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# The Constructors of Hittite Hydraulic Structures and Their Labour Organization

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I would like to offer my *Doktorvater* and *Lehrer* a contribution stemming from my last research stay in Berlin, which was hosted by the project he co-directed—*Rethinking Oriental Despotism*—and which focuses on one of his preferred topics, administration, and on my favourite subject, water. I am very grateful for his advice and support during all the years since I became one of his students. I hope this contribution serves as an expression of my gratitude and esteem.

## 1. Introduction<sup>1</sup>

The design and construction of certain Hittite hydraulic structures, in particular dams, underground fountains, and all types of cisterns dug into the ground, requires a certain degree of specialised knowledge on hydraulic engineering and construction techniques. This is because the construction of these structures was not merely a matter of digging in the ground or piling stones. It also involved considering the pressure of the water, especially in the case of dams and underground fountains. Other aspects include seepage, i.e. ensuring that it never reached the critical point beyond which the respective structure would be damaged, as well as erosion caused by water and ice.

This specialised knowledge did not necessarily have to be derived from complex structural and fluid dynamics calculations, as is the case today. Most probably it was based on a combi-

<sup>1</sup> A brief and preliminary version of this paper was presented at the 12<sup>th</sup> ICH in 2023. I would like to

thank the colleagues who provide me with their comments and suggestions on that occasion.

nation of observation, knowledge gained from the construction of other types of structures (buildings, city walls, granaries...), and trial-and-error.<sup>2</sup> In any case, however, skilled workers (and designers) were needed to build them.

## 2. Hydraulic structures

### 2.1 Construction techniques: archaeology

A brief explanation of the most relevant construction techniques developed by the Hittites to design various solutions for harvesting and supplying water will better illustrate the complexity of these structures.<sup>3</sup> This will also help clarify why it was necessary to have specialised knowledge to build them<sup>4</sup>:

1) **Dams**<sup>5</sup>: Structurally, Hittite dams were gravity dams, i.e. their shape—trapezoidal in profile—acted against the pressure of the water.<sup>6</sup> Their mass was also important, but secondary.<sup>7</sup> Based on their construction materials they were embankment dams, that is, earth- and rockfill dams. This type of dam must be built on level ground to allow the structure to settle evenly and to prevent the formation of cracks, and, eventually, the collapse of the structure. Among the Hittites, almost all of these dams had a stone membrane to minimise seepage<sup>8</sup>. This membrane is documented either in both slopes, such as in Gölpınar and the North-western dam at Kuşaklı/Şarišša, or only in the water slope, as in the case of Karakuyu and the

<sup>2</sup> See, for example, JACKSON 1997: xv: “The technology of water control appears so simple, so basic, that it can easily fade from a society’s collective consciousness. (...) For thousands of years, human societies have used technology to alter river flow and store water (...) and the technology of water control has evolved in myriad ways.”

<sup>3</sup> For a broader view of all Hittite hydraulic structures and their construction techniques, see ARROYO 2015.

<sup>4</sup> See, for example, SEEHER 2006: 20: “Diese Abdichtung der Ostteiche war sicher (...) Ergebnis einer langen Erfahrung im Wasserbau”; HÜSER 2007: 65: “hethitischen „Dammspezialisten“”, ib., 110: “Bei dem Südwest-Damm wurde bereits auf die topographische und geologische Gunstsituation hingewiesen. Gleiches gilt auch für den Nordwesten-Damm”; SCHACHNER 2009: 18: “(...) stellen sie Staudämme und Talsperren komplexe Bauwerke dar, die ein erhebliches theoretisches und technisches Wissen voraussetzen”;

SCHACHNER/WITTENBERG 2012: 245: “(...) anhand der technischen Ausführung der Bauten ein hoher Stand an Ingenieurwissen deutlich wird”; ib. 249: “(...) sind die Wasserspeicher (...) Ausdruck einer hoch entwickelten Ingenieurskunst.”

<sup>5</sup> ARROYO 2015: 145–150, with references and figs.

<sup>6</sup> See BAGG 2010: esp. 121.

<sup>7</sup> JACKSON 1997: xxiv: “(Gravity dams) depend upon their shape -and not simply their mass- for stability in resisting hydrostatic pressure. In essence, the amount of material in a structural dam is not as important as developing a design that utilizes the strength (as opposed to the weight) of the material used to build the dam.”

<sup>8</sup> The Köylütölu dam might have had a stone membrane in its water slope, but its existence cannot be proved neither by the survey reports or by the photos, see EMRE 1993: 8–9, Pl. 19–21; HÜSER 2007: 142; HARMANŞAH ET AL. 2017: 311–312 and Fig. 14–5, with references.

South-western dam at Kuşaklı/Şarišša. The North-western dam at Kuşaklı/Şarrišša is the only Hittite exemplar which also had a clay core to minimise seepage.

2) **Cisterns**<sup>9</sup>: Hittite cisterns were always dug into the ground, either in the rock or in the soil. The latter normally had a layer of clay above the earth which is covered by a stone membrane. Their function was to minimise seepage, as in the case of dams, but also to prevent the walls from slipping, protect them against the erosion caused by water and ice, and prevent pollution of the water by filtration. Stone membrane and clay layer were not necessary in the case of cisterns excavated in rock because this material is impermeable, or at least more impermeable than soil. However, some of these cisterns, such as the one of Yenicekale at Boğazköy/Ḫattuša, had a layer of plaster on their walls.<sup>10</sup> This both improves the impermeability of the rock and help prevent the growth of algae.<sup>11</sup>

3) **Underground fountains**<sup>12</sup>: This very particular type of fountain had a stone wall that separates the basin from the aquifer. Water leaks from this wall only through one point, whereas the rest of the wall is impermeable. Behind this wall there may have been an earth and gravel filling to protect the aquifer from seepage and the wall from water pressure.<sup>13</sup> The basin of the underground fountain at Oymağaç/Nerik had what most probably is a drain, and a thick layer of clay (20 cm.) under the stone paving of the basin.<sup>14</sup> The entire construction of this type of structure was covered with a corbelled vault made with boulders, which also entails considerable knowledge in structural engineering.<sup>15</sup>

## 2.2 Construction techniques: textual sources

Some of the construction techniques documented by archaeology, as well as some of the constituents of a few water structures, can be compared with information from a small number of texts.

The most illustrative passage refers to stone membranes and is documented in the “Instructions of Arnuwanda I for the frontier post governors” (KUB 31.86+ (CTH 261.I.D) ii 17’–21’) [1]<sup>16</sup>:

<sup>9</sup> ARROYO 2015: 143–145, with references and figs.

<sup>10</sup> SCHACHNER/SEEHER 2016: 22.

<sup>11</sup> See SUCH/BERNHARDT 1993: 817: “Aus wartungstechnischen und hygienischen Gründen müssen die (...) Innenflächen glatt und porenfrei sein.” See also below 3.1 and n. 70.

<sup>12</sup> See ARROYO 2021, with references and figs.

<sup>13</sup> In the “Quellgrotte” at Boğazköy/Ḫattuša water came into the basin through a conduit running through this filling, see NEVE 1969/70: 98. Behind the wall of the underground fountain at Oymağaç/Nerik no excavations have been made, but CZICHON/MIELKE 2020: 159, indicate that there was a “kompakte[s] tonig-lehmige[s] Sediment.”

<sup>14</sup> CZICHON/MIELKE 2020: esp. 159, 169–177, Abb. 1, 11–15.

<sup>15</sup> The Hittites used corbelled vaults in structures designed to support heavy weights, such as posterns gates, underground stone channels and rooms (such as in Gavürkalesi), as well as between rooms 29 and 30a of Temple 6 in Boğazköy/Ḫattuša, see ARROYO 2014: 151, n. 633, with references.

<sup>16</sup> MILLER 2013: 222–223 sub §22. For the frontier post governors, *au(wa)riyaš išba-*, *BĒL MAD-GALTI*, see below 3.1 and n. 50.

<sup>(17)</sup>(...) *ku-it-ma-an URU-an ú-i-du-<sup>r</sup>ma-an-zi<sup>1</sup>* <sup>(18)</sup>*ze-en-na-i nu-kán HÉ-RI-TU<sub>4</sub> GAM-anda 6 gi-pé-eš-šar e-eš-<sup>r</sup>du<sup>1</sup>* <sup>(19)</sup>*še-er ar-ḫa-ya-at-kán 4 gi-pé-eš-šar e-eš-du<sup>20</sup>* <sup>(20)</sup>*ma-a-<sup>r</sup>an<sup>1</sup> <sup>r</sup>ú<sup>1</sup>-e-ti-na-an-za-ma ša-ra-a Ú-UL ar-nu-zi<sup>21</sup>* <sup>(21)</sup>*r<sup>1</sup>nu-u-wa<sup>2</sup> ša-ra-a IŠ-TU NA<sub>4</sub>* (erasure)<sup>17</sup> *tal-ḫa-an-du*

<sup>(17-18)</sup>(...) By the time he finishes building the town, the moat shall be 6 ell deep, <sup>(19)</sup>and out above it shall be 4 ell. <sup>(20)</sup>But if the water does not rise over, <sup>(21)</sup>they shall still pave (it) over with stone.<sup>18</sup>

The moat, like any other open structure dug into the ground, was filled with water or snow from precipitation for much of the year. Therefore, its walls had to be covered with a stone membrane for exactly the same reasons that apply to the water slopes of earth- and rockfill dams and the walls of cisterns dug into the ground (see above 2.1). Moreover, in this particular case, it was also necessary to prevent seepage and, therefore, capillarity in the city walls.<sup>19</sup> This preceptive passage from the “Instructions to the frontier post governors” reflects this specialized knowledge and commands that it be put into practice.

