity of 50 liters/second at a temperature of 15°C, the principal source supplying the city's Olympic swimming pool.³⁵

c. As for the area located to the north of the city of Constantine, there is the Ain el-Hamma spring, with a capacity of 900 liters/second, situated along the fault axis of Jabal Chettaba, close to formations of the Triassic geological period; it is one of the most important sources supplying the city with fresh water.³⁶

The academic study conducted by the French geological engineer Guy Durozoy, presented at the 19th International Geological Congress held in 1952 in Algiers, entitled "La géologie et les problèmes de l'eau en Algérie,"³⁷ showed that the limestone formations of the region, and the rates of water seepage within them, store a water reserve equal to 28 million cubic meters.³⁸ Most of this water is mineral water, and some of it is interconnected through formations of the Middle and Upper Jurassic geological period, which, from the stratigraphic and paleogeographic point of view, may date back to the Lower Cretaceous geological period.³⁹

Chemical analyses have also established the similarity of the water passing through the mineral limestone formations or others, even where it has seeped into continental soils, with the exception of Ain Hammam el-Ghrouz, whose analyses showed that it had mixed, at depth, with gypsum of the Triassic geological period, and therefore contains a large quantity of sulfates; likewise Ain Jaid and Malou, which contain a large quantity of sulfates and chlorides.⁴⁰

We thus conclude that the groundwater sources of the Constantine region take the form of water-bearing strata and springs: the former exploited by pumping, as is the case in the plains of Ain Kechra, Berthaou, and Telaghma; the latter used either for irrigation, as in the case of El Hama, or to supply cities with their drinking-water needs, as with Ain Fezguia, or for both purposes together, as with Ain Bou Merzoug.⁴¹

It is worth noting that modern field studies analyzing the water – whether groundwater or surface water – of the city of Constantine have established that the network of the Wadi al-Rummel (Rhummel) river, Bou Merzoug, and their tributaries is unfit for human consumption, though there is a possibility of treating it industrially to render it fresh after ridding it of waste and toxic pollutants.⁴² The city of Constantine, like other densely populated cities (megapolis), continues to suffer from the water problem; here we must

recommend and emphasize the exploitation of surface water through the construction of further dams and water-treatment plants.⁴³

3. FINDINGS

In conclusion, this study has led us, through its subject matter, to the following findings:

- The city of Constantine – Kirtan – Cirta – is ancient, its nucleus dating back to the Neolithic period; it was distinguished by a uniquely singular geostrategic position, owing to the high rocky site upon which it was founded, which gave it a character of impregnability and defensibility, as attested by foreign sources – Greek, Latin, and Arab-Islamic.
- The various historical sources have revealed to us that the inhabitants of the city of Constantine possessed strategic systems for preserving their water security and for the optimal exploitation of water resources, whether for drinking purposes or for irrigation and agriculture; they also built reserve aqueducts for times of war and siege.
- Modern geological stratigraphic studies have shown the great importance of limestone formations in storing groundwater.
- Despite the rocky composition of the city of Constantine, it possessed a hydrographic wealth owing to its distinctive geographical nature and rock strata, through which the springs of its wadis and rivers flowed, such as the Wadi al-Rummel gorge and Bou Merzoug.
- There is a need to preserve the dynamic and vital role of the groundwater reserves of the limestone formations that constitute Constantine's hydrographic wealth, through treatment and industrial remediation to render it fresh, as well as the construction of dams close to the city to resolve the problem of supplying it with drinking water – given the effect of this on the development of its urban fabric – so as to sustain the character of the city of Constantine in the civilizational role for which it and its people have been renowned, from its ancient history down to the present day, at the forefront of Algeria historically and civilizationaly.

Appendices



Appendix 1 – Map of the geographical and political extent of the ancient Numidian kingdoms



Appendix 2 – A view of the Wadi al-Rummel gorge, dating to the year 1881



Appendix 3 – A view of the Wadi al-Rummel (Rhummel) gorge beneath the suspended bridge, 2014



Appendix 4 – A view of the city of Constantine showing the Wadi al-Rummel gorge

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- ¹¹Muhammad ibn Abd al-Mun’im al-Himyari, *al-Rawd al-Mi’tar fi Khabar al-Aqtar*, ed. Ihsan Abbas, *Mu’assasat al-Nasir li-l-Thaqafa*, 2nd ed., Beirut, 1980, p. 481. of modern accounts ‘Qarthadasht.’ The Romans took Massinissa’s expansionist project as a pretext for entering and destroying Carthage on the grounds that it had violated the terms of the 146 BC peace treaty. For more see: Moscati, S., *L’épopée des Phéniciens*, ed. Fayard, Paris, 1971, p. 310; Warmington, B. H., *Carthage*, ed. Penguin Books, London, 1960, p. 14; Muhammad Seghir Ghanem, *al-Mamlaka al-Numidiyawa-l-Hadara al-Buniyya*, Dar al-Huda, Ain M’lila, 2006, p. 16.
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- ¹³The history of Carthaginian civilization goes back to the twelfth century BC, when the Phoenicians established numerous colonies in the western Mediterranean basin, but permanent settlement in the Mediterranean came with the founding of the city of Carthage in 814 BC, which became a state dominating the Mediterranean for some 700 years, called in a number of modern accounts ‘Qarthadasht.’ The Romans took Massinissa’s expansionist project as a pretext for entering and destroying Carthage on the grounds that it had violated the terms of the 146 BC peace treaty. For more see: Moscati, S., *L’épopée des Phéniciens*, ed. Fayard, Paris, 1971, p. 310; Warmington, B. H., *Carthage*, ed. Penguin Books, London, 1960, p. 14; Muhammad Seghir Ghanem, *al-Mamlaka al-Numidiyawa-l-Hadara al-Buniyya*, Dar al-Huda, Ain M’lila, 2006, p. 16.
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