

UCLA

UCLA Encyclopedia of Egyptology

Title

Community Water Management

Permalink

<https://escholarship.org/uc/item/6js6t0wh>

Journal

UCLA Encyclopedia of Egyptology, 1(1)

ISSN

2693-7425

Author

Driaux, Delphine

Publication Date

2026-10-04

DOI

10.5070/G9.4337

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/4.0/>

Peer reviewed

UCLA ENCYCLOPEDIA of EGYPTOLOGY

COMMUNITY WATER SUPPLY

تزويد التجمعات السكانية بالمياه

Delphine Driaux

EDITORS

ANNA HODGKINSON
Material Culture
Berlin, Germany

CHRISTINE JOHNSTON
Natural Environment: Landscapes and Climate
Bellingham, USA

WILLEKE WENDRICH
Editor-in-Chief,
Los Angeles, USA

MENNAT-ALLAH EL-DORRY
ANNETTE IMHAUSEN
JUAN CARLOS MORENO GARCÍA
MASSIMILIANO NUZZOLO
RUNE NYORD
TANJA POMMERENING
ANDRÉAS STAUDER
JONATHAN WINNERMAN

Cairo, Egypt
Frankfurt, Germany
Paris, France
Turin, Italy
Atlanta, USA
Marburg, Germany
Paris, France
Los Angeles, USA

Natural Environment: Flora and Fauna
Domains of Knowledge
Economy
Geography
History of Egyptology
Domains of Knowledge
Language, Text, and Writing
Religion

Citation:

Driaux, Delphine, 2026, Community Water Supply. In Anna Hodgkinson, Christine Johnston, and Willeke Wendrich (eds.), *UCLA Encyclopedia of Egyptology*, Los Angeles. ISSN 2693-7425. DOI: 10.5070/G9.4337.

COMMUNITY WATER SUPPLY

تزويد التجمعات السكانية بالمياه

Delphine Driaux

Gemeinschaftliche Wasserbewirtschaftung
L'approvisionnement en eau de la population

In pharaonic Egypt, community water supply was shaped by the interplay between environmental constraints and administrative organization. The provision and distribution of water in settlements generally relied on practical arrangements designed to ensure regular access and daily supply. While the Nile remained the primary source of water, some settlements—especially those distant from its banks—relied on diverse and adaptive management strategies, sometimes incorporating simple technological solutions such as wells. Rather than developing elaborate water installations, communities depended on straightforward logistics and workforces to deliver water. Archaeological data, texts, and depictions reveal how water was transported by water-carriers and made available to the population at specific points. These practices were adapted to local topographies and the types of settlements involved, reflecting the dynamic relationship between natural constraints, technological adaptation, and institutional involvement in water supply.

في مصر الفرعونية، تشكل نظام إمدادات المياه للمجتمعات المحلية من خلال التفاعل بين القيود البيئية والتنظيم الإداري. واعتمد توفير المياه وتوزيعها داخل التجمعات السكانية، بوجه عام، على ترتيبات تهدف إلى ضمان الوصول المنتظم للمياه وتأمين الاحتياجات اليومية للسكان. وعلى الرغم من أن نهر النيل ظل المصدر الرئيس للمياه، فإن بعض التجمعات، ولا سيما البعيدة عن مجرى النهر، اعتمدت استراتيجيات إدارة متنوعة ومرنة، شملت في بعض الأحيان استخدام تقنيات بسيطة، مثل حفر الآبار. ولم يكن الاتجاه السائد يتمثل في إنشاء منشآت مائية معقدة، بل في الاعتماد على منظومة لوجستية مباشرة وقوى عاملة تولت نقل المياه وتوزيعها. وتكشف الشواهد الأثرية والنصوص والمناظر المصرية القديمة عن الكيفية التي كان يُنقل بها الماء بواسطة السقائين، ويُتاح للسكان في نقاط محددة داخل التجمعات السكانية. وقد تكيّفت هذه الممارسات مع الخصائص الطبوغرافية المحلية وأنماط التجمعات المختلفة، بما يعكس العلاقة الديناميكية بين القيود الطبيعية، والتكيف التقني، والدور المؤسسي في تأمين إمدادات المياه.



In a desert country like Egypt, it is commonplace to assert that water is a vital and precious resource. In antiquity, Herodotus wrote that Egypt was “a gift of the river” (*Histories* 2.5.1). With these famous words, the Greek author undoubtedly emphasized the importance of the Nile in the

Egyptian environment and landscape, but arguably also the importance of water in the civilization of ancient Egypt (fig. 1).

From a historical perspective, water control, and in particular the capacity to regulate water for irrigation, constituted a pivotal factor in the development of ancient Egypt, often



Figure 1. Location of the most important sites mentioned in the text.



Figure 2. Fragment of a tomb painting representing the garden and pool in Nebamun's estate.

characterized as a “hydraulic civilization” (Butzer 1976). Each year, the Nile inundation rhythmically transformed the Egyptian landscape from July to September before gradually receding by November, thereby structuring the agricultural calendar and sustaining the country. This annual Nile phenomenon was regarded as a divine entity appearing with the features of the god Hapi. Nevertheless, the inundation was intrinsically linked to royal authority, as the king was believed to be the sole figure responsible for ensuring the prosperity and abundance of the land. In consequence of his function and divine essence, the king wielded control and authority over water (Goyon 1987: 200; Grimal 1994: 195).

Community Water Needs

While inundation water was crucial for maintaining Egypt's fertility, water itself was the cornerstone of community life and addressed a multitude of essential needs across domestic, urban, and institutional contexts. Ancient Egyptian society thus depended heavily on a consistent water supply. This dependence influenced everything from the layout of settlements along the Nile to everyday activities.

First and foremost, the fundamental water need of the population was drinking water, a necessity rendered even more critical by the country's relatively hot climate. In domestic contexts, food and drink preparation constituted an additional pivotal domain of

water needs. Beer, as a staple beverage, involved the use of a significant quantity of water in its brewing process (Samuel 2000: 545, 551–555). Bread, another fundamental component of the ancient Egyptian diet, also necessitated water for dough preparation (Samuel 2000: 545, 564–565). Additionally, water was used for cleaning and washing, encompassing general household sanitation and laundry—usually conducted in the Nile or canals (Agut-Labordère 2021: 84–88). Bodily care also required water. Bathroom facilities discovered, for instance, within large houses at el-Amarna (Driaux 2026: 138–142) attest to such bathing practices, although the habits of those without dedicated installations remain unclear (Driaux 2012: 55).

Along with the water consumption of the people living in a house, there were also the water requirements of animals that a household might keep for its own use, such as goats, sheep, pigs (Redding 2024: esp. 103–120), and perhaps even cattle (although of considerably larger size)—all of which required a steady supply of water. Finally, large or affluent houses sometimes included gardens for the cultivation of trees, plants, and vegetables primarily for subsistence purposes, and of flowers for religious or purely aesthetic reasons. Such gardens would have required regular watering—most likely provided by the ornamental basins frequently depicted in garden representations (fig. 2) (Hugonot 1989: 92–168).

Beyond domestic uses, craft production in ancient Egyptian communities was water intensive. Pottery production, for example, required water at various stages of the manufacturing process: for clay preparation, shaping, and specific surface-treatment techniques (Arnold and Bourriau eds. 1993: esp. 12–13, 85–86). Water was also involved in textile production, in particular for washing raw materials like flax and for dyeing fabrics (Vogelsang-Eastwood 2000: 271, 279). Other crafts, like metalworking, used water to separate gold particles liberated by the grinding process from the quartz ore (D. Klemm, R. Klemm, and Murr 2001: 652), or during specific phases of the copper smelting

process, such as cooling (Verly et al. 2021). Water also appears to have been employed in stonework, particularly to facilitate the extraction of limestone blocks in the quarries (Burgos and Laroze 2020: 84–88).

Water Sources

To meet these diverse needs, the Egyptians relied primarily on the Nile. As a vital artery around which all life in the country was organized, the river was the most easily accessible and sustainable source of water, supplying both the urban centers and the farming communities along its banks. While textual evidence abundantly praises the Nile, and particularly the annual flood, for its benefits, written sources are notably less explicit about the river's crucial role in providing water to the population. These references are generally found embedded within broader narratives and appear merely as subsidiary details. This is exemplified by a passage from the Tale of Sinuhe, where the protagonist, addressing the king, states: “the water of the river is drunk when you wish” (Papyrus Berlin 3022, l. 233–234, see Gardiner 1909, pl. 12A–12; Parkinson 1997: 39), subtly emphasizing the king's authority over water. Funerary texts also refer to the Nile as the source of the water people drink, as seen on the 18th Dynasty statue depicting Merymaat and his wife (Archaeological Museum of Bologna, inv. MCA-EGI-EG_1813), where the deceased enumerates the blessings he wishes to enjoy and says: “May I drink water from the flow of the river” (col. 12; Gabolde 1994: 266).

A variant of this passage is preserved on the funerary stela of Nakhtmin from the same period: “May I drink water from my canal every day” (stela Louvre C 55, l. 4; Barbotin and Devauchelle 2005: 167–169), suggesting that the Nile was not the only readily accessible source of water. Egyptians could also draw upon natural channels (e.g., a minor river branch; Toonen et al. 2018) and a network of canals that served as secondary watercourses, which were also likely used for irrigation and water distribution to areas distant from the riverbanks.

These inexhaustible sources provided abundant water, which could, however, prove to be of poor quality, and perhaps even unsuitable for consumption, especially during the flood season. Egyptian texts do not provide any information on this matter, but some Arab authors recounted that annually, a few weeks before the flood, the Nile's water, laden with plant particles, would take on a green hue (Meeks 2001: 500). Upon the arrival of the inundation, the water would lose its green color and take on a reddish tinge, the color of the suspended sediment carried by the river. Several Greek (and Latin) authors echo this change, using the adjective μέλας “dark” to describe the Nile, which even became one of the common names for the river at that time (Bonneau 1964: 65–66).

For approximately five months of the year, the water of the Nile was therefore not particularly suitable for consumption. It is possible that the water underwent treatment intended to purify it, but no textual evidence from the Pharaonic Period directly addresses this (Meeks 2001: 502–508). During those months, the groundwater appeared to be the most reliable alternative for obtaining higher quality water. It was also the most suitable solution for communities living in arid landscapes situated far from the Nile Valley or from other natural water resources available only in specific locations, such as Lake Moeris in the Fayum or the springs in the oases. This is evidenced, for instance, by an inscription engraved in the temple of Sety I at Kanais, in the Wadi Mia, which recounts how the king, during a desert expedition, ordered the digging of a well to quench the thirst of his men (Text B: Kitchen 1975: 66, 1–15; 1993: 56–57).