Fountains are, however, the water structures whose configuration is most attested in texts, although these references do not allude to underground examples.

A. Ünal drew attention to a passage of a mythological text (KBo 23.27 (CTH 776.1) obv. i 18’–19’) in which *anda wahnu-*, “to encircle, to surround, to enclose,”<sup>20</sup> is documented in connection with the terms “spring” (Sum. PÚ)<sup>21</sup> and “stone” (Sum. NA<sub>4</sub>) [2]:<sup>22</sup>

<sup>17</sup> There are traces of two signs that have been erased by the scribe between NA<sub>4</sub>, which was written above this erasure, and the first sign of *talḫandu*, see MILLER 2013: 222 sub §22, and n. 362, with references (esp. KOŠAK 1993: 110). See also the photo of the tablet <hethiter.net/: fotarch BoFN06562>.

<sup>18</sup> In l: 18’, translation of Akk. *beritu* follows CAD, H, 198–199, s.v.: *ḫiritu* A: “ditch, canal; moat”; TRÉMOUILLE 2002: esp. 146–148; and HW<sup>2</sup>, K, 376, s.v.: *gipeššar*, contra MILLER 2013: 223 sub §22: “*beritu*-trench.” See also MARIZZA 2007: 104, 106; HOFFNER 2009: 343 (KBo 18.54 (CTH 188) rev. 26’). Translation of l: 20’ matches our knowledge of Hittite water engineering, especially with regard to earth- and rockfill dams, which must be higher than the water level, see TRÉMOUILLE 2002: 148; ARROYO 2015: 148. For *talḫai-* with the meaning “to pave, to cover with stones,” see KOŠAK 1993: 110; HHW, 161, s.v.: *talḫi-*: “Denom. *talḫai-* ‘(mit Steinen) auslegen, bedecken, pflastern, auskleiden’; MHW, 672,

s.v.: *talḫai-*: “(verb) pave, cover, line, case?”; it is, however, not included either in HW<sup>1</sup> nor in HEG.

<sup>19</sup> In KUB 31.100+ (CTH 257.4.A) i<sup>3</sup> 16’–17’, the “Instructions of Arnuwanda I for the mayor (*ḪAZANNU*)”, it is said that the defense wall of the Aleppo House must be covered with stones (*tal-ḫa-u-wa<sup>1</sup>-[an<sup>1</sup>]-zi<sup>1</sup>*), see KOŠAK 1993: 108, 110; MILLER 2013: 190–191 sub §5’, who in this passage translates *talḫai-* as “plaster”. The same verb and the noun related to it are also attested in the previous paragraph of the same text (KUB 31.100+ (CTH 257.4.A) i<sup>3</sup> 13’–15’), but the tablet is so damaged that nothing can be understood, see MILLER LOC. CIT.

<sup>20</sup> HW<sup>1</sup>, 240, s.v.: “(...) (Lager) ringsum befestigen (...) *anda w.*, einwickeln; – einschließen, umschließen”; HEG, W–Z, 192, s.v.: *wahnu-*.

<sup>21</sup> For the translation of PÚ either as “spring” or “fountain” according to the context, see ARROYO 2019: 219; id. forthcoming.

<sup>22</sup> See ÜNAL 1998: 87–88, 94, and n. 30; TRÉMOUILLE 1999: 207.

<sup>(18)</sup>[ ]x *a-pa-a-at* PÚ *an-da wa-ab-nu-wa-an-zi* (...) <sup>(19)</sup>[ ]-*an* ŠA NA<sub>4</sub> *an-da wa-ab-nu-wa-an-zi* (...)

“(18) [ ]x this spring is enclosed (...) <sup>(19)</sup>[ ]x of stone (it) is enclosed (...)”

As A. Ünal indicated, this passage almost certainly refers to a spring transformed into a fountain by “enclosing” it with stones.<sup>23</sup> The fountains of Yalburt and Eflatun Pınar confirm this type of transformation, as their respective springs have been “enclosed” with ashlar and transformed into fountains,<sup>24</sup> i.e. a basin has been constructed surrounding the spring. In contrast to the preceding text, this passage is a brief textual correlate of these two Hittite fountains. It is not, however, evidence that part of the knowledge used to construct fountains was written down, either as a prescription on how to build them or as a conscious action intended to record this knowledge. Another passage of this same text might also refer to the conversion of a spring into a fountain, although this time in the opposite sense, i.e. indicating that it should be left intact (KBo 23.27 (CTH 776.1) obv. ii 16’–17’) [3]<sup>25</sup>:

<sup>(16)</sup>(...) *nu wa-a-tar ha-a-ni an-da-ma-at* (erasure) <sup>(17)</sup>Ú-UL *wa-ab-nu-wa-an-zi*<sup>3</sup>

“(16–17)(...) and (he) scoops water, but they do not encircle it”

A. Ünal understood the enclitic anaphoric pronoun *-at* in l: 16 as referring to “the headwater of Šapandaliya river.”<sup>26</sup> The river of this city is indeed mentioned in l: 15, but not its “headwater” (*haršummar*),<sup>27</sup> which in the whole text is clearly documented only in rev. iii 9, 17.<sup>28</sup> However, given that the paragraph begins with the indication that water must be brought from the river of the city of Šapandaliya (KBo 23.27 (CTH 776.1) obv. ii 12’–13’), Ünal’s suggestion is convincing. If this is indeed the case, then this passage refers to the source of a river which must be left intact.

A fragmentary passage from the “Instructions of Arnuwanda I for the mayor (*HAZANNU*)” also refers to one of the main constituents of Hittite fountains (KUB 31.100 (CTH 257.4.A) rev. iv<sup>2</sup> 4’) [4].<sup>29</sup>

<sup>23</sup> ÜNAL 1998: 83, 87–88, and n. 30.

<sup>24</sup> For Yalburt, see ARROYO 2014: 73–76, with references; for Eflatun Pınar, see ib.: 65–73; BACHMANN 2017; both with references. For a clear definition of both “fountain” and “spring” and the differences between them, see ARROYO 2019: 218; id. forthcoming.

<sup>25</sup> ÜNAL 1998: 89, 95; TRÉMOUILLE 1999: 196, 208.

<sup>26</sup> ÜNAL 1998: 95.

<sup>27</sup> For *haršummar*, see ARROYO 2019: 218, with references.

<sup>28</sup> ÜNAL 1998: 91; TRÉMOUILLE 1999: 209. According to Ünal (op. cit.: 87), the word could be tentatively reconstructed in obv. i 11’ and rev. iii 10’, but see TRÉMOUILLE op. cit.: 207, 209.

<sup>29</sup> MILLER 2013: 192–193. See also KOŠAK 1993: 109, 111. For the translation of PÚ<sup>HLA</sup> as “fountains,” see ARROYO 2019: 219.

(4)[...] *na-aš* <sup>r</sup>PÚ<sup>Hn.A</sup>-*aš* *ku-ut-ta-aš* EGIR-*an ša-ra-a* x[...]

“(4)[...] and up behind the walls of the fountains [...]”

The only two things that can be deduced from this passage are that fountains had walls, which is again proven by archaeology, and that the mayor was responsible for these structures in the area under his jurisdiction. The instructions addressed to the frontier post governors command these officials to take care of fountains and/or springs.<sup>30</sup>

Once more, the passage is a reflection of the reality and not a record of the knowledge needed to construct these structures.

Finally, part of the text known as “Benedictions for Labarna” also reflects some of the components of Hittite fountains (KBo 21.22 (CTH 820.4) rev. 36’–39’)<sup>31</sup> [5]:

(36)<sup>[D]</sup><sup>r</sup>UTU<sup>1</sup>-*wa-aš wa-at-ta-ru ú-it na-at ma-a-aḫ-<sup>r</sup>ḫa<sup>1</sup>-[an i-ya-an] (37)*kat-ta<sup>1</sup> ša-ra-at-kán* NA<sub>4</sub>-*ta <sup>r</sup>ú<sup>1</sup>-e-da-an iš-ki-y[a-an ] <sup>r</sup>lu-li<sup>1</sup>-[it<sup>2</sup>] (38)*na-at pár-ša-né-eš pa-a-aḫ-ša-an-ta wa-at-tar-še-da<sup>1</sup>-kán* x[ ] (39)*[lu]-<sup>r</sup>ú<sup>1</sup>-li-az ar-aš-zi (...)***

“(36)The fountain of the Sun Goddess came (lit.), ‘How (is) it [made?’] (37)From bottom to top it (is) constructed with stone, coat[ed ], [with?] a ba[sin<sup>2</sup>], (38)it (is) protected by leopards, its water x[ ] (39)flows from the [ba]sin.”

The parallelisms between this text and Eflatun Pınar (stone as construction material, sculptures of felines and high-reliefs of several Sun goddesses) suggest that the text could have served as a model for the construction of the fountain.<sup>32</sup>

As far as I know, there is no other text that can shed light on the knowledge required to construct hydraulic structures, that describes them or that shows a sketch of them.<sup>33</sup> Still, both in the case of stone membranes and their function, as well as in that of springs transformed into fountains using stone (blocks), it has been possible to correlate some archaeological data with textual evidence.

Nonetheless, many questions remain unanswered regarding the construction process of these structures. It is unclear who had the specialised knowledge required to design and construct complex hydraulic structures, who were the skilled workers involved in building

<sup>30</sup> The *au(wa)riyaš išḫa-* (*BĒL MADGALT*). This prescription is documented in KUB 13.1++ (CTH 261.I.A) rev. iii 13’–17’ and includes both the cult provisions and “inspection” of fountains and/or springs, see MILLER 2013: 228–229 sub §35’. For the duties of both officials, mayor and frontier post governor, regarding hydraulic structures, see below 2.

<sup>31</sup> KELLERMAN 1978: 200–202; ARCHI 1979: 46–47; WATKINS 1995: 137–138; CHD, L–N: 81, s.v.: *luli-*, *luliyā-*, 2; ARROYO 2022b: 26. See also STEITLER 2017: 135, Table 4.12.

<sup>32</sup> ARROYO 2022b: 26.

<sup>33</sup> For sketches and drawings in Hittite tablets, see ÜNAL 1989.

these structures<sup>34</sup> and how the labour force was organised.<sup>35</sup> As A. Bagg has pointed out for Assyrian hydraulic structures,<sup>36</sup> there must have been a group of engineers who designed and supervised the construction works, who had to have the right knowledge to cope with problems related to hydraulic and structural issues, and who had to rely on skilled workers. As has been shown (see above 2.1), the construction of some parts of dams, of cisterns dug into the ground and of underground fountains needed professionals, especially those entrusted with the construction of stone membranes and the rear wall of underground fountains.<sup>37</sup> Similarly, other water structures, such as fountains, also show the need for skilled workers in their construction.<sup>38</sup> This is no different from the construction of buildings, which also needed specialised workers such as the <sup>LU</sup>NAGAR, carpenter, responsible for placing the beams on the roof of a house;<sup>39</sup> or from the fact that every craft requires skilled workers<sup>40</sup>. And when these workers had to work together, someone had to be responsible for their organization.

Unfortunately, to my knowledge, only indirect information is available on these questions.<sup>41</sup>

### 3. Labour organization and hydraulic structures

Ḫatti was politically organized as a centralised state ruled by the king, some of whose competences were exercised by delegation by several types of institutions and civil, religious and

<sup>34</sup> ÜNAL 1988B: 1471, posed the same question regarding the construction of houses.

<sup>35</sup> See also HOUWINK TEN CATE 1984: 56: “important civilian enterprises which required large numbers of labour forces,” with references; SCHACHNER 2009: 18–19; SCHACHNER/WITTENBERG 2012: 249.

<sup>36</sup> BAGG 2000: esp. 280–281; id. 2004. For the Neo-Assyrian hydraulic projects there is one fragmentary text that indicates how a water tunnel was constructed and the tools that were used to do it, see BAGG 2004: 358. A text dated in the 40<sup>th</sup> year of Nebuchadnezzar (CT 55, 232) deals with “the issue of iron spades (*marru*) and *hālilu* tools for work on a dam (*mušannītu*) at the Canal of Abundance,” see SADOWICZ/ZAWADZKI 2023: 175.

<sup>37</sup> See above 2.1 and n. 4.

<sup>38</sup> See BACHMANN 2006: 252, 262–263.

<sup>39</sup> Perfectly described in KUB 55.28+ (CTH 470.95) rev. iii 1–21, see ÜNAL 1988: esp. 99–101; id.

1988B: 1476–1479; both with references to other texts. For <sup>LU</sup>NAGAR, see HHW, 247, s.v.; HZL sub Nr. 308; RÜSTER/NEU 1991: 10 (Baumeister), 34 (Holzarbeiter), 75 (Tischler), 86 (Zimmermann, Baumeister); PECCHIOLI DADDI 1982: 49, s.v.; KLENGEL 1996: 268, 273 and n. 48; WEEDEN 2011: 587. Carpenters are also mentioned in administrative texts and receive goods from the palace, see BURGİN 2022b: 256–257 (KBo 23.26+ (CTH 245.I) ii 10’), 274–275 (KUB 40.96+ (CTH 245.I) rev. iii’ 14’.

<sup>40</sup> See IMPARATI 1999: 351; KLINGER 2022: 611. For the different terms related to skilled workers and their related crafts, see PECCHIOLI DADDI 1982: 29–87; KLENGEL 1996; DOĞAN-ALPARSLAN ET AL. 2020. See also BILGIN 2018: 391–391; BURGİN 2022: 80–81, 97, 134, 382 (sub EN ŠU-TI).

<sup>41</sup> See VIGO 2018: esp. 271–272, 279, 305; id. 2023: 98, for the complexity of an inquiry into Hittite workers.

military officials.<sup>42</sup> Texts show that some of these officials managed labour force and were entrusted with construction projects (see also above 2.2 text [1]).<sup>43</sup>

### 3.1 Officials

The only term in the Hittite textual corpus that refers without any doubt to an official who might have had a specialised knowledge concerning hydraulic structures and/or the management of their workforce is LÚ PA<sub>5</sub>, Akk. *gugallu(m)*, “canal inspector.”<sup>44</sup> The term might have indicated a type of official involved in the maintenance of canals and the distribution of their water, as in Mesopotamia. However, in the Hittite textual corpus, LÚ PA<sub>5</sub> is only attested in the Hedammu Myth as an epithet of the Storm-god.<sup>45</sup> For its part, Akk. *gugallu(m)* is only documented in the Akkadian version of the “Treaty of Šattiwaza of Mitanni with Šuppiluliuma I” (CTH 52.I) among the Mitannian gods, again as the epithet of the Storm-god.<sup>46</sup> Therefore, although there were “canals” (Sum. PA<sub>5</sub>, Hit. *amiyara-*)<sup>47</sup> in Ḫatti, there is no evidence that there were “canal inspectors,” i.e. there is no evidence for a specific official whose main function was to manage canals. This is because these canals were not like their Mesopotamian counterparts,<sup>48</sup> but rather irrigation ditches whose maintenance was part of the usual agricultural work on a plot of land.<sup>49</sup>

<sup>42</sup> See VAN DEN HOUT 2004: 228; BILGIN 2018: esp. 2–3, 9–12, 422–423, 441–442, 445–446, 454; KLINGER 2022: 625–630; BURGIN 2022: 97–99; VIGO 2023: 97–98. See also a summary of the various theories concerning the Hittite state in BURGIN OP. CIT.: 7–104. The letter HKM 55 rev. 32–33 from Kaššu to Ḫimuili clearly states that “(e)ven the country belongs to our Lord,” see ALP 1991: 224–225; HOFFNER 2009: 201; MARIZZA 2009: 67. For Ḫimuili see below 3.2. n. 130.

<sup>43</sup> See also n. 19.

<sup>44</sup> WEEDEN 2011: 560, with references. For the Akkadian term see CAD, G, 121, s.v.: *gugallu* A, 1: “inspector of canals.”

<sup>45</sup> KUB 33.103 (CTH 348.I.1.D) obv. ii 14, see E. RIEKEN ET AL. 2009 sub D, § 7”. See also PECCHIOLI DADDI 1982: 567, s.v.; WEEDEN 2011: 560.

<sup>46</sup> KBo 1.3 (CTH 52.I) rev. 40’, see CHRISTIANSEN 2012: 217, 220. For the treaty, see BECKMAN 1999: 48–54, DEVECCHI 2015: 254–262. The god and his epithet are not listed in CTH 51.I, see BECKMAN OP. CIT.: 42–48, DEVECCHI OP. CIT.: 251; CHRISTIANSEN 2012: 207–213. The Hittite versions of both documents are very fragmented

and do not preserve the list of gods. The Storm-god and other deities with this same epithet are documented in other Mesopotamian texts, see CAD, G, 121, s.v.: *gugallu* A.

<sup>47</sup> HW<sup>2</sup>, 67, s.v.: *amiyara-*; HED, A, 48, s.v.: *amiyara-*. See also KLENGEL 2006: 5. The Law §162/a/\*47 documents only the Sum. PA<sub>5</sub>, see HOFFNER 1997: 128–129, but the Law §109/\*9 documents both terms in two of its versions, see HOFFNER OP. CIT: 106. See also below texts [9, 11].

<sup>48</sup> See also KLENGEL 2006: 8; KLINGER 2022: 610.