Water Management Projects and Technologies

Beyond the variable water quality at specific times of the year, the proximity to the river or to any other waterways had a substantial influence on the establishment of settlements. While such close access to water resources offered significant advantages for sustaining inhabitants, it nevertheless posed environmental challenges, particularly during

the annual floods. In the Nile Valley, defined as a convex floodplain (Butzer 1976: 15–16) and therefore exposed to inundation, the settlements were mostly established on levees and, in some cases, on islands within the river channel (Graham 2010). These levees, naturally formed along the riverbanks through the successive accumulation of coarse sediment and sometimes reinforced by the inhabitants themselves, rose a few meters above the surrounding landscape and ensured protection against floodwaters. In the nearly flat plain of the Delta, shaped by the various branches of the Nile, settlements could be founded on the levees or on hills formed by Pleistocene sand and sandy clay deposits, known as *geziras* (from the Arabic “sand-island”) or “turtlebacks” (Moeller 2016: 45–51). By containing the potentially deleterious effects of the floods (notably the risk of structural damage to their mudbrick architecture), the Egyptians enabled themselves to live in the vicinity of water resources, which allowed them to easily irrigate their fields and meet their daily water needs. This close proximity to watercourses could, moreover, explain the absence of wells in the cities of the Nile Valley prior to the New Kingdom, though it should be borne in mind that the available archaeological evidence remains limited.

Wells—defined here as structures dug into the ground to the depth of the water table—were long-known features whose existence can be traced back to the Early Neolithic Period, as evidenced by those discovered in the Western Desert, and more particularly in the Nabta Playa area. These wells seem to have been dug by communities of Saharan cattle pastoralists when rainfall was insufficient to maintain permanent standing water in natural depressions (Wendorf and Schild 2001: 320), or when the artesian springs ran dry (Briouis et al. 2012: 179). They comprise surface wells that tap into a shallow aquifer, quite close to ground level.

Two types of wells were known to have been used during the Neolithic Period. The first was a simple well (fig. 3), typically circular in shape and with nearly straight walls. These

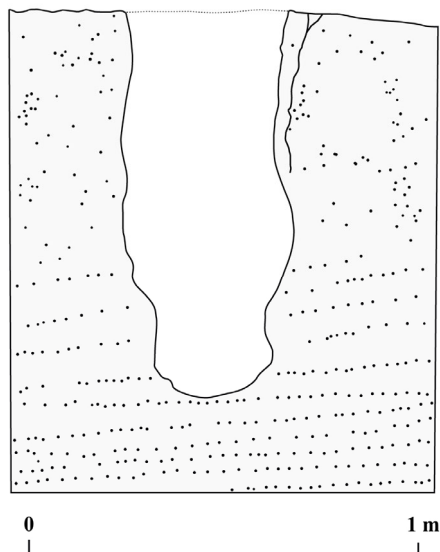


Figure 3. Profile of a simple well uncovered at Nabta Playa, site E-75-9.

were sunk into layers of laminated sand and could reach a depth of up to approximately 2.5 meters (Wendorf and Schild 1980: 90–92, 132–137; 2001: e.g., 99–103). Although the pits were not very deep, water was likely drawn using a vessel attached to a rope. The second type of well has been called a “walk-in well” (Wendorf and Schild 1980). It is distinguished by its oblong shape, with

dimensions that could reach nearly eight meters in length, a depth that could exceed three meters, and inward-sloping walls (Kobusiewicz 2003: 97–103). It allowed direct access to water via steps carved into the walls (fig. 4). It was then simply a matter of climbing down inside to draw water using a vessel.

These wells persisted until the Late Neolithic (Kobusiewicz 2003). A hiatus in the archaeological record follows until similar structures resurface from the Old Kingdom onwards. Structures nearly identical to walk-in wells have been identified in the Western Desert region, specifically at Gebel el-Asr in association with gneiss quarrying sites (Bloxam 2003: 69–70, pls. 24–25; Shaw et al. 2010: 304–305, fig. 11), and also on the eastern coast at Ain Sukhna, where a somewhat more elaborate well has been discovered in connection with metallurgical activities (IFAO 2011: 64, fig. 49). Located in remote areas most often associated with expeditions, these wells provide clear evidence of the gradual acquisition of solid technical knowledge, including methods for deeper excavation and adaptation to varying soil conditions. This expertise was subsequently implemented in well constructions within the Nile Valley, notably in domestic settings and temple complexes.



Figure 4. Reconstruction of a walk-in well uncovered at Nabta Playa, site E-00-1.

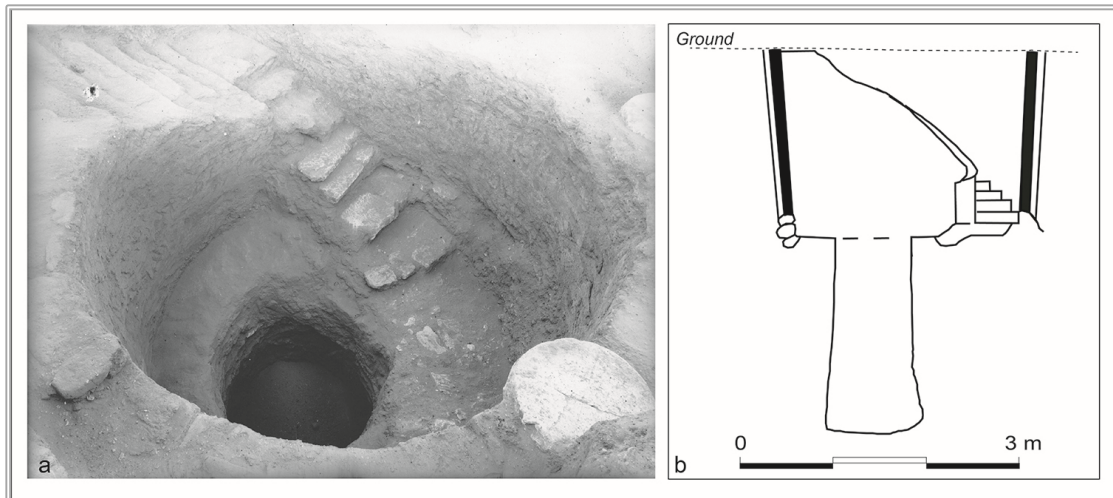


Figure 5. Left: Two-stage well in the courtyard to the east of Ranefer's house at el-Amarna. Right: Section of a two-stage well discovered at el-Amarna, in the courtyard of house O49.20.

A further example is the well discovered at Tundaba, an outpost located at the mid-point of the route between the Theban area and the Kharga Oasis. Dating to the late Second Intermediate Period or early New Kingdom, this structure reached a depth of over 28 meters. It had a roughly circular upper section, featuring an access ramp and a small set of stairs—both embedded within the structure—that led to the lower section, consisting of an irregularly cut shaft extending down to the aquifer (J. Darnell and D. Darnell 2002: 148–149, fig. 22). The well of Tundaba has also been discussed in an online publication, where the excavators refer to it as a “cistern” (J. Darnell and D. Darnell n.d.). However, as Henning Franzmeier (2008b: 41) has convincingly demonstrated, it should be correctly identified as a well rather than a cistern. Unlike wells, cisterns are waterproof structures, built above or below ground, designed to store water collected from external sources such as rainfall—a type of installation for which no archaeological evidence currently exists in pharaonic Egypt.

Wells such as that at Tundaba foreshadow those that appear in the Nile Valley from the beginning of the 18th Dynasty onwards. The most substantial evidence comes from el-Amarna, where the installations—referred to as “two-stage wells” by Barry Kemp (1989a: 12)—have a bipartite structure (fig. 5). The

upper part consists of a wide pit, either square or circular in shape, measuring on average four meters in width with inward-sloping walls. A ramp or a flight of steps, fully integrated into the structure, provides access to the lower level a few meters down. Within this reduced space, a narrower vertical shaft, circular in shape, descends to the water table. Cut into the ground, these wells could be enhanced with additional features, such as a mudbrick casing reinforcing the upper walls, or stone paving covering the floor of the lower level (e.g., Borchardt and Ricke 1980: 206–207, pl. 20).

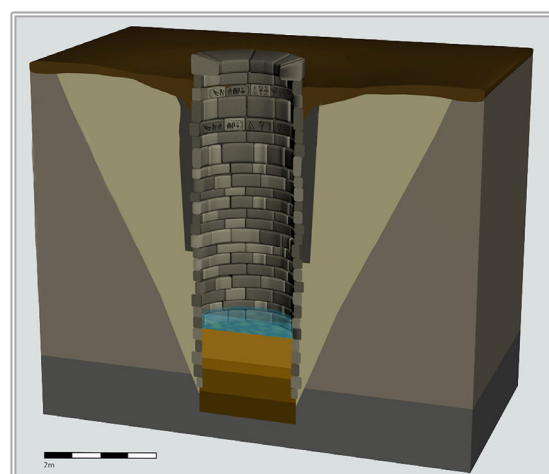


Figure 6. Section of the simple well with stone casing discovered at Qantir.

Primarily used for domestic purposes, two-stage wells are almost completely replaced from the 19th Dynasty onwards by simple wells, similar to the type dating to the Neolithic Period. Simple wells typically have a straight vertical shaft that is most often cylindrical, although some quadrangular examples exist. These wells are either cut directly into the ground where the bedrock is sufficiently stable, as at Zawiyet Umm el-Rakham (Morris 2006: 158–165), or cased with stone when the surrounding geological conditions are less reliable, as evidenced at Qantir (fig. 6) (Franzmeier 2008a; 2010: 30–39). Their main advantage over two-stage wells lies in their much smaller ground footprint, as they rarely exceed two meters in diameter.

The largest examples of wells are found within temple complexes. They are built entirely of stone and usually include one or more semi-subterranean flights of stairs designed to provide the closest possible access to the water table. Unlike those in two-stage wells, these stairways do not form part of the main structure but are conceived of as separate architectural elements that are appended to it. Some of them, such as those at Medinet Habu (Hölscher 1941: 68, figs. 42–43), bear inscriptions or decorations, lending these installations a monumental character linked to the cultic and ritual practices with which they were associated (fig. 7).

These sophisticated structures enabled users to reach the well-water easily and draw it manually. In the case of simple wells (without staircases), water would have been pulled up from the mouth of the shaft using a container attached to a rope. In both cases, the use of a *shaduf* would have been unsuitable, as this counterweight-based lifting device (Hairy 2009: 552–555) is not designed to reach significant depths. Its operational range is generally limited to one to three meters (Henein 1988: 57). With the *shaduf*, the greater the depth from which water must be raised, the longer the counterbalanced beam must be, which slows the process and considerably increases the physical effort required. Figure 7.