<sup>49</sup> In any case, the importance of irrigation in Ḫatti is attested in a variety of texts. In the “Instructions for the frontier post governors” (KUB 13.2+ (CTH 261.I.B) rev. iii 54’–55’) these officials are responsible for irrigating fields and pastures, see MILLER 2013: 230–231 sub §44’, and below text [9]. The mayor must also irrigate the orchards, see below and n. 69. These plots of land belonged to the palace and were not exploited by private individuals, see below 3.2 and text [10]. The “Telipinu Edict” (KBo 7.15 (CTH 19.II.G) rev. iii 12’) contains similar provisions, see HOFFMAN 1984: 38–39 sub §35; GILAN 2015: 155 sub §35. In the first version of the “Myth of the disappearance and re-

Importantly, at least two Hittite officials had been appointed by the king as responsible for different building projects, the maintenance of hydraulic structures and the management of the workforce: the frontier post governor (*au(wa)riyaš išḫa-*, *BĒL MADGALTI*)<sup>50</sup> and the mayor (<sup>U</sup>*HAZANNU*)<sup>51</sup>. They both belonged to the state administrative structure and their competences were established by the central power and regulated in the instructions addressed to them, as well as in other instructions, such as those issued by Tudḫaliya I for the military (KUB 13.20 (CTH 259.B) i 7–9)<sup>52</sup> [6]:

(7)(...) *ma-a-an* 'KIN-*ma*' *ku-it-[(ki)]* (8)*na-aš-ma ú-[e-tum-m]ar na-aš-ma ku-iš im-ma KIN-az nu-uš-ša-an an-da ar-du-ma-at na-an ša-a-ku-<sup>r</sup>wa-aš-š<sup>r</sup>[(a-ri-i)]t* (9)<sup>r</sup>*ZI-it<sup>r</sup> an-<sup>r</sup>ni-iš-ke-et<sup>r</sup>-tén na-at ŠA EGIR<sup>r</sup>.UD-MI pa-ab-ḫa-aš-ša-nu-wa-an KIN e-eš[-d(u)]*

“(7)(...) When there is some task, though, (8–9) either cons[truc]tion duty or any task whatsoever, you must show up for it, and you must perform it wholehe[(art)]edly, as it should be a (lit.) protected work of the future.”

Despite the designation of the text, in my opinion this particular prescription is addressed to the frontier post governors. In a previous paragraph (KUB 13.21+ (CTH 259.C) i 8<sup>r</sup>–9<sup>r</sup>),<sup>53</sup> they are said to be responsible for the army, and in the lines preceding the quoted passage (KUB 13.10 (CTH 259.B) 1–2),<sup>54</sup> they are held answerable for officials reluctant to go into battle.<sup>55</sup>

In the paragraph quoted above, the works that the king's officials had to supervise must be enduring, i.e. they had to be so well built that they would withstand the passage of time.<sup>56</sup>

turn of the Sun-god” (VBoT 58 (CTH 323.1.A) i 29–30) it is said that the god Telipinu “diverts the water” (*wātar nāi*) in the fields, see E. RIEKEN ET AL. (ED.) 2009b sub §6'. There is also the verb “to irrigate,” *ši(e)šš(i)uriya-*, see CHD, Š, 457, s.v.: *šiššuriya-*, *šiššuriya-*, *šieššuriya-*; HED, SE, SI, SU, 89, s.v.: *sissiur-*, *siessur-*, *sis(s)ur-*, *ses(s)ur-*.

<sup>50</sup> HW<sup>2</sup>, A, 631–632, s.v. See also WEEDEN 2011: 215–218, 450; MILLER 2013: 212–213; BILGIN 2018: 9, 84, 88–92, with references; VIGO 2018: 274–276. See also above 2.2 text [1], and below texts [7–9].

<sup>51</sup> WEEDEN 2011: 215, 217–218, 508; MILLER 2013: 183; BILGIN 2018: 371; all of them with references. See also above 2.2 text [4], and below.

<sup>52</sup> MILLER 2013: 148–149 sub §8”, and n. 71. See also HED, PA, 14, s.v.: *paḫ(ha)š-*. The quoted paragraph is repeated almost identically several lines

below, in KUB 13.20 i 20–21.

<sup>53</sup> MILLER 2013: 146–147 sub §4”.

<sup>54</sup> MILLER 2013: 146–149 sub §7”.

<sup>55</sup> See also MILLER 2013: 129, with regard to the “Instructions of Arnuwanda I for the frontier post governors (*BĒL MADGALTI*): “(...) the exclusive authority of the Great King to decide what army divisions are to be released and which are to be retained for work duties and to the authority of whoever is designated by the king as commander in his absence.”

<sup>56</sup> A similar expression can be found in the “Instructions of Arnuwanda I for the mayor (*HAZANNU*)” (KUB 31.100 (CTH 257.4.A) i 10<sup>r</sup>): EGIR. UD-MI *wetummar*, see MILLER 2013: 190–191 sub §3'. See also KOŠAK 1993: 108–110; ÜNAL 1988: 97; id. 1988B: 3.

These works, which were commissioned by the king and are intended to endure, can be connected to two other expressions, “works of the king” (LUGAL-(u)waš KIN<sup>HI.A</sup>-aš)<sup>57</sup> and “palace works” (È.GAL-LIM KIN<sup>HI.A</sup>).<sup>58</sup> Both were used to refer to building projects and are documented in the “Instructions of Arnuwanda I for the mayor (HAZANNU)”. The former, “works of the king,” include the work of carpenters (who laid the beams)<sup>59</sup> and maybe also potters and horse trainers.<sup>60</sup> The latter, “palace works,” appears in the same paragraph as the former, but it is not linked to any type of worker. Both expressions are related to provisions which forbid the mayor from appropriating workers for his own benefit or for that of a private individual. The context of their attestation, although fragmentary, indicates that these expressions are synonyms. They equate the monarchy with the institution of the palace, indicate which duties were the final prerogative of the king, and also separate state institutions, their workers and the buildings that housed them from private individuals.<sup>61</sup> In sum, all these expressions reflect the presence of the central authority in local administration and establish a chain of command.

Concerning hydraulic structures, the frontier post governor had to ensure that the various elements of the city’s water drainage system were not clogged, so that capillarity and seepage could not damage buildings. They must also be sure that the irrigation system and the “bird’s ponds” were in good condition:

<sup>57</sup> Attested in KUB 31.112+ (CTH 257.3.A) r. col. 14’, 23’ and DAAM 3.150 (CTH 257.3.C) ii’ 4; for all of them, see MILLER 2013: 188–191 sub §§4’–5’, who translates the expression also as “king’s projects” and “work projects of the king.”

<sup>58</sup> KUB 31.112+ (CTH 257.3.A) r. col. 24’, see MILLER 2013: 188–189 sub §5’. The “Instructions of Arnuwanda I for the frontier post governors (BĒL MADGALTI)” refer to “palaces” under the supervision of these officials (KUB 13.2+ (CTH 261.I.B) rev. iv 9’–10’), see MILLER OP. CIT.: 232–233 sub §53’. For “palaces” in Ḫatti, see IMPARATI 1999: 343; SIEGELOVÁ 2001; IMPARATI 2002: esp. 94–97; VAN DEN HOUT 2004: esp. 228.

<sup>59</sup> KUB 31.112+ (CTH 257.3.A) r. col. 23’, see MILLER 2013: 188–189 sub §5’. For this function of carpenters, see above and n. 39.

<sup>60</sup> DAAM 3.150 ii’ 1–2, see MILLER 2013: 190–191 sub §1’. Hittite pottery is so standardised that its production must have been controlled by the state, and horses were a very important part of the army.

<sup>61</sup> As in the case of the royal granary (LUGAL ÉSAG) which, according to the “Instructions of a Tutḫaliya for stabilization of legal administration” (KUB 13.9+ (CTH 258.1.A) rev. iii 3’–11’), could only be opened by the appointed officials, and the “men of the city” (LÚ<sup>MES</sup> URU-LIM) were answerable for this, see MILLER 2013: 138–139 sub §10’. See also IMPARATI 2002: 99 and n. 35. A similar provision for protecting the grain supply is documented in the “Edict of Telipinu” (KBo 3.1+ (CTH 19.II.A) rev. iii 50’–53’), see HOFFMAN 1984: 46–47 sub §40; Gilan 2015: 155 sub §40. This text lists several cities with storehouses (É<sup>NA</sup>-KIŠIB, lit. “seal house”; KBo 3.1+ (CTH 19.II.A) rev. iii 18’–43’), see HOFFMAN OP. CIT.: 41–45 sub §§37–38; GILAN OP. CIT.: 154 sub §§37–38. See also KLINGER 2022: 627. The responsibilities of the frontier post governors also included protecting food supplies. See also the letter KBo 71.127 addressed to the EN É ABUSI concerning an issue with grain, see BURGİN 2023: 61–62.

KUB 31.86+ (CTH 261.1.D) ii 39'–41'<sup>62</sup> [7]

<sup>(39)</sup>(...) *nam-ma-kán* U[(RU-ri ar-ta-ah<sub>3</sub>-hi-uš)] <sup>(40)</sup>[(le)]-e ša-a-hi-iš-ke<sub>9</sub>-ta-ri na-aš-kán  
MU.KAM-ti MU.KA[(M-ti)] <sup>(41)</sup>[UGU (š)]a-an-hi-iš-kán-du

“(39)Further, the [(waste pipes in the tow)]n <sup>(40–41)</sup>must not become clogged. They must be cleaned [(up)] year for year.”

KUB 13.2 ii (CTH 261.1.B) 21'–25'<sup>63</sup> [8]

<sup>(21)</sup>ŠA É.DU<sub>10</sub>.ÚS.SA-ya ŠA É<sup>LÚ</sup>SAGI É<sup>É</sup>hi-lam-na-aš-ša <sup>(22)</sup>a-ar-ta-hi-uš ú-e-ha-an-da-ru na-  
aš<sup>É</sup> uš<sup>É</sup>-kán-du ku-i-ša-kán <sup>(23)</sup>ú-e-te-na-za ša-ha-ri na-an-kán ša-ra-a ša-an-ha-an-du <sup>(24)</sup>ma-  
ni-ya-hi-ya-ya-ták-kán ku-i-e-eš MUŠEN<sup>HIA</sup>-aš lu-ú-li-ya-aš an-da <sup>(25)</sup>na-at SIG<sub>5</sub>-an-te-eš  
a-ša-an-du

“(21–22)The waste pipes of the washroom, of the house of the cupbearer, and the gate-house must be walked along and inspected regularly. That which <sup>(23)</sup>is clogged due to the water they shall clean up. <sup>(24)</sup>Also the birds’ ponds in your district <sup>(25)</sup>shall be well.”

KUB 13.2 ii (CTH 261.1.B) 58'–59'<sup>64</sup> [9]

<sup>(58)</sup>(...) *nam-ma-kán hu-up-pí-da-nu-e-eš* PA<sub>5</sub><sup>HIA</sup>-ša ša-ra-a <sup>(59)</sup>ša-an-h[a-an-t]e-eš a-ša-an-du  
(...)

“(59)(...) Further, the *conduits* and the irrigation ditches shall be cle[an]ed up”

<sup>62</sup> MILLER 2013: 224–225 sub §26'. For <sup>(GIS)</sup>*artabhi-*, see HEG, 69, s.v.: “Kloake, Abwasserkanal”; HED, A, 176, s.v.: “sewer”, contra HW<sup>2</sup>, A, 348, s.v.: “Wasserrohr”; but see the critics of HOFFNER 1983: 415–416. In my opinion, the attestations indicate that they channelled wastewater or rainwater, but they were not sewers *sensu stricto*, see ÚNAL 1993: 125, and n. 26, with references.

<sup>63</sup> MILLER 2013: 226–227 sub §30'. The translation of *weh-* as “to walk along” (“patrol” in CHD, Š, 169, s.v.: *šanh-*), makes good sense, despite the remarks of MILLER OP. CIT.: 381–382, n. 402.

<sup>64</sup> MILLER 2013: 230–231 sub §45'. The term

<sup>(GIS)</sup>*hu(p)pidanu-* refers to a type of water conduction, which sometimes is attested together with PA<sub>5</sub> (see BEAL 1992: 43, n. 172 and below 3.2 text [11]). For PA<sub>5</sub>, see above n. 47). The clearly agricultural context of this prescription suggests translating it as “irrigation channel,” but the determinative used in other contexts seems to preclude this solution. A general term “conduit” has been preferred here. See HW<sup>2</sup>, H, 743, s.v.: “Röhre(?)”; HEG, A–H, 296, s.v.: <sup>(GIS)</sup>*hupitanu-*: “(eine Pflanze?)”. For the responsibility of the frontier post governors regarding irrigation, see above n. 49.

These prescriptions align with those intended to maintain other buildings in good condition, such as plastering walls<sup>65</sup> and preventing roofs from leaking,<sup>66</sup> as well as with those that prescribe how to construct certain structures.<sup>67</sup>

According to the Instructions addressed to him, the mayor was also responsible for building projects,<sup>68</sup> watering orchards<sup>69</sup> and for keeping a pond free of what seems to have been algae,<sup>70</sup> recalling the above quoted passage from the “Instruction to the frontier post governors” concerning birds’ ponds [8].

These two officials also had to manage the labour contingents that were active in their respective jurisdictions (see above). These, and other types of what might have been specialised workers, as well as their respective tasks are discussed in the following section.

### 3.2 (Skilled) Workers and their supervisors

A term that can be associated with the construction of hydraulic structures is <sup>LU</sup>NAGAR.NA<sub>4</sub>, “stonemason.”<sup>71</sup> However, this type of worker is attested only in two texts that deal with the cult<sup>72</sup> as part of the personnel ascribed to a temple, and their exact tasks are not mentioned. There is no attestation of a supervisor, so they might have been independent workers. In any case, as skilled workers, they could have been involved in any project that required the use of stone. They might have been involved in building hydraulic structures, or part thereof, since most such structures are made with this material, but we lack direct information.<sup>73</sup>

Another term that might be connected with the building of hydraulic structures is what F. Pecchioli Daddi considered to have been the Akkadian term for “mason, construction worker” (“muratore”), <sup>LU</sup>etenu,<sup>74</sup> which is attested in two Hittite texts. Note, however, a confusion has been revealed for Akk. *ēdēnu*, *ēdānu*, “only, solitary, single.” The Akkadian word F. Pecchioli Daddi most probably referred to was *itinnu(m)*, *etennum*.<sup>75</sup>

<sup>65</sup> Bo 6558 ii 17’ (+) KUB 31.89(+) ii 2’, see MILLER 2013: 222–223 sub §23; KUB 31.86+ ii 25’, see MILLER OP. CIT.: 222–223 sub §24; KUB 13.2+ ii 13’–18’, see MILLER OP. CIT.: 224–227 sub §§28’–29’

<sup>66</sup> KUB 31.86+ ii 27’, see MILLER 2013: 222–223 sub §24’, and n. 366, 376; KUB 13.2+ ii 37’–38’, see MILLER OP. CIT.: 226–227 sub §33’. This prescription also includes providing buildings with rain gutters (<sup>GIS/URUDU</sup>)*heyawallali*-; see HW<sup>2</sup>, HJ, 555, s.v.; HED, H, 303, s.v.: *be(w)u-*, *be(y)aw-*, such as in KUB 13.2+ ii 1–2, see MILLER OP. CIT.: 222–223 sub §21.

<sup>67</sup> See above 2.2. text [1].

<sup>68</sup> See above and 1.1, n. 19.

<sup>69</sup> KUB 31.100 iv<sup>2</sup> 16’–17’, see MILLER 2013: 192–193 sub §12”.

<sup>70</sup> KBo 13.58 iii 18’–25’, see MILLER 2013: 186–187 sub §11”.

<sup>71</sup> PECCHIOLI DADDI 1982: 49, s.v.; HHW, 247, s.v.; RÜSTER/NEU 1991: 69 (Steinmetz).

<sup>72</sup> “Cult of Teššub and Ḫebat of Aleppo” (KBo 14.142 (CTH 698.IA) iv 22), and “Cult inventory with image descriptions” (KUB 38.12 (CTH 527.53.A) ii 21), see PECCHIOLI DADDI 1982: 49, s.v.: <sup>LU</sup>NAGAR.NA<sub>4</sub>. For KUB 38.12 ii 21, see CAMMAROSANO 2018: 422–423. KBo 14.142 iv 22 preserves only this term and three other signs. These workers are not attested in administrative texts.

<sup>73</sup> But see below 3.2 and n. 138.

<sup>74</sup> PECCHIOLI DADDI 1982: 57, s.v.

<sup>75</sup> ARROYO 2022.

A loose term that could indicate a workforce connected with the construction of hydraulic structures is  $LÚ^{MES}$  KIN, “worker(s).”<sup>76</sup> They are only mentioned in the “Instructions for the frontier post governors”<sup>77</sup> and in a list of men and soldiers.<sup>78</sup> The list is very fragmentary and does not preserve—if they were ever mentioned—the tasks of the two  $LÚ^{MES}$  KIN who appear in it. For their part, the instructions indicate that the  $LÚ^{MES}$  KIN were under the orders of the frontier post governors and that they were part of the “infrastructure” of border towns, along with cattle, sheep, horses and donkeys.<sup>79</sup> However, the text does not specify the exact functions of these men. The fact that they are mentioned along with domestic animals and that they are all said to leave the town at dawn and return at dusk, seems to indicate that the  $LÚ^{MES}$  KIN worked in the fields outside the city. This hypothesis is supported by another version of these instructions, which indicates that cattle, sheep, horses, donkeys and the  $LÚ^{MES}$  ŠE.KIN.KU<sub>5</sub>, “field workers,” must return to the city if the enemy is sighted.<sup>80</sup> Moreover, KIN is used for any kind of work, be it agricultural or construction work. In sum, all the evidence suggests that they were agricultural workers.

A similar term to  $LÚ^{MES}$  KIN is  $ÉRIN^{MES}$  KIN, which is attested in the “Deeds of Šuppiluliuma I,” in two instructions and in one letter (see below and text [10]). F. Pecchioli Daddi and S. Rosi equate the two terms, but while the former translates them as “truppe del genio,” i.e. “engineering corps” or sappers, Rosi considers them as a vague type of workers that could accompany the army.<sup>81</sup> Ph. Houwink ten Cate and M. Weeden agree with F. Pecchioli Daddi in translating  $ÉRIN^{MES}$  KIN as “engineering troops/corps.”<sup>82</sup> This translation derives from the attestation of the term in the “Deeds of Šuppiluliuma I” where it is said that these men reconstructed the city of Almina,<sup>83</sup> as well as from Güterbock’s translation of the passage.<sup>84</sup> G.