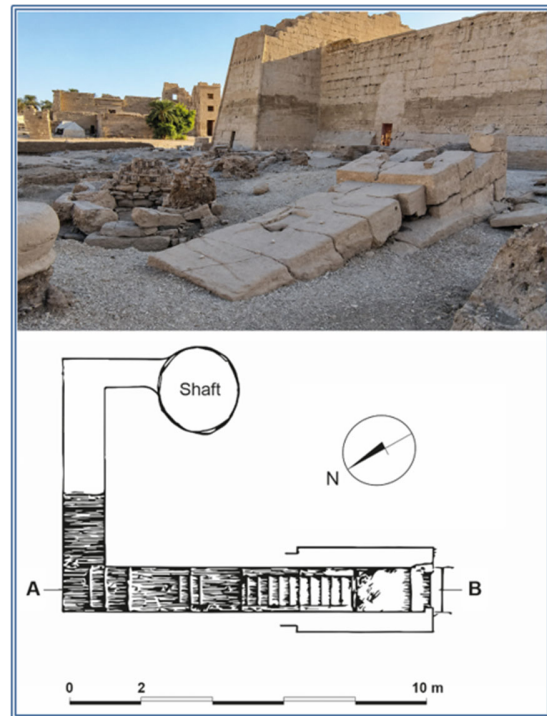


Figure 7. Well in court E of the temple of Ramesses III at Medinet Habu.

Nevertheless, it appears that the *shaduf*, which emerges in the 18th Dynasty (or at least begins to be depicted in representations from that point), may have been used occasionally in two-stage wells. To date, no archaeological evidence has clearly confirmed its presence in the lower section of these structures, but a depiction on one of the walls in the tomb of Meryra at el-Amarna seems to attest to such use. In the scene, the *shaduf* is placed in a square two-stage well, which likely served to water the nearby garden (fig. 8). It seems that these lifting devices were not primarily intended to meet household water needs but were rather employed in irrigating fields or gardens. This is suggested by the scene from the tomb of Ipuw, where water is drawn not from a well but seemingly from a canal (Davies 1927: pl. XXIX)—possibly indicating that such devices were mainly used along the Nile or canals, as they are in Egypt today.

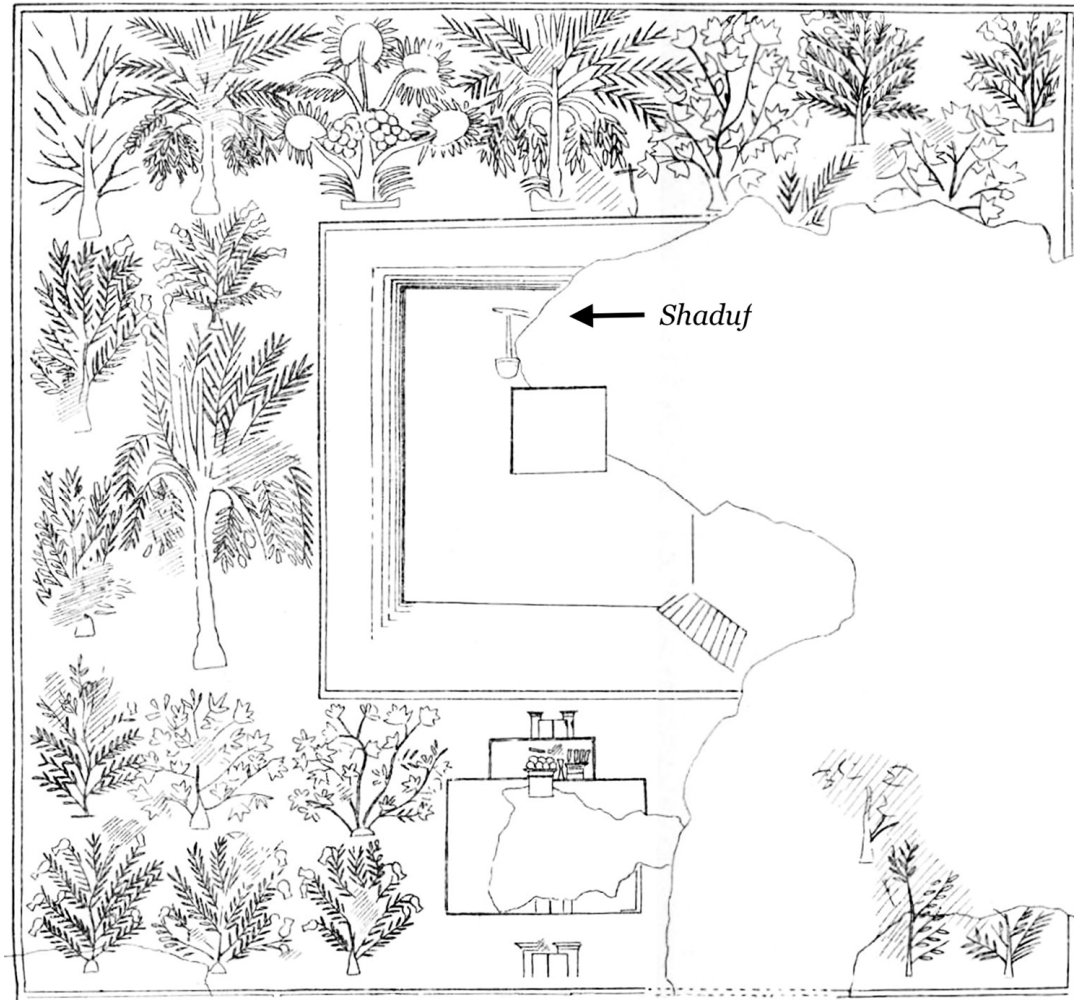


Figure 8. Representation of a square two-stage well equipped with a *shaduf* from the tomb of Meryra at el-Amarna.

Another water-lifting mechanism, the *sakia*—a ceramic-bucket wheel powered by animal traction—appears around the third century BCE. Used mainly for irrigation (though also employed in Alexandria to fill cisterns until the Ottoman Period), it offers the advantage of drawing water from great depths and delivering a high flow rate (Hairy 2009: 558–560).

In contrast to the aforementioned lifting devices, the *qanat* functions as a passive system relying on gravity to irrigate fields in arid and semi-arid regions. The foundation of this subterranean system is a deep well that reaches the artesian aquifer, specifically positioned in an elevated area upstream from

the region designated for water provision. A gallery is then excavated from the intended endpoint back towards the water source, initially as an open channel, and later as a tunnel with a series of vertical access shafts allowing maintenance (Boucharlat 2015). With its extremely slight gradient, the conduit enables water to reach the destination point through gravity-driven flow. Originating in Iran, *qanats* are evidenced in Egypt in the Western Desert (De Angeli 2013), notably at Ain Manawir in the Kharga Oasis, which preserves the oldest examples, dating from the fifth century BCE and coinciding with Persian occupation (Wuttmann 2001). The Demotic documentation discovered in the ancient

village provides evidence of the legal functioning of the irrigation system. Each landowner was allocated three “days of water” per month, during which they had the right to open the sluices controlling the irrigation of their fields. These “days of water” (or fractions of a day) could, however, be sold to other farmers, as contracts recording transactions pertaining to water usage rights reveal (Chauveau 2001; Agut-Labordère 2020).

Administrative Management (MK and NK)

Textual evidence regarding supply and administrative management of water is scarce, particularly when it comes to water meant for drinking or domestic use. However, a few biographical texts do mention the establishment of water points in cities (albeit without providing much detail), as evidenced by a passage from the Middle Kingdom stela of Mentuwer (Egyptian Museum, Florence, inv. 1774, l. 5), in which he states: “I made a watering place (*swrt*) for my city” (Varille 1934; Landgráfová 2011: 268–269). These facilities appear to have been implemented by local officials. For example, Sarenput I, mayor of Elephantine during the reign of Senusret I, recounts the works he carried out in his city and declares: “(I) made a chamber for the *wꜥb* priest, (and) a drinking place (*st swr*) for Elephantine” (Aswan Museum, stela of Sarenput I, inv. 1373, l. 15–16; Habachi 1985: 36–37, pl. 24; Franke 1994: 154–157).

Elephantine

To date, none of the installations referenced in the textual records has been clearly identified through archaeological investigation. Nevertheless, in the case of Elephantine, Cornelius von Pilgrim has put forward the hypothesis that the large courtyard paved with mudbrick, located to the northwest of the Temple of Satet, could correspond to the drinking place cited in Sarenput’s stela (Kaiser et al. 1997: 152–157; von Pilgrim 1997: 17–18). Used to celebrate the arrival of the inundation, the courtyard was equipped with a stone basin embedded in the ground, which received water from the temple through a stone channel. According to

von Pilgrim, this space was likely not used solely during flood festivals. Throughout the rest of the year, it may have been accessible to the local population, with the basin serving as a public reservoir where individuals came to fetch the water they needed daily. Regular water deliveries from the river, likely involving donkeys, would therefore have been necessary to ensure a continuous water supply. There is no definitive evidence linking this courtyard with certainty to the drinking place of Sarenput, and some reservations may well be expressed regarding the use of cultic installations for everyday purposes (see, e.g., Driaux 2016: 47; F. Arnold 2022: 152–154). Nonetheless, the implementation of an organized water supply at Elephantine is hardly in doubt, as such delivery systems are attested at other sites.

El-Amarna

At el-Amarna, the inhabitants of the city appear to have obtained their water independently through the many two-stage wells embedded within the urban fabric. Archaeological evidence indicates that nearly all large properties were equipped with a private well in their courtyard (fig. 9), allowing their wealthy inhabitants direct access to water within the domestic space. The state no longer needed to be directly involved, as these households could manage their own water needs.

However, this created difficulties for poorer households, for whom a private well was too expensive to implement. Consequently, community wells are also found throughout the city (fig. 10). Their location in open spaces, near clusters of small houses, often sharing other facilities such as storage bins or ovens, suggests that inhabitants with a common social background, grouped within the same neighborhood, organized themselves to dig a well close to their homes (Kemp 1977: 133–134).

In contrast, the el-Amarna Workmen’s Village, situated on the edge of the desert, relied on a system of water distribution overseen by the local administration. The site of the Workmen’s Village was probably not suitable for digging a well, with the water table

presumably too deep in that specific area and the technical knowledge possibly too limited at the time to reach it. Water was therefore brought by carriers to the settlement, and archaeological investigations conducted on the site and its surroundings make it possible to reconstruct how this supply was organized (Kemp 1984; 1987: 23–24; see also Driaux 2016: 47–52).

The water provided for the Workmen's Village was not sourced from the Nile, which was far too distant from the remote community. It came rather from wells, located at the city margins, which were part of craft-production complexes arranged around large courtyards encompassing workshops and storage spaces for commodities. These

establishments appear to have been placed under the responsibility of officials whose loyalty was rewarded by the king (Kemp 1989b). Functioning as service centers, and subject to both private and institutional control, they provisioned the Workmen's Village with goods and water.

The route linking the city to the settlement bears witness to water deliveries and the manner in which these were carried out. A large number of Canaanite amphorae sherds found scattered along the path, resulting from accidental breakage during transport, suggests that these vessels, originally containing valuable liquids such as wine and oil, were repurposed to convey water (Renfrew 1987). This transport was most probably undertaken

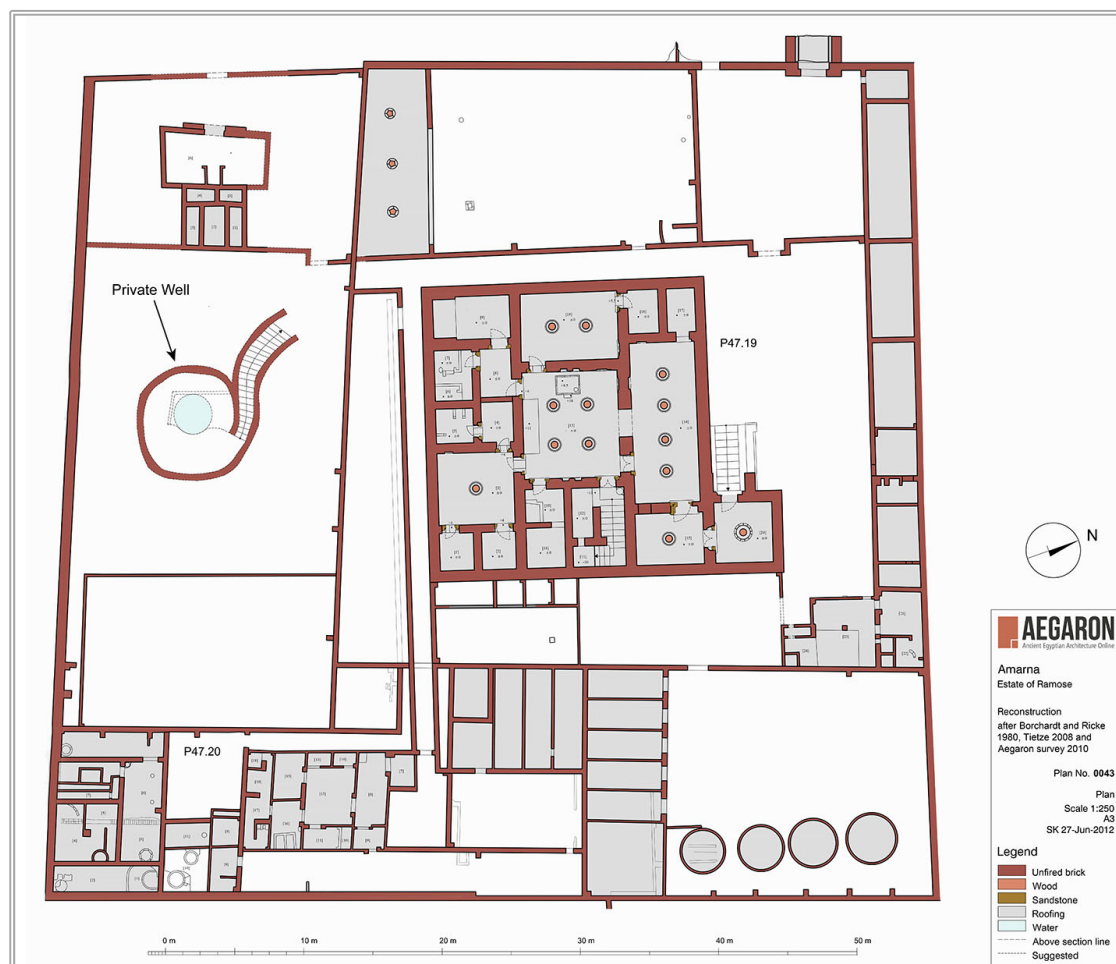


Figure 9. Reconstruction of the estate of Ramose with its private well at el-Amarna.

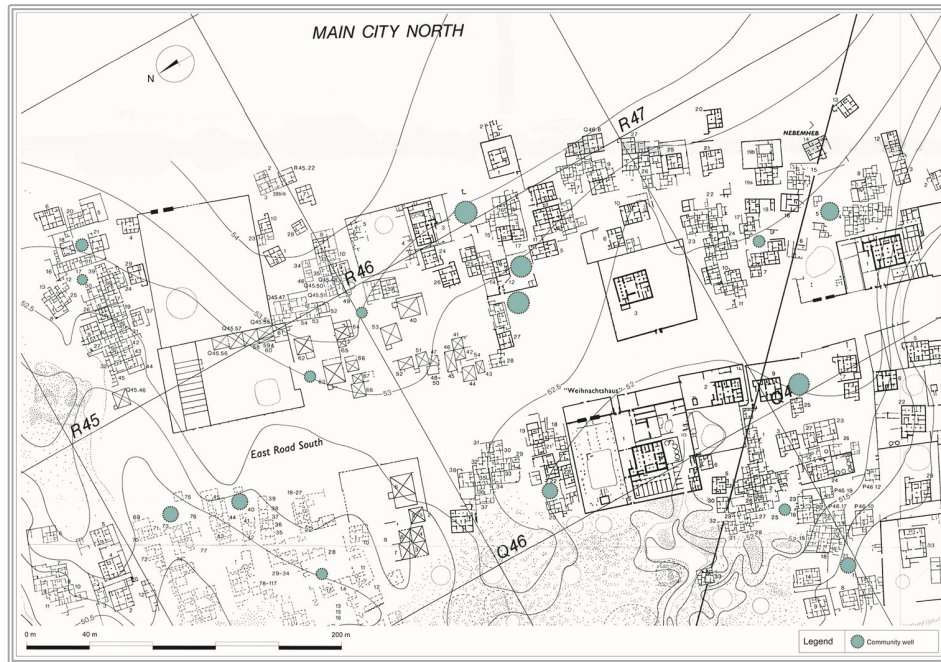


Figure 10. Plan of an area within the Main City North at el-Amarna showing the location of community wells.

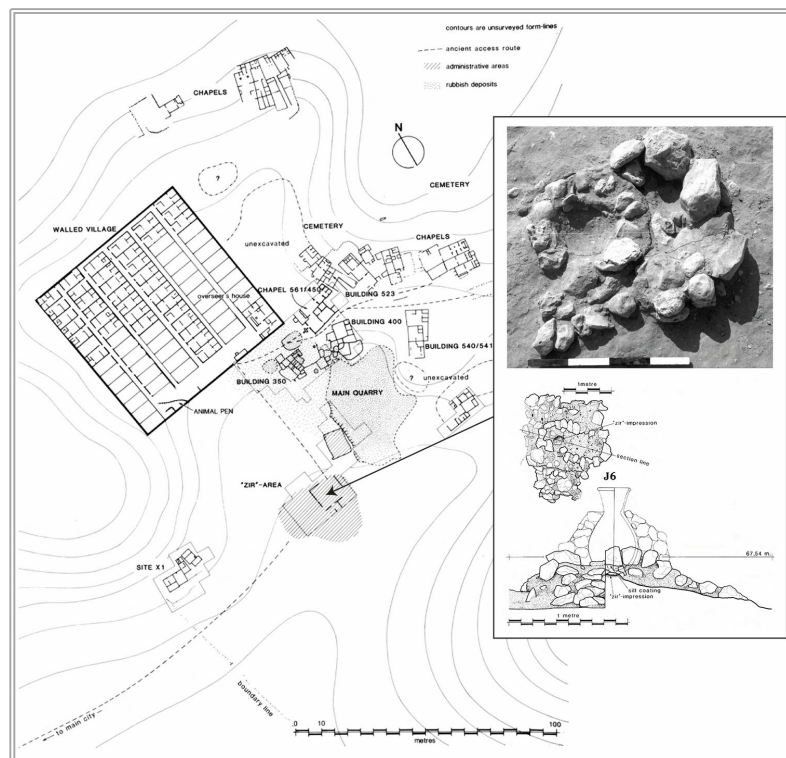


Figure 11. General map of the el-Amarna Workmen's Village and its surroundings. Inset: details of a *zir*-emplacement.

with donkeys, as seemingly depicted in a scene from the tomb of Mahu (Davies 1906: pl. XXIV). Water amphorae were not unloaded within or near the village itself, but rather some 60 meters away. This may have been intended to avoid nuisances that might be associated with donkeys and/or to keep outsiders at a distance: in fact, a stone alignment extending from Site X1 delineated the area reserved for community use by marking a clear boundary that was presumably not meant to be crossed (fig. 11).

The water loads were then carried manually to a reception point situated some dozen meters from the village gateway (Renfrew 1987: 97–98). This defined space, floored with mud, contained numerous emplacements made of stones, brick rubble, and marl mortar designed to permanently support pottery storage vessels (see fig. 11); some depressions in the ground also indicate the temporary presence of jars simply standing upright in the space (Kemp 1984). The majority of the sherds found embedded in these roughly circular structures belong to large biconical jars with thickened rims used for storing water (Rose 1984: 146–152) and referred to in modern Arabic as *zir*—a term that led the excavators to conveniently name this part of the site the “Zir-Area” (see fig. 11) (Kemp 1984: 60). The water was subsequently decanted from the amphorae into these large jars, where it was temporarily retained prior to distribution to the villagers (Kemp 1984: 79). The Zir-Area could thus quite readily be equated with the watering or drinking places mentioned in the texts. Nevertheless, although archaeological discoveries provide evidence for the involvement of the local administration in the water supply of the Workmen’s Village, no written document confirms this. Similarly, the precise organization of water deliveries—their frequency, the workforce assigned to this task, and other related aspects—remains unknown. In contrast, such details, and the role of the administration, are partly documented for the site of Deir el-Medina. Unlike el-Amarna, this site offers textual sources that compensate for a less visible archaeological footprint.

Deir el-Medina

Situated likewise at the edge of the desert, the village of Deir el-Medina fell under the jurisdiction of “the Tomb,” an institution originating from a royal foundation (Černý 1973; Valbelle 1985: 87–157). As such, it was the responsibility of the state to provide the inhabitants with water and foodstuffs, along with tools and materials necessary for their everyday life and work activities. Deliveries were carried out by service personnel attached to the village and referred to as *smdt* in the written sources (Černý 1973: 180–190; Valbelle 1985: 126–136; Gabler 2018: 1–47). They encompassed a diverse range of professions, including the *jnjw-mw*, or “water-carriers” in charge of the daily water supply (e.g., Christophe 1955; Allam 1994; Gabler 2018: 109–173). Some 200 hieratic documents, mainly on ostraca, dating from the 19th and 20th Dynasties, mention over 70 men who held this position during this period and offer insights into the water distribution system (fig. 12). Some texts, such as O. DeM 189 (Černý 1937: pl. 53A–53) imply, for instance, that during the 19th Dynasty, a single water-carrier was tasked with provisioning

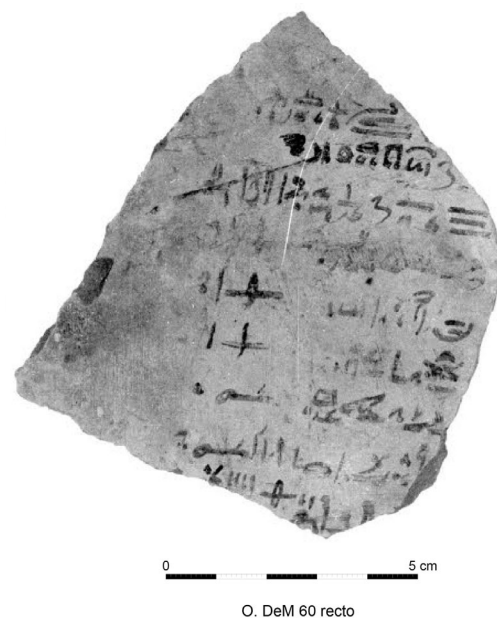


Figure 12. Ostrakon from Deir el-Medina dating to the reign of Ramesses II, bearing a hieratic inscription that documents the distribution of water rations to some workmen.



Figure 13. Plan of Deir el-Medina indicating key water-related features.

four to five households (Gabler 2018: 126–127). This would suggest that in the reign of Ramesses II, when the village likely housed between 30 and 40 workmen’s families, six to ten water-carriers were required to meet daily needs. However, their exact number cannot be precisely established, as it could have changed over time in response to demographic fluctuations within the village; moreover, the standard workload assigned to each man may also have shifted across periods.

Based on the delivery records, it has been estimated that a workman could have received a daily average water quantity of approximately 95 liters for himself and his

household. This amount seems not to have been exactly the same for all workmen and may in fact have been even greater for men holding higher-ranking positions, such as scribes or foremen (Janssen 1979: 12–13; Gabler 2018: 125–128). To transport their loads, the *jnjw-mw* made use of donkeys, some of which may, occasionally, have been rented to the workmen (Eichler 1991; Janssen 2005: 96–101). The textual sources, however, do not clarify whether water-carriers operated with a single donkey, thereby requiring multiple round-trips to deliver their complete daily supply, or whether they accomplished the task in one journey using several animals.

Some uncertainty persists regarding both the precise location where water was unloaded and the methods of distribution. The documents provide no details on these matters, and the site has not preserved archaeological remains as clear as those uncovered at el-Amarna. An area situated to the north, between the north-eastern corner of the Ptolemaic temple and the temple of Amun, where a road linking the village to the Nile Valley came to an end, could have been used as an unloading and control space (rather than a *zîr*-area as proposed by Gobeil 2018), before the water was conveyed close to the village entrance or even directly within it. Bernard Bruyère indeed suggested that water was temporarily stored just a few meters from the village gateway, in a large amphora measuring 1.5 meters in diameter (fig. 13), partially set in a cavity lined with a stone rim and placed under the supervision of a guard whose hut was found nearby (Bruyère 1939: 34, pl. III, XXIX; see also Christophe 1955: 395–396). However, given that some water-carriers were the sons of workmen (Gabler 2018: 161–170), and were therefore free to move about the settlement, it is also conceivable that, following its unloading, the water may have been carried by hand directly to the doorsteps of houses.

Finally, there is also the question of the source of the water that was brought daily to Deir el-Medina. It did not come from the Nile, which was too far from the village, but more likely from a channel that ran, at the time, in front of the funerary temples (Toonen et al. 2018, especially fig. 6)—those of Sety I and Ramesses II are situated less than one kilometer from the settlement. Somewhere in the immediate vicinity must then have been the place called *mryt* (Erman and Grapow eds.: *Wb II* 109.12–110.3) in some Deir el-Medina texts, a term commonly translated as “riverbank” and which, according to a number of these attestations, may have served as a water supply site (Černý 1973: 94–97; Gabler 2018: 334–336). It is also possible that, at the beginning of the 20th Dynasty, the aforementioned channel was superseded by a nearer water source, located less than 200 meters from the village. The

“Great Pit”—a well, long considered to have never been in use (e.g., Bruyère 1953: 25–28; Allam 1994: 2)—may in fact have provided a more rapid and efficient water supply, at least temporarily, from the probable date of its excavation in year 15 of Ramesses III, according to O. DeM 92 (Driaux 2011). This solution, however, was not necessarily less laborious given that the well reaches a depth of over 52 meters. This two-stage well, of the same type as those at el-Amarna but substantially larger (Driaux 2011: 135–136), required water-carriers to make their way down to the bottom via several flights of steps, then make the ascent to the surface with their load of water before distributing it to the workmen and their families.

Water Management in Practice

Like the workmen’s villages of el-Amarna and Deir el-Medina, communities living in planned settlements, typically surrounded with an enclosure wall and established and administered by the state, would have benefited from an organized supply system.

Giza

The implementation of such distribution systems may date back to the Old Kingdom, as suggested by sites at Giza such as Heit el-Ghurab—a large settlement housing, notably, the people working on the pyramids—and Khentkawes Town, founded to accommodate the personnel assigned to the funerary cult of the deceased queen (e.g., Driaux and Tavares 2013 – 2014). To date, archaeological investigations have not revealed any features that might have served as water points for the inhabitants of these two settlements. The large terraced basin discovered to the east of Khentkawes Town is the only structure in the immediate vicinity that could have provided access to water (AERA 2011). However, it appears to have been in use only during the inundation, when it filled to a depth of two to three meters via a canal located approximately 50 meters to the north of Heit el-Ghurab, remaining dry for the rest of the year (Lehner 2020: 196–197; 2024: 380–393, fig. 1). The two communities must therefore have been supplied primarily with water from a more

distant source, possibly a secondary branch of the river located over 1.5 kilometers to the east (Lehner 2020; 2022: 144). In the case of Khentkawes Town, both the inherent characteristics of the site and its topography point to the possibility that water could have been delivered directly within the town and even directly to the door of each house. Such an arrangement may then reflect a distribution system tailored to the high status and rank of the priests who lived there (Stadelmann 1981: 70).

This may find resonance in more recent water supply practices in Egypt. André Raymond, who studied the water-carriers (*saqqā'in*) of Cairo—a profession that persisted until the nineteenth century—describes how water drawn from the Nile and which was then a paid commodity was distributed to the city's inhabitants (Raymond 1958). The water-carriers provided domestic deliveries to clients who could afford their services, decanting the water into their household water containers or storage jars. Individuals too poor to purchase water from the *saqqā'in* relied instead on the city cisterns (*sabīḥ*), where they fetched water free of charge; most of these facilities were pious foundations established by wealthy benefactors (Raymond 1958: 193–194).

Lahun

A similar pattern of water supply may be hypothesized for the most affluent inhabitants of the pyramid town of Lahun. Located more than one kilometer from the pyramid of Senusret II, the almost square-shaped settlement was surrounded by an enclosure wall with its main gate on the eastern side (Moeller 2016: 271–290). While some parts of the town have not been excavated and earlier archaeological investigations (Petrie 1890: 21–32; 1891: 5–15) provide only partial documentation that is sometimes difficult to interpret, there is no conclusive evidence for any water supply facility within the densely structured urban fabric. The site lies far from the Nile (Moeller 2017: 200–201), and, given the absence of any water-related installation comparable to a *zīr*-area near the entrance, supply within the settlement must necessarily

be postulated. The large mansions situated in the northern part of the site and occupied by high-ranking officials (Quirke 2005: 69–73; Kemp 2006: 220–221) may have benefited from individual delivery directly to their homes. Conversely, the numerous smaller houses located in the western sector and southern part of site were likely excluded from such provisions due to the operational constraints involved, namely the difficulty of organizing deliveries to so many individual dwellings. The inhabitants of these houses probably had to supply themselves, collecting the water they needed from storage vessels whose precise location, whether inside or outside the town, remains uncertain.

Nubian fortresses

The fortresses built in Lower Nubia during the Middle Kingdom for military and administrative purposes (Monnier 2010: 117–159) constitute another example of planned settlements that very likely had an organized water supply. Constructed predominantly atop rocky outcrops, they were strategically positioned on high points in the landscape. However, such locations made it geologically impossible to dig wells within the fortifications, and the groundwater table was, in any case, far too deep to be reached. The only solution for providing water to the fortresses was the river, located several tens of meters below. Although the river was relatively close, the steep and rugged topography often made it difficult to access. To address these difficulties, each fortress included staircases built into the hillside that were partially or completely covered to ensure protected access in the event of an attack.

At Uronarti, for instance, a staircase almost 240 meters long spanned a vertical descent of 62 meters to reach the Nile. The upper part of the structure was open to the sky, while the final segment, in the lower part, was roofed with large stone slabs (Dunham 1967: 19–20, pls. XI.B–C, XII–XIII, map III). At Semna, the staircase, consisting of 131 steps and measuring approximately 57 meters in length (fig. 14), was entirely covered. It began with an initial section built of granite rubble and slabs, which then continued into a sub-

terranean section carved into the rock (Reisner 1929: 152; Dunham and Janssen 1960: 7, pl. 7). The provisioning of water (and presumably other commodities brought by boat) must have occurred daily, requiring numerous round trips.

No written documents indicate the presence of water-carriers at these forts, and it is reasonable to assume that this task was assigned to members of the garrisons. The use of donkeys to carry water jars also seems excluded, since the staircases are often too

narrow in their lower parts—at Uronarti, the covered section measures only 0.80 meters in width. Water jars would have had to be transported manually, potentially with ropes or nets. However, estimating the number of daily trips needed remains difficult given the lack of reliable population estimates for the fortress. The configuration of the sites and the primary military function of the fortresses make water storage anywhere beyond the walls implausible. Yet, no clearly defined water storage facilities have been identified.

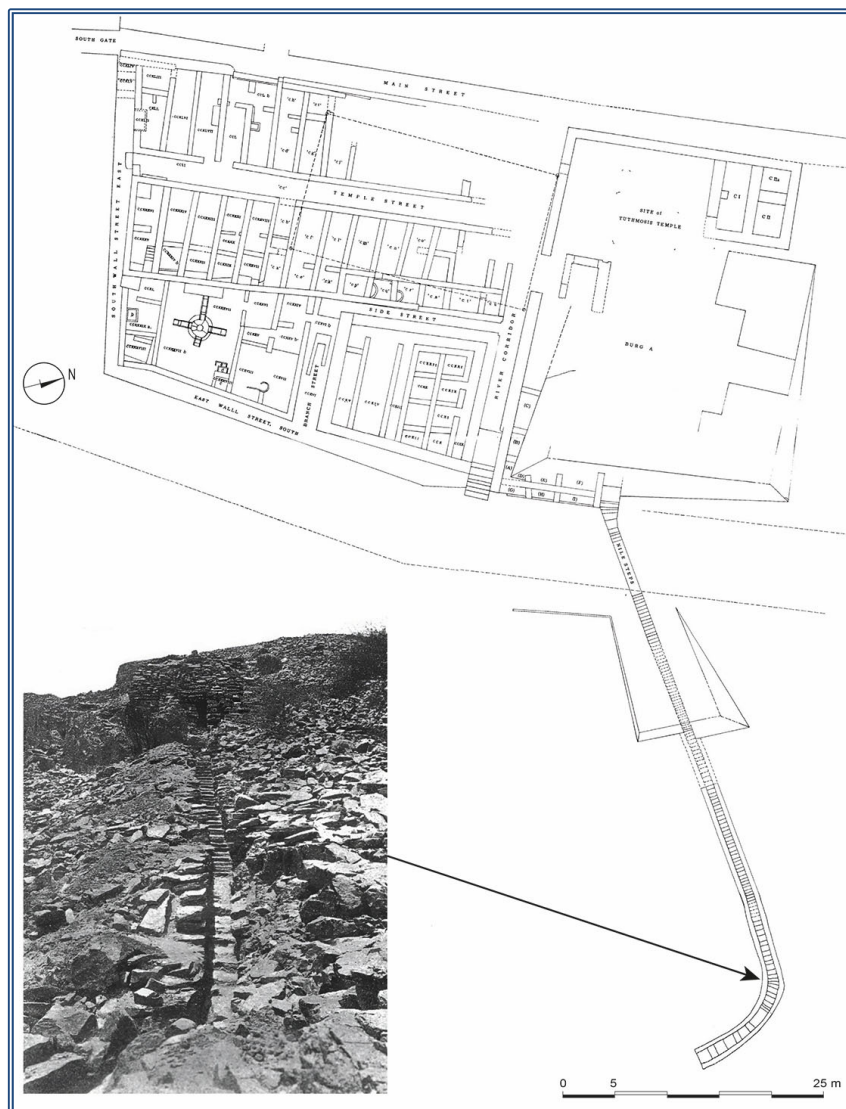


Figure 14. Southwest quarter of the Semna fortress with staircase providing access to the Nile. Inset: View of the remains of the staircase looking west, photographed by Reisner's expedition in the late 1920s.

Water must therefore have been kept in jars separately within barracks, houses, and other administrative buildings—a hypothesis notably advanced by Noel Wheeler (1932: 255) regarding the Shalfak fortress.

Concluding Remarks

Although explicit archaeological evidence (such as that at el-Amarna) and written sources (like those from Deir el-Medina) are sometimes lacking, it is the thorough analysis of settlements, and of their layout and organization, that enables serious consideration of systematic water supply organized by the administration. This becomes particularly evident when villages and towns were established by the state for specific purposes, such as pyramid towns or fortresses. Such communities were generally located at some distance from the river or any water sources. It was therefore necessary for water to be brought from outside into the settlements themselves or, at the very least, to their immediate vicinity. The means employed to do so remained relatively simple, as the

local administration relied primarily on manpower to carry out this tedious task.

Nevertheless, this model appears to have evolved gradually during the New Kingdom. From this period onwards, the emergence and increasing development of wells in the Nile Valley fundamentally transformed water management practices. It was no longer strictly necessary to bring water from the river into settlements, as wells made it possible to obtain water directly within inhabited spaces. However, the adoption of wells was neither uniform nor universally feasible, creating new dynamics in the ways different households secured their water supply. The development of wells, together with technological improvements, thus favored, in certain cases and at specific sites, a gradual shift from relatively egalitarian and centralized community water supply systems towards more diverse and individualized models, in which households increasingly assumed greater responsibility for meeting their own water needs.

Bibliographic Notes

To date, there is no comprehensive synthesis of water supply and management in ancient Egypt. Much of the information and data presented here are based on Driaux (2010), with an updated and expanded version currently being prepared for publication. For further details on some aspects, particularly regarding wells, see Franzmeier (2008b, 2010). For additional examples of wells apart from those mentioned above, see for instance: el-Amarna (Kemp 1989a); Medinet Habu (Hölscher 1941); Sais (Wilson 2005); Tell Abqa'in (Thomas 2002); and Tanis (Fougerousse 1935 – 1937; Brissaud 2018). On water supply for desert expeditions, see especially Gasse (1994) and Förster (2007), but also Förster (2015) for further details on donkeys and the water loads they carried. The bibliography on water-carriers at Deir el-Medina is extensive, therefore reference may be made to Gabler (2018), which offers an overview of the studies conducted on this subject. For the hieratic transcription of O. DeM 60 (as shown in fig. 12), see Černý (1935: pl. 46); for the transliteration, see Gabler (2018: 126, 637).

Acknowledgements

The *UCLA Encyclopedia of Egyptology (UEE)* expresses thanks to Bruce Redwine and to Rebecca Dash Sperber and the Glen R. Dash Charitable Foundation for their support, enabling continued free access to the *UEE* articles.

References

Agut-Labordère, Damien

- 2020 Qu'est-ce qu'un "jour d'eau"? L'eau et la terre à 'Ayn Manâwir (Oasis de Kharga) V^e–IV^e siècle av. J.-C. In *L'eau dans tous ses états: Perceptions antiques*, dir. Sophie Bouffier and Iván Fumadó Ortega, pp. 195–201. Aix-en-Provence: Presses Universitaires de Provence.
- 2021 A man's business? Washing the clothes in ancient Egypt (second and first millennia BCE). In *Textiles and gender: Production to wardrobe from the Orient to the Mediterranean in antiquity*, ed. Mary Harlow, Cécile Michel, and Louise Quillien, pp. 83–94. London: Bloomsbury Academic.

Allam, Schafik

- 1994 À propos de l'approvisionnement en eau de la colonie ouvrière de Deir el-Médineh. In *Les problèmes institutionnels de l'eau en Égypte ancienne et dans l'Antiquité méditerranéenne*, Bibliothèque d'étude 110, ed. Bernadette Menu, pp. 1–14. Cairo: Institut français d'archéologie orientale.

Ancient Egypt Research Associates (AERA)

- 2011 KKT-E+: The buried basin and the town beyond. *Aeragram* 12(1), pp. 10–13.

Ancient Egyptian Architecture Online Dataverse (AEGARON)

- 2022 Amarna, *UCLA Dataverse*, V1: <https://doi.org/10.25346/S6/GOQGUP>

Arnold, Dorothea, and Janine Bourriau (eds.)

- 1993 *An introduction to ancient Egyptian pottery*. Sonderschrift 17 des deutschen archäologischen Instituts, Abteilung Kairo. Mainz: Philipp von Zabern.

Arnold, Felix

- 2022 Communal space at Elephantine. In *Daily life in ancient Egyptian settlements*, Sonderschriften des deutschen archäologischen Instituts, Abteilung Kairo, ed. Johanna Sigl, pp. 151–162. Wiesbaden: Harrassowitz.

Barbotin, Christophe, and Didier Devauchelle

- 2005 *La voix des hiéroglyphes: Promenade au département des antiquités égyptiennes du musée du Louvre*. Paris: Louvre Éditions and Éditions Khéops.

Bloxam, Elisabeth G.

- 2003 *The organisation, transportation and logistics of hard stone quarrying in the Egyptian Old Kingdom: A comparative study*. PhD dissertation: London: University College London.

Bonneau, Danielle

- 1964 *La crue du Nil: Divinité égyptienne à travers mille ans d'histoire (332 av.–641 ap. J.-C.) d'après les auteurs grecs, latins, et les documents des époques ptolémaïque, romaine et byzantine*. Paris: Librairie C. Klincksieck.

Borchardt, Ludwig

- 1912 Ausgrabungen in Tell el-Amarna 1911/12. *Mitteilungen der Deutschen Orient-Gesellschaft* 50, pp. 1–40.

Borchardt, Ludwig, and Herbert Ricke

- 1980 *Die Wohnhäuser in Tell el-Amarna*. Wissenschaftliche Veröffentlichung der deutschen Orient-Gesellschaft 91. Berlin: Gebr. Mann Verlag.

Boucharlat, Rémy

- 2015 Le falaj ou qanāt, une invention polycentrique et multipériode. *ArchéOrient – Le Blog*. <https://doi.org/10.58079/bcu4>

Briois, François, Béatrix Midant-Reynes, Sylvie Marchand, Yann Tristant, Michel Wuttman, Morgan de Dapper, Joséphine Lesur, and Claire Newton

- 2012 Neolithic occupation of an artesian spring: KS043 in the Kharga Oasis, Egypt. *Journal of Field Archaeology* 37(3), pp. 178–191.

Brissaud, Philippe

- 2018 *Tanis: Le domaine de la déesse Mout et son lac sacré*. Norderstedt: Books on Demand.

Bruyère, Bernard

- 1939 *Rapport sur les fouilles de Deir el Médineh (1934 – 1935): Troisième partie: Le village, les décharges publiques, la station de repos du col de la Vallée des Rois*. Fouilles de l'Institut français d'archéologie orientale 14. Cairo: Institut français d'archéologie orientale.
- 1953 *Rapport sur les fouilles de Deir el Médineh (années 1948 à 1951)*. Fouilles de l'Institut français d'archéologie orientale 26. Cairo: Institut français d'archéologie orientale.

Burgos, Franck, and Emmanuel Laroze

- 2020 L'extraction des blocs en calcaire de l'Ancien Empire: Une expérimentation au ouadi el-Jarf. *The Journal of Ancient Egyptian Architecture* 4, pp. 73–95.

- Butzer, Karl W.
1976 *Early hydraulic civilization in Egypt: A study in cultural ecology*. Chicago and London: The University of Chicago Press.
- Černý, Jaroslav
1935 *Catalogue des ostraca hiératiques non littéraires de Deir el-Médineh* (N^{os} 1 à 113). Documents de fouilles de l'Institut français d'archéologie orientale 3. Cairo: Institut français d'archéologie orientale.
1937 *Catalogue des ostraca hiératiques non littéraires de Deir el-Médineh II* (N^{os} 114 à 189). Documents de fouilles de l'Institut français d'archéologie orientale 4. Cairo: Institut français d'archéologie orientale.
1973 *A community of workmen at Thebes in the Ramesside Period*. Bibliothèque d'étude 50. Cairo: Institut français d'archéologie orientale.
- Chauveau, Michel
2001 Les qanāts dans les ostraca de Manāwir. In *Irrigation et drainage dans l'Antiquité: Qanāts et canalisations souterraines en Iran, en Égypte et en Grèce*, Persika 2, dir. Pierre Briant, pp. 137–142. Paris: Thotm éditions.
- Christophe, Louis-A.
1955 Les porteurs d'eau de Deir el-Medineh pendant le règne de Ramsès III. *Bulletin de l'Institut d'Égypte* 36(2), pp. 381–408.
- Darnell, John Coleman, and Deborah Darnell
2002 Opening the narrow doors of the desert: Discoveries of the Theban Desert Road Survey. In *Egypt and Nubia: Gifts of the desert*, ed. Renée Friedman, pp. 132–155. London: The British Museum Press.
n.d. Tundaba cistern. Online resource: <https://egyptology.yale.edu/expeditions/past-and-joint-projects/theban-desert-road-survey-yale-toshka-desert-survey/abu-ziyar/cistern>
- Davies, Norman De Garis
1903 *The rock tombs of el Amarna I: The tomb of Meryra*. Archaeological Survey of Egypt 13. London: The Egypt Exploration Fund.
1906 *The rock tombs of el Amarna IV: The tombs of Penthu, Mahu, and others*. Archaeological Survey of Egypt 16. London: The Egypt Exploration Fund.
1927 *Two Ramesside tombs at Thebes*. Robb de Peyster Memorial Series V. New York: The Metropolitan Museum of Art.
- De Angeli, Stefano
2013 “Qanat landscapes” in the oases of the Western Desert of Egypt: The cases of the Bahriya and Farafra oases. In *Bahriya Oasis: Recent research into the past of an Egyptian oasis*, ed. Marek Dospěl and Lenka Suková, pp. 271–285. Prague: Faculty of Arts, Charles University in Prague.
- Driaux, Delphine
2010 *Les aménagements hydrauliques en contexte urbain dans l'Égypte ancienne*. Paris: PhD thesis, Sorbonne University.
2011 Le Grand Puits de Deir al-Medīna et la question de l'eau: Nouvelles perspectives. *Bulletin de l'Institut français d'archéologie orientale* 111, pp. 129–141.
2012 Les aménagements sanitaires: Un “luxe” de la maison égyptienne. *Égypte, Afrique & Orient* 66, pp. 49–58.
2016 Water supply of ancient Egyptian settlements: The role of the state: Overview of a relatively equitable scheme from the Old to New Kingdom (ca. 2543 – 1077 BC). *Water History* 8(1), pp. 43–58.
2026 The daily water in the Egyptian house: The Amarna example. In *Wasser im alten Ägypten, Geschichte der Wasserversorgung* 8, ed. Heidi Köpp-Junk, pp. 134–151. Oppenheim am Rhein: Nünnerich-Asmus Verlag & Media. 2016 Water supply of ancient Egyptian settlements: The role of the state: Overview of a relatively equitable scheme from the Old to New Kingdom (ca. 2543 – 1077 BC). *Water History* 8(1), pp. 43–58.
- Driaux, Delphine, and Ana Tavares
2013– Esquisse d'une mosaïque urbaine: Villes et villages de Giza à l'Ancien Empire. *Égypte, Afrique & Orient* 42 (2013 – 2014), pp. 3–14.
- Dunham, Dows
1967 *Uronarti, Shalfak, Mirgissa: Second Cataract forts II*. Boston: Museum of Fine Arts.
- Dunham, Dows, and Jozef M. A. Janssen
1960 *Semna, Kumma: Second Cataract forts I*. Boston: Museum of Fine Arts.
- Eichler, Selke
1991 Untersuchungen zu den Wasserträgern von Deir el-Medineh II. *Studien zur Altägyptischen Kultur* 18, pp. 173–205.

- Erman, Adolf, and Hermann Grapow (eds.)
1926– *Wörterbuch der Aegyptischen Sprache (Wb)*. 13 volumes (1926 – 1963). Leipzig: Hinrichs.
- Förster, Frank
2007 With donkeys, jars and water bags into the Libyan Desert: The Abu Ballas Trail in the late Old Kingdom/First Intermediate Period. *British Museum Studies in Ancient Egypt and Sudan* 7, pp. 1–36.
2015 *Der Abu Ballas-Weg: Eine pharaonische Karawanenroute durch die Libysche Wüste*. Africa Præhistorica 28. Cologne: Heinrich-Barth-Institut.
- Fougerousse, Jean-Louis
1935– Le grand puits de Tanis. *Kémi* 5 (1935 – 1937), pp. 71–103.
- Franke, Detlef
1994 *Das Heiligtum des Heqaib auf Elephantine: Geschichte eines Provinzheiligtums im Mittleren Reich*. Studien zur Archäologie und Geschichte Ägyptens 9. Heidelberg: Heidelberg Orientverlag.
- Franzmeier, Henning
2008a Sherds, clay and clean water. *Ancient Egypt* 8(6), pp. 45–49.
2008b Wells and cisterns in pharaonic Egypt: The development of a technology as a progress of adaptation to environmental situations and consumer's demands. In *Current research in Egyptology 2007: Proceedings of the Eighth Annual Symposium*, ed. Kenneth Griffin, pp. 37–51. Oxford: Oxbow Books.
2010 *Ein Brunnen in der Ramses-Stadt: Zur Typologie und Funktion von Brunnen und Zisternen im pharaonischen Ägypten*. Forschungen in der Ramses-Stadt 7. Hildesheim: Verlag Gebrüder Gerstenberg.
- Gabler, Kathrin
2018 *Who's who around Deir el-Medina: Untersuchungen zur Organisation, Prosopographie und Entwicklung des Versorgungspersonals für die Arbeitersiedlung und das Tal der Könige*. Egyptologische Uitgaven 31. Leiden: Nederlands Instituut voor het Nabije Oosten; Leuven: Peeters.
- Gabolde, Marc
1994 La statue de Merymaât gouverneur de Djâroukha (Bologne K.S. 1813). *Bulletin de l'Institut français d'archéologie orientale* 94, pp. 261–275.
- Gardiner, Alan H.
1909 *Die Erzählung des Sinube und die Hirtengeschichte*. Hieratische Papyrus aus den Königlichen Museen zu Berlin 5. Leipzig: J.C. Hinrichs.
- Gasse, Annie
1994 L'approvisionnement en eau dans les mines et carrières (aspects techniques et institutionnels). In *Les problèmes institutionnels de l'eau en Égypte ancienne et dans l'Antiquité méditerranéenne*, Bibliothèque d'étude 110, ed. Bernadette Menu, pp. 169–176. Cairo: Institut français d'archéologie orientale.
- Gobeil, Cédric
2018 Archaeology in the archives: A *ẓir*-area at Deir el-Medina and its implications for the location of the *kbetm*. In *Outside the box: Selected papers from the conference "Deir el-Medina and the Theban Necropolis in Contact," Liège, 27 – 29 October 2014*, ed. Andreas Dorn and Stéphane Polis, pp. 191–216.
- Goyon, Jean-Claude
1987 L'eau: Réalités, mythes et rites dans l'Égypte pharaonique: Essai de bilan sur les premières approches. In *L'eau et les hommes en Méditerranée*, dir. André de Réparaz, pp. 199–204. Paris: Éditions du Centre National de la Recherche Scientifique.
- Graham, Angus
2010 Islands in the Nile: A geoarchaeological approach to settlement location in the Egyptian Nile Valley and the case of Karnak. In *Cities and urbanism in ancient Egypt: Papers from a workshop in November 2006 at the Austrian Academy of Sciences*, Untersuchungen der Zweitstelle Kairo des Österreichischen Archäologischen Instituts 35, ed. Manfred Bietak, Ernst Czerny, and Irene Forstner-Müller, pp. 125–143. Vienna: Österreichische Akademie der Wissenschaften.
- Grimal, Nicolas
1994 Le sage, l'eau et le roi. In *Les problèmes institutionnels de l'eau en Égypte ancienne et dans l'Antiquité méditerranéenne*, Bibliothèque d'étude 110, ed. Bernadette Menu, pp. 195–203. Cairo: Institut français d'archéologie orientale.
- Habachi, Labib
1985 *Elephantine V: The sanctuary of Heqaib*. Archäologische Veröffentlichungen, Deutsches Archäologisches Institut, Abteilung Kairo 33. Mainz: Philipp von Zabern.

- Hairy, Isabelle
2009 Les machines de l'eau en Égypte et à Alexandrie. In *Du Nil à Alexandrie: Histoires d'eaux*, dir. Isabelle Hairy, pp. 550–571. Alexandria: Éditions Harpocrates.
- Henein, Nessim Henry
1988 *Mārī Girgis: Village de Haute-Égypte*. Bibliothèque d'étude 94. Cairo: Institut français d'archéologie orientale.
- Herodotus
n.d. *Histories: Book II*, 5:
<http://data.perseus.org/citations/urn:cts:greekLit:tlg0016.tlg001.perseus-eng1:2.5.1>
- Hölscher, Uvo
1941 *The excavation of Medinet Habu III: The mortuary temple of Ramses III, Part I*. Oriental Institute Publications 54. Chicago: The University of Chicago Press.
- Hugonot, Jean-Claude
1989 *Le jardin dans l'Égypte ancienne*. Publications Universitaires Européennes XXXVIII, Archéologie 27. Frankfurt: Peter Lang.
- Institut français d'archéologie orientale (IFAO)
2011 'Ayn Soukhna. In *Rapport d'activité 2010–2011*, pp. 59–65. Cairo: Institut français d'archéologie orientale. https://www.ifao.egnet.net/uploads/rapports/Rapport_IFAO_2011.pdf
- Janssen, Jac. J.
1979 The water supply of a desert village. *Bulletin of the Museum of Mediterranean and Near Eastern Antiquities* 14, pp. 9–15.
2005 *Donkeys at Deir el-Medīna*. Egyptologische Uitgaven 19. Leiden: Nederlands Instituut voor het Nabije Oosten.
- Kaiser, Werner, Frank Andraschko, Martin Bommas, Horst Jaritz, Walter Niederberger, Cornelius von Pilgrim, Mieczysław Rodziewicz, Anne Seiler, and Martin Ziermann
1997 Stadt und Tempel von Elephantine. 23./24. Grabungsbericht. *Mitteilungen des Deutschen Archäologischen Instituts, Abteilung Kairo* 53, pp. 117–193.
- Kemp, Barry J.
1977 The city of el-Amarna as a source for the study of urban society in ancient Egypt. *World Archaeology* 9(2), pp. 123–139.
1984 Report on the 1983 excavations: Commodity delivery area (zir-area). In *Amarna reports I*, Egypt Exploration Society Occasional Publications 1, ed. Barry J. Kemp, pp. 60–80. London: Egypt Exploration Society.
1987 The Amarna Workmen's Village in retrospect. *Journal of Egyptian Archaeology* 73, pp. 21–50.
1989a Report on the 1987 excavations: A large well beside Building Q48.4. In *Amarna reports V*, Egypt Exploration Society Occasional Publications 6, ed. Barry J. Kemp, pp. 1–14. London: Egypt Exploration Society.
1989b Appendix: Workshops and production at el-Amarna. In *Amarna reports V*, Egypt Exploration Society Occasional Publications 6, ed. Barry J. Kemp, pp. 56–63. London: Egypt Exploration Society.
2006 *Ancient Egypt: Anatomy of a civilization*. Second edition. London and New York: Routledge.
- Kemp, Barry J., and Salvatore Garfi
1993 *A survey of the ancient city of el-'Amarna*. Egypt Exploration Society Occasional Publications 9. London: Egypt Exploration Society.
- Klemm, Dietrich, Rosemarie Klemm, and Andreas Murr
2001 Gold of the pharaohs: 6000 years of gold mining in Egypt and Nubia. *African Earth Sciences* 33, pp. 643–659.
- Kitchen, Kenneth A.
1975 *Rameside inscriptions: Historical and biographical I*. Oxford: Blackwell.
1993 *Rameside inscriptions: Translated and annotated: Translations I: Ramesses I, Sethos I and contemporaries*. Oxford: Blackwell.
- Kobusiewicz, Michal
2003 Neolithic wells of the Western Desert of Egypt. In *Cultural markers in the Late Prehistory of Northeastern Africa and recent research*, Studies in African Archaeology 8, ed. Lech Krzyżaniak, Karla Kroeper, and Michal Kobusiewicz, pp. 95–104. Poznań: Poznań Archaeological Museum.

Landgráfová, Renata

- 2011 *It is my good name that you should remember: Egyptian biographical texts of Middle Kingdom stelae*. Prague: Faculty of Arts, Charles University in Prague.

Lehner, Mark

- 2020 Lake Khufu: On the waterfront at Giza: Modelling water transport infrastructure in Dynasty IV. In *Profane landscapes, sacred spaces*, ed. Miroslav Bárta and Jiří Janák, pp. 191–292.
- 2022 Sensory experience and social space at Heit el-Ghurab, the Giza pyramid builder's settlement. In *Daily life in ancient Egyptian settlements*, Sonderschrift des deutschen archäologischen Instituts, Abteilung Kairo 47, ed. Johanna Sigl, pp. 131–149. Wiesbaden: Harrassowitz.
- 2024 Pyramid harbours at Giza. In *Egyptian riverine harbours: Proceedings of the symposium held at IFAO, Cairo (15th – 18th September 2019)*, Bibliothèque d'étude 188, ed. Marine Yoyotte, Irene Forstner-Müller, and Harco Willems, pp. 367–400. Cairo: Institut français d'archéologie orientale.

Meeks, Dimitri

- 2001 Traitement, conservation et transport de l'eau du Nil: Histoire et problèmes. In *Techniques et sociétés en Méditerranée: Hommage à Marie-Claire Amouretti*, ed. Jean-Pierre Brun and Philippe Jockey, pp. 499–512. Paris: Maisonneuve & Larose.

Moeller, Nadine

- 2016 *The archaeology of urbanism in ancient Egypt: From the Predynastic Period to the end of the Middle Kingdom*. New York: Cambridge University Press.
- 2017 The foundation and purpose of the settlement at Lahun during the Middle Kingdom: A new evaluation. In *Essays for the library of Sesbat: Studies presented to Janet H. Johnson on the occasion of her 70th birthday*, Studies in Ancient Oriental Civilization 70, ed. Robert K. Ritner, pp. 183–203. Chicago: The University of Chicago.

Monnier, Franck

- 2010 *Les forteresses égyptiennes: Du Prédynastique au Nouvel Empire*. Connaissances de l'Égypte Ancienne 11. Brussels: Éditions Safran.

Morris, Joanne P.

- 2006 *Wells and water supply in New Kingdom Egypt*. Unpublished Ph.D. dissertation: Liverpool: University of Liverpool.

Parkinson, Richard B.

- 1997 *The Tale of Sinuhe and other ancient Egyptian poems, 1940 – 1640 BC*. Oxford: Oxford University Press.

Petrie, Flinders W. M.

- 1890 *Kahun, Gurob, and Hawara*. London: Kegan Paul, Trench, Trübner, and Co.
- 1891 *Illahun, Kahun, and Gurob*. London: Davit Nutt.

Quirke, Stephen

- 2005 *Lahun: A town in Egypt 1800 BC, and the history of its landscape*. London: Golden House Publications.

Raymond, André

- 1958 Les porteurs d'eau du Caire. *Bulletin de l'Institut français d'archéologie orientale* 57, pp. 183–202.

Redding, Richard W.

- 2024 *A view from the herd: Cattle, sheep, goats, and pigs in pharaonic Egypt: A primer for Egyptologists and archaeologists*. Archaeobiology 5. Columbus (GA): Lockwood Press.

Reisner, George A.

- 1929 Excavations at Semna und Uronarti by the Harvard-Boston Expedition. *Sudan Notes and Records* 12(2), pp. 143–161.

Renfrew, Colin A.

- 1987 Report on the 1986 excavations and survey: The survey of Site X2. In *Amarna reports IV*, Egypt Exploration Society Occasional Publications 5, ed. Barry J. Kemp, pp. 87–102. London: Egypt Exploration Society.

Rose, Pamela J.

- 1984 The pottery distribution analysis. In *Amarna reports I*, Egypt Exploration Society Occasional Publications 1, ed. Barry J. Kemp, pp. 133–153. London: Egypt Exploration Society.

Samuel, Delwen

- 2000 Brewing and baking. In *Ancient Egyptian materials and technology*, ed. Paul T. Nicholson and Ian Shaw, pp. 537–576. Cambridge: Cambridge University Press.

- Shaw, Ian, Elisabeth Bloxam, Tom Heldal, and Per Storemyr
2010 Quarrying and landscape at Gebel el-Asr in the Old and Middle Kingdoms. In *Recent discoveries and latest researches in Egyptology: Proceedings of the first Neapolitan Congress of Egyptology, Naples, June 18th – 20th 2008*, ed. Francesco Raffaele, Massimiliano Nuzzolo, and Ilaria Incordino, pp. 293–312. Wiesbaden: Harrassowitz.
- Stadelmann, Rainer
1981 La ville de pyramide à l’Ancien Empire. *Revue d’égyptologie* 31, pp. 67–77.
- Thomas, Susanna
2002 The wells of Tell Abqa’in. *Ancient Egypt* 2(6), pp. 22–27.
- Toonen, Willem H. J., Angus Graham, Benjamin T. Bennington, Morag A. Hunter, Kristian D. Strutt, Dominic S. Barker, Aurélia Masson-Berghoff, and Virginia L. Emery
2018 Holocene fluvial history of the Nile’s west bank at Thebes, Luxor, Egypt, and its relation with cultural dynamics and basin-wide hydroclimatic variability. *Geoarchaeology* 33(3), pp. 273–290. DOI: 10.1002/gea.21631.
- Valbelle, Dominique
1985 “*Les ouvriers de la Tombé*”: *Deir el-Médineh à l’époque ramesside*. Bibliothèque d’étude 96. Cairo: Institut français d’archéologie orientale.
- Varille, Alexandre
1934 La stèle de Sa-Mentou-Ouser (No. 6365 du Musée égyptien de Florence). In *Mélanges Maspero I: Orient ancien*. Mémoires de l’Institut français d’archéologie orientale 66(2), pp. 553–566. Cairo: Institut français d’archéologie orientale.
- Verly, Georges, Frederik W. Rademakers, Claire Somaglino, Pierre Tallet, Luc Delvaux, and Patrick Degryse
2021 The *Chaîne Opératoire* of Middle Kingdom smelting batteries and the problem of fuel: Excavation, experimental and analytical studies on ancient Egyptian metallurgy. *Journal of Archaeological Science: Reports* 37, no. 102708. DOI: 10.1016/j.jasrep.2020.102708.
- Vogelsang-Eastwood, Gillian
2000 Textiles. In *Ancient Egyptian materials and technology*, ed. Paul T. Nicholson and Ian Shaw, pp. 268–298. Cambridge: Cambridge University Press.
- von Pilgrim, Cornelius
1997 The town site on the island of Elephantine. *Egyptian Archaeology: The Bulletin of the Egypt Exploration Society* 10, pp. 16–18.
- Wendorf, Fred, and Romuald Schild
1980 *Prehistory of the Eastern Sahara*. New York and London: Academic Press.
2001 *Holocene settlement of the Egyptian Sahara, Volume 1: The archaeology of Nabta Playa*. New York: Kluwer Academic/Plenum Publishers.
- Wheeler, Noel F.
1932 Excavations of the Harvard-Boston Expedition in Halfa Province, 1930 – 1931. *Sudan Notes and Records* 15(2), pp. 251–259.
- Wilson, Penelope
2005 Two graves and a well at Sais. *Egyptian Archaeology* 26, pp. 34–35.
- Wuttman, Michel
2001 Les qanâts de ‘Ayn-Manâwîr. In *Irrigation et drainage dans l’Antiquité: Qanâts et canalisations souterraines en Iran, en Égypte et en Grèce*, Persika 2, dir. Pierre Briant, pp. 109–135. Paris: Thotm éditions.

Image Credits

- Figure 1. Location of the most important sites mentioned in the text. (Map created by Olivier Onézime and adapted by the author.)
- Figure 2. Fragment of a tomb painting representing the garden and pool in Nebamun’s estate. (Thebes, 18th Dynasty. BM EA 37983 © The Trustees of the British Museum; shared under a Creative Commons Attribution-Noncommercial-ShareAlike 4.0 International [CC BY-NC-SA 4.0] license.)
- Figure 3. Profile of a simple well uncovered at Nabta Playa, site E-75-9. (Drawing by the author, after Wendorf and Schild 2001: fig. 6.6.)

- Figure 4. Reconstruction of a walk-in well uncovered at Nabta Playa, site E-00-1. (Drawing by the author, after Kobusiewicz 2003: fig. 8.)
- Figure 5. Left: Two-stage well in the courtyard to the east of Ranefer's house at el-Amarna. (Photograph courtesy of the Egypt Exploration Society.) Right: Section of a two-stage well discovered at el-Amarna, in the courtyard of house O49.20. (Drawing by the author, after Borchardt 1912: fig. 5.)
- Figure 6. Section of the simple well with stone casing discovered at Qantir. (© artefacts-berlin.de.)
- Figure 7. Well in court E of the temple of Ramesses III at Medinet Habu. (Photograph by the author, looking south; plan redrawn and adapted by the author after Hölscher 1941: fig. 42.)
- Figure 8. Representation of a square two-stage well equipped with a *shaduf* from the tomb of Meryra at el-Amarna. (After Davies 1903: pl. XXXII.)
- Figure 9. Reconstruction of the estate of Ramose with its private well at el-Amarna. (Plan by AEGARON 2022: <https://doi.org/10.25346/S6/GOQGUP>, after Borchardt and Rieke 1980: pl. 23, and modified by the author.)
- Figure 10. Plan of an area within the Main City North at el-Amarna showing the location of community wells. (After Kemp and Garfi 1993: Sheet 6, modified and adapted by the author.)
- Figure 11. General map of the el-Amarna Workmen's Village and its surroundings. Inset: details of a *zir*-emplacement. (After Kemp 1984: figs. 1.3, 5.4, 5.10.)
- Figure 12. Ostrakon from Deir el-Medina dating to the reign of Ramesses II, bearing a hieratic inscription that documents the distribution of water rations to some workmen. (O. DeM 60; photograph © IFAO.)
- Figure 13. Plan of Deir el-Medina indicating key water-related features. (Plan by Olivier Onézime and adapted by the author.)
- Figure 14. Southwest quarter of the Semna fortress with staircase providing access to the Nile. (After Dunham and Janssen 1960: map IV.) Inset: View of the remains of the staircase looking west, photographed by Reisner's expedition in the late 1920s. (After Reisner 1929: pl. V.)