<sup>76</sup> See ROSI 1984: 111–112, 114, and nn. 14, 19, esp. 111; BEAL 1992: 270, and n. 1012; WEEDEN 2011: 559; VIGO 2018: 273. For KIN, Hit. *aniyatt-*, see HW<sup>2</sup>, A, 88–90, s.v.: *aniyatt-*; WEEDEN 2011: 531, s.v.: KIN, with references; VIGO 2018: 273.

<sup>77</sup> KUB 13.1+ (CTH 261.I.A) i 17, [20, 31], see MILLER 2013: 218–219 sub §§7–9. See also HW<sup>2</sup>, A, 90, s.v.: *aniyatt-*; PECCHIOLI DADDI 1982: 464, s.v.:  $ÉRIN^{MES}/LÚ^{MES}$  KIN; ROSI 1984: 112; BEAL 1992: 270, and n. 1012.

<sup>78</sup> KBo 16.60 (CTH 236) rev. 8’, see WERNER 1967: 48–49; PECCHIOLI DADDI 1982: 464, s.v.:  $ÉRIN^{MES}/LÚ^{MES}$  KIN; ROSI 1984: 112; BEAL 1992: 42.

<sup>79</sup> See n. 77.

<sup>80</sup> See ROSI 1984: 112. The passage is KUB 13.2+ (CTH 261.I.B) i 7’–8’, see MILLER 2013: 220–221 sub §15. For the  $LÚ^{MES}$  ŠE.KIN.KU<sub>5</sub>, see PECCHIOLI DADDI 1982: 17, s.v.:  $LÚ^{MES}$  ŠE.KIN.KUD; HHW, 255, s.v.:  $LÚ^{MES}$  ŠE.KIN.KUD. See below for a similar case of a possible equation between dif-

ferent worker terms in the “Instructions of Arnuwanda I for the mayor (of Ḫattuša).”

<sup>81</sup> PECCHIOLI DADDI 1982: 464, s.v.:  $ÉRIN^{MES}/LÚ^{MES}$  KIN; ROSI 1984: 112. See also n. 76.

<sup>82</sup> HOUWINK TEN CATE 1984: 65, and n. 58; WEEDEN 2011: 489. See also HZL sub Nr. 327; RÜSTER/NEU 1991: 10 (Bautrupp(e)).

<sup>83</sup> KBo 5.6 (CTH 40.IV.1.A) i 13, see DEL MONTE 2009: 86, 101. See also HW<sup>2</sup>, A, 90, s.v.: *aniyatt-*; PECCHIOLI DADDI 1982: 464, s.v.:  $ÉRIN^{MES}/LÚ^{MES}$  KIN; ROSI 1984: 112, and n. 20. They seem to have acted directly under the orders of the king, as no official or supervisor is mentioned in connection with them and the preceding paragraph indicates that the monarch personally lead the reconstruction of other cities, most probably due to the military context.

<sup>84</sup> GÜTERBOCK 1956: 90. See also ROSI 1984: 112, and n. 21.

Del Monte, however, translates the term in this text as “pionieri”<sup>85</sup> and, as it will be shown, “engineering troops/corps” doesn’t fit well with other occurrences of ÉRIN<sup>MEŠ</sup> KIN.<sup>86</sup>

The “Instructions for the frontier post governors” mention the ÉRIN<sup>MEŠ</sup> KIN in a very fragmented context<sup>87</sup> from which it can only be inferred that they had to work regularly in the city and that they were under the supervision of the frontier post governor. No mention is made about the kind of work they did.

The “Instructions for the mayor” also mention the ÉRIN<sup>MEŠ</sup> KIN, but this time in such a fragmented context that nothing can be deduced from it,<sup>88</sup> except that they were under the orders of the mayor just as they were under the orders of the frontier post governor in border towns. In the same and following passages, ÉRIN<sup>MEŠ</sup> and LÚ<sup>MEŠ</sup> ÉRIN<sup>MEŠ</sup> are attested.<sup>89</sup> A similar term, LÚ<sup>MEŠ</sup> ÉRIN.KIN, might be attested in another version of this instruction, but the tablet is broken and the reading is very doubtful.<sup>90</sup> ÉRIN<sup>MEŠ</sup> can be equated with Hit. *tuzzi(ant)*-, “troops; army,”<sup>91</sup> especially in military contexts, but the term is also a vague reference to a group of persons, many times workers, and many times agricultural workers, who can be under the supervision of an official.<sup>92</sup> The letter RSO 23 29: 22–32 sent to Niqmadu III mentions a group of ÉRIN<sup>MEŠ</sup> under the supervision of a LÚ<sup>MEŠ</sup> KARTAPPU (“charioteer”)<sup>93</sup> who must work on irrigating orchards (KIRI<sub>6</sub><sup>MEŠ</sup>) and constructing a canal (Sum. PA<sub>5</sub>; Akk. *atappu*) in the city of Alathā.<sup>94</sup> All of the above suggests that in the “Instructions for the mayor” the three terms ÉRIN<sup>MEŠ</sup> KIN, ÉRIN<sup>MEŠ</sup> and LÚ<sup>MEŠ</sup> ÉRIN<sup>MEŠ</sup> can be understood as a group of people who carried out different types of work, thus, simply workers. In fact, in this

<sup>85</sup> DEL MONTE 2009: 101, and 184, s.v. See also ROSI 1984: 112, and n. 19, with references.

<sup>86</sup> In fact, in all the occurrences of the term in instruction texts, Miller understands it as “labor contingent” or “workforce,” see below.

<sup>87</sup> KUB 13.2 (CTH 261.I.B) iv 6’, see MILLER 2013: 232–233 sub §52: “labor contingents.” See also HW<sup>2</sup>, A, 90, s.v.: *aniyatt*-; PECCHIOLI DADDI 1982: 464, s.v.: ÉRIN<sup>MEŠ</sup>/LÚ<sup>MEŠ</sup> KIN; ROSI 1984: 112.

<sup>88</sup> KUB 31.112 (CTH 257.3.A) r. col. 4’, see MILLER 2013: 188–189 sub §2’. See also HW<sup>2</sup>, A, 90, s.v.: *aniyatt*-; ROSI 1984: 112.

<sup>89</sup> KUB 31.112 (CTH 257.3.A) r. col. 5’, 7’–8’, 12’, 19’, see MILLER 2013: 188–189 sub §§2’–4’.

<sup>90</sup> KUB 26.9+ (CTH 257.1.E) iv 2’, see Miller 2013: 186 sub §14’, 386 n. 460: “LÚ<sup>MEŠ</sup> É]RIN.KIN(?)”. See the photo of the tablet <hethiter.net/: fotarch N05498>.

<sup>91</sup> EDHIL, 908, s.v.: *tuzzi*-; WEEDEEN 2011: 218–220, 223, 483–486, with references. ÉRIN<sup>MEŠ</sup> con-

nected to KARAŠ, “military camp, army,” and unspecified works (KIN<sup>MEŠ</sup>) are attested in some letters from Ugarit sent to Niqmadu III, such as RSO 23 31: 8, 10, 17 and RSO 23 32: 13’, see LACKENBACHER/MALBRAN-LABAT 2016: 62, 68–69, respectively. See also COHEN/TORRECILLA 2022: 41, who interpret those works as an “agricultural/cultivation project,” see *ibid.*: 40–43; and below n. 94.

<sup>92</sup> DEL MONTE, 1995: 92–96, 130, esp. 95. See also HOUWINK TEN CATE 1984: 55–57; HOFFNER 2009: 133, 382, n. 126; and below.

<sup>93</sup> See HHW 281; BILGIN 2018: 184–185, 191, 231, with references.

<sup>94</sup> See LACKENBACHER/MALBRAN-LABAT 2016: 64–65; COHEN/TORRECILLA 2022: 42–44. For the role of the LÚ<sup>MEŠ</sup> KARTAPPU of Karkamiš, see BILGIN 2018: 75 and n. 220, 145, 234–235, 243. See also below and text [11] for the ÉRIN<sup>MEŠ</sup> UKU.UŠ performing a similar task.

instruction addressed to the mayor, the ÉRIN<sup>MEŠ</sup> are many times linked to KIN,<sup>95</sup> but not to any military context whatsoever.<sup>96</sup> This is similar to the possible equation between LÚ<sup>MEŠ</sup> KIN and LÚ<sup>MEŠ</sup> ŠE.KIN.KU<sub>5</sub> in the “Instructions to the frontier post governors” addressed above.

Finally, a letter found in Ortaköy/Şapinuwa mentions ŠA KIN A-NA ÉRIN<sup>MEŠ</sup>, an expression that can be equated with ÉRIN<sup>MEŠ</sup> KIN.<sup>97</sup> This group of people, together with oxen, are requested to be sent in the context of the annual start of the work in the city (HHCTO 1 obv. 6') [10]:<sup>98</sup>

<sup>(6')</sup> *ka-a-ša ŠA KIN-ya ku-it me-hur ka-ru-ú ar-[ta-r]i (...)*

“<sup>(6')</sup>The time for the work ha[s] now already co[me] (...)”

This passage and the request for both workers and oxen seem to refer to agricultural work, perhaps related to sowing or harvest seasons, rather than to a building project.<sup>99</sup> The letters HKM 5 and 54 from Maşat Höyük/Tapikka that deal with oxen and agricultural work support this hypothesis.<sup>100</sup> However, it cannot be totally ruled out that oxen were used for construction work, such as in carrying stones. Equally, maintenance or construction work may have begun at a particular time of the year, such as after the winter or at the end of spring, when temperatures were lower, there was no snow, and rainfall was not abundant; such considerations are also valid for military campaigns.

In conclusion, however tempting a translation of ÉRIN<sup>MEŠ</sup> KIN as “engineering troops/corps” might be, a more general term, “workers” or “labour contingent” might be preferable in view of the fact that their exact tasks are not well defined, even when they are once mentioned in connection with the reconstruction of a city. The attestations of the term refer to a group of people who could perform any type of work. They might have been involved in the construction of hydraulic structures, but if so, not as skilled workers.

<sup>95</sup> KUB 31.112+ (CTH 257.3.A) r. col. 5', 14', 19'–20', 22', see MILLER 2013: 188 sub §§2'–4'. Maybe also in KBo 13.58 (CTH 257.1.A) iii 34'–35', but the tablet is broken at the end of ÉRIN<sup>MEŠ</sup> and the missing part is large, see MILLER OP. CIT.: 186 sub §13” and the photo of the tablet <hethiter.net/: fotarch B0635a>.

<sup>96</sup> KBo 13.58 (CTH 257.1.A) ii 30', KUB 26.9+ (CTH 257.1.E) r. col. 7'–8', 12' (LÚ<sup>MEŠ</sup> ÉRIN<sup>MEŠ</sup>), KBo 50.261+ (CTH 257.3.B) 14', see MILLER 2013: 184 sub §8', 188 sub §§2'–4', 190 sub §2”.

<sup>97</sup> HHCTO 1 obv. 6', see ÜNAL 1998: 24; HOFFNER 2009: 260.

<sup>98</sup> ÜNAL 1998: 17, 19. See also HOFFNER 2009: 259; MARIZZA 2009: 117.

<sup>99</sup> Contra ÜNAL 1998: 20. See also MARIZZA 2009: 116.

<sup>100</sup> See ALP 1991: 126–127 (HKM 5), 220–221; DEL MONTE 1995: 115; HOFFNER 2009: 103–104 (HKM 5), 199 (HKM 54); MARIZZA 2009: 99 (HKM 5), 66–67 (HKM 54). For other texts from Maşat Höyük/Tapikka which deal with harvest and sowing, see DEL MONTE 1995: 122–131.

A further term that might be connected with construction work is LÚ<sup>MES</sup> UKU.UŠ/É<sup>RIN</sup> (LÚ<sup>MES</sup>) UKU.UŠ.<sup>101</sup> It is documented in a great variety of texts: the “Instructions for the UKU.UŠ-Troops,”<sup>102</sup> eight letters,<sup>103</sup> two oracles,<sup>104</sup> one treaty,<sup>105</sup> one decree,<sup>106</sup> one list of men and soldiers,<sup>107</sup> one “dream of the queen,”<sup>108</sup> one “historical report,”<sup>109</sup> one “fragment of historical text,”<sup>110</sup> one “possible court record,”<sup>111</sup> the funerary rituals,<sup>112</sup> in the “Ḫattušili III’s report on Šuppiluliuma I’s campaigns,”<sup>113</sup> twice in the Extensive Annals of Muršili II,<sup>114</sup> and maybe in the KILAM Festival.<sup>115</sup>

This group of men was part of the standing army, but it is not possible to determine what kind of troops they were,<sup>116</sup> especially because most of the texts mentioned above in which

<sup>101</sup> PECCHIOLO DADDI 1982: 464–465, s.v.; ROSI 1984: esp. 109–117; BEAL 1992: 37–44, 50–52, esp. 39, and 51, n. 197; IMPARATI 1999: 334, and n. 52; WEEDEN 2011: 324–326, with references; BILGIN 2018: 219, 228.

<sup>102</sup> See MILLER 2013: 280–281; BILGIN 2018: 374–375. See also below text [11].

<sup>103</sup> HKM 35 obv. 3 (ALP 1991: 182–183; BEAL 1992: 39, n. 150; HOFFNER 2009: 162), HKM 52 30–31 (ALP OP. CIT.: 214–217; BEAL OP. CIT.: 41, n. 159, 43, n. 171; HOFFNER OP. CIT.: 195), KBo 18.50 obv. 12 (ROSI 1984: 114; HAGENBUCHNER 1989: 96–97), KBo 18.53 obv. 4<sup>r</sup> (PECCHIOLO DADDI 1982: 464, s.v.; ROSI OP. CIT.: 116; HAGENBUCHNER OP. CIT.: 55–56; BEAL OP. CIT.: 38, and n. 145), KBo 18.54 obv. 3–6 (PECCHIOLO DADDI OP. CIT.: 464, s.v.; ROSI OP. CIT.: 116, BEAL OP. CIT.: 37, and n. 144; HOFFNER OP. CIT.: 340–344; WEEDEN 2011: 325), KBo 18.72 rev. 7 (PECCHIOLO DADDI OP. CIT.: 464, s.v.; ROSI OP. CIT.: 114; HAGENBUCHNER OP. CIT.: 115–116), KBo 18.83 obv. 4 (PECCHIOLO DADDI OP. CIT.: 465, s.v.; ROSI OP. CIT.: 115; HAGENBUCHNER OP. CIT.: 474; GANDER 2022: 538) and KUB 26.53 11 (ROSI OP. CIT.: 114; HAGENBUCHNER OP. CIT.: 341; CORDANI 2017: 125).

<sup>104</sup> KBo 16.98 obv. 1 (ROSI 1984: 115; VAN DEN HOUT 1998: 94) and KUB 5.3 obv. i 42–44, 54–55 (ROSI OP. CIT.: 116, and n. 35; BEAL 1992: 39, n. 151; id. 2002: 30, n. 83).

<sup>105</sup> KUB 23.68 (CTH 133) rev. 1–5, “Treaty between Arnuwanda I with the Išmerigaeans,” see PECCHIOLO DADDI 1982: 465, s.v.; ROSI 1984: 110; BEAL 1992: 39–40, and n. 153; WEEDEN 2011: 490. See also BECKMAN 1999: 16.

<sup>106</sup> KUB 21.29 (CTH 89.A) obv. ii 6, rev. iii 21, “Decree of Ḫattušili III concerning the people of Tiliura,” see ROSI 1984: 114; BEAL 1992: 42, and n.

165, GONZÁLEZ SALAZAR 1994: 161, 164; WEEDEN 2011: 628).

<sup>107</sup> KBo 16.60 obv. 2<sup>r</sup>, rev. 7<sup>r</sup>–8<sup>r</sup>, see WERNER 1967: 48–49; PECCHIOLO DADDI 1982: 464, s.v.; ROSI 1984: 111–112, and n. 12; BEAL 1992: 42–43, and nn. 168–170; WEEDEN 2011: 324.

<sup>108</sup> KUB 15.1 obv. i 31, see ROSI 1984: 115.

<sup>109</sup> KBo 22.11 i 5, see PECCHIOLO DADDI 1982: 464, s.v.; ROSI 1984: 111; BEAL 1992: 38, and n. 147.

<sup>110</sup> VBoT 115 rev. 4, see ROSI 1984: 117, n. 36.

<sup>111</sup> KUB 31.68 obv. 30<sup>r</sup>, see PECCHIOLO DADDI 1982: 465, s.v.; VAN DEN HOUT 1995: 190–191.

<sup>112</sup> KUB 39.22 i 5, see OTTEN 1958: 90; PECCHIOLO DADDI 1982: 464, s.v.; ROSI 1984: 114, and n. 26; BEAL 1992: 43–44, and n. 173.

<sup>113</sup> KUB 19.9 rev. iii 10, iv 9, see RIEMSCHEIDER 1962: 115; GÜTERBOCK 1973: 76; PECCHIOLO DADDI 1982: 464, s.v.; ROSI 1984: 114, and n. 24; BEAL 1992: 38, and n. 146; WEEDEN 2011: 628.

<sup>114</sup> KBo 5.8 obv. i 1–4 (GOETZE 1933: 146–147; PECCHIOLO DADDI 1982: 464, s.v.; ROSI 1984: 110; BEAL 1992: 38, n. 149; WEEDEN 2011: 490) and KUB 14.16 obv. i 25–26 (GOETZE OP. CIT.: 28–29; PECCHIOLO DADDI OP. CIT.: 464, s.v.; ROSI OP. CIT.: 110; BEAL OP. CIT.: 38, and n. 148; WEEDEN OP. CIT.: 628).

<sup>115</sup> KBo 10.23 rev. v 26, see PECCHIOLO DADDI 1982: 465, s.v., ROSI 1984: 114; BEAL 1992: 44, and n. 173. However, SINGER 1984: 14 reads: “É<sup>RIN</sup><sup>MES</sup> URU[.]” This last sign of the line is very damaged but it might be possible to identify it with the first part of UKU, see the photos <hethiter.net:/fotarch B0030a> and <hethiter.net:/fotarch BF05506>.

<sup>116</sup> BEAL 1992: 39, 43, 50–52, and n. 197: “standing army troops”; MILLER 2013: 399, n. 22: “(…) unclear what subgroup of soldiers they would have been”; BILGIN 2018: 219, 228, with references.

they are attested are heavily damaged. In fact, there have been many translations of the term, including “body guard” and “policeman.”<sup>117</sup>

Various supervisors of the UKU.UŠ are documented, and like their subordinates, in a wide variety of texts that are mostly dated to the last phase of Hittite history<sup>118</sup>: EN UKU.UŠ,<sup>119</sup> GAL (LÚ<sup>MES</sup>) UKU.UŠ,<sup>120</sup> and UGULA UKU.UŠ((,ŠÁ).E.NE).<sup>121</sup> But when their duties are mentioned, all these officials are mainly attested in the context of a war in which they lead the soldiers, without any mention of construction work.<sup>122</sup>

<sup>117</sup> PECCHIOLI DADDI 1982: 464, s.v., gives the translations of Friedrich (“Schwerbewaffnete”) and Werner (“Militärpolizei”); ROSI 1984: 117: “scorta”; HOFFNER 2009: 162, translates ÉRIN<sup>MES</sup> UKU.UŠ as “regular troops,” but leaves the term untranslated on p. 342 (KBo 18.54 anv. 5, see n. 103) and translates LÚUKU.UŠ on p. 194 (HKM 52 rev. 31, see n. 103) as “policeman,” see discussion and previous literature for this translation in BEAL 1992: 43, n. 171. WEEDEN 2011: 324–326, with references, 490, 628, who translates ÉRIN<sup>MES</sup> UKU.UŠ as “vanguard-troops” on p. 490, but LÚUKU.UŠ on p. 628 as “heavy infantry” and equates the term with Akk. *rēdū*, although on p. 326 he affirms that “(...) any derivation of the function of the LÚ<sup>MES</sup>UKU.UŠ from the Akkadian equivalent *rēdūm*, (...) i.e. members of a particular military unit or squad, cannot be given any substance. These are simply members of the standing army labelled in terms of their social class.”

<sup>118</sup> On supervisors, see BILGIN 2018: esp. 392–394. On the dating of the texts, see HOFFNER 2009: 365; BILGIN 2018: 228. This dating, however, is restricted solely to those texts that mention GAL (LÚ<sup>MES</sup>) UKU.UŠ. The attestation of the UGULA UKU.UŠ.E.NE in KBo 7.14, known as the “Zukraši text” (see n. 121), is most probably OS, see S. KOŠAK, [hethiter.net/](http://hethiter.net/): [hetkonk \(2.plus\)](http://hetkonk.2.plus/); KLINGER 2022b: esp. 282. For the texts in which these officials are documented, see below.

<sup>119</sup> Attested only in a cult inventory, KBo 12.56 (CTH 527.7) i 4’, see PECCHIOLI DADDI 1982: 466, s.v.; BEAL 1992: 391; HAZENBOS 2003: 54–55; TORRI/BARSACCHI 2018: 63. Rosi (1984: 125), indicates KBo 12.65, which is most probably an erratum for KBo 12.56, see TORRI/BARSACCHI OP. CIT.: 74–75. WEEDEN 2011, doesn’t list this official.

<sup>120</sup> See PECCHIOLI DADDI 1982: 546, s.v.; ROSI 1984: 118, 124–125; BEAL 1992: 380–391; WEEDEN 2011: 495: “chief of the vanguard troops”, see also

n. 117; BILGIN 2018: 219–231, with references. The position is sometimes divided into that of the Left and that of the Right. They are attested in the “Extensive annals of Muršili II” (KBo 16.11+ 4’, see ROSI OP. CIT.: 123–124, and n. 59; BEAL OP. CIT.: 41 and n. 160, 380–381), the list of witnesses of three treaties (KBo 1.6 (CTH 75.A) rev. 20, see ROSI OP. CIT.: 124, and n. 60; BEAL OP. CIT.: 381–382 // KBo 4.10 (CTH 106.II.2) rev. 29, 31, see ROSI OP. CIT.: 124; BEAL OP. CIT.: 384–385; VAN DEN HOUT 1995: 48; WEEDEN OP. CIT.: 48 // Bo 86/299 (CTH 106.I.1) rev. iv 33, 39; see OTTEN 1988: 26–27; BEAL OP. CIT.: 386–387), one land donation (KUB 26.43 anv. 49, rev. 30, see IMPARATI 1974: 30, 36; ROSI OP. CIT.: 124; BEAL OP. CIT.: 382), one fragment of historical text (KUB 31.32 rev. 5, see ROSI OP. CIT.: 124; BEAL OP. CIT.: 386), two letters (KUB 23.87 9’, see ROSI OP. CIT.: 124–125; HAGENBUCHNER 1989: 227–228; BEAL OP. CIT.: 389; GANDER 2022: 461–463 // VSNF 12.129 obv. 2, see ROSI OP. CIT.: 124–125; BEAL OP. CIT.: 389; HOFFNER 2009: 365–366) and two oracles (KUB 22.42 (CTH 575) rev. 7, ROSI OP. CIT.: 125; BEAL OP. CIT.: 390 // KUB 22.2 (CTH 582) obv. 1, 9, see BEAL OP. CIT.: 390). Doubtful attestations are not considered here.

<sup>121</sup> See PECCHIOLI DADDI 1982: 466, s.v.: UGULA UKU.UŠ; ROSI 1984: 118–124; WEEDEN 2011: 324, 326, 628. Only attested in two versions of the “*Res Gestae Hattušili I*,” KBo 7.14+ obv. ii 14 (see ROSI OP. CIT.: 118–119, 123; BEAL 1992: 380; DE MARTINO 2003: 112; WEEDEN LOC. CIT.) and KUB 31.5 obv. ii 8 (ROSI OP. CIT.: 122; DE MARTINO OP. CIT.: 96; WEEDEN LOC. CIT.).

<sup>122</sup> ROSI 1984: 118, 125; BILGIN 2018: 230. See also BEAL 1992: 380. However, five of them seem to have exercised other duties beyond those directly related to military campaigns: Aranḫapilizzi, Saḫurunuwa, Tattamaru and two unnamed officials. Aranḫapilizzi, who is mentioned in the annals of Muršili II and in the treaty with Aleppo

According to the very fragmentary instructions addressed to them, the tasks of the UKU. UŠ in peacetime included working on urban building projects<sup>123</sup> involving *conduits* (*huppidanu-*) and canals (PA<sub>5</sub><sup>HIA</sup>) (KUB 13.28+ (CTH 267) 6'–10') [11]<sup>124</sup>:

(6)[...] *hu-up-pi-da-nu-uš* PA<sub>5</sub><sup>HIA</sup> *da-aš-ke<sub>9</sub>-ten* (erasure) <sup>GIS</sup>*ti-i-e-eš-šar-ra* (7)[... *ku-it*] *im-ma ku-it* KIN *ša-ra-a wa-at-ku-uš-ke-et-ta* (8)[...-a]*t-tén-pát ki-nu-na tu-uk A-NA ÉRIN*<sup>MEŠ</sup> UKU.<UŠ> *ki-iš-ša-an* (9)[... -m]*a' ma-a-an* <sup>PUTU</sup>-ŠI *ku-wa-pi ha-an-te-ez-zi a-ú-ri-ya URU-an* (10)[... *šu-m*]*eš' -ša' ÉRIN*<sup>MEŠ</sup> UKU.UŠ *ÉRIN*<sup>MEŠ</sup> *-ti an-da KIN-an ú-e-te-eš-ke-te-ni*

“(6)[...] you (pl.) shall “take” *conduits* (and) canals. The orchards, too, (7)[... wha]tever work “springs up.” (8)You (pl.) shall indeed [...] But now to you (sg.), to the UKU.UŠ-troops, thus (9) [...]: If My Majesty ever/somewhere [...] a town by/for a frontier post (10)[..., yo]u UKU.<UŠ>-troops, too, will carry out the construction work for/with the soldiers”

In the following and final lines, the text insists that the *ÉRIN*<sup>MEŠ</sup> UKU.UŠ must collaborate with the *ÉRIN*<sup>MEŠ</sup> on construction works, refers to the construction of cities by the army (*tuzzi(ant)-*) and again mentions a canal and the king.<sup>125</sup> Thus, the text indicates that the UKU.UŠ had to take part in urban building projects, as the *ÉRIN*<sup>MEŠ</sup> KIN. But this time, these projects included important hydraulic structures for a town, such as canals for irrigation and *conduits*, most probably also used for watering fields.<sup>126</sup> This is the same task that the *ÉRIN*<sup>MEŠ</sup> performed under the supervision of a <sup>LU</sup>*KARTAPPU* in the Syrian city of Alathā.<sup>127</sup> The subordination of the UKU.UŠ to the king is clear from both his mention and the nature of the text.<sup>128</sup> Importantly, Hittite towns were managed by different officials who exerted the king's power by delegation. The frontier post governors, in particular, were responsible for the

(CTH 75), moved the statue of the Storm-god from Tarḫuntašša to Ḫattuša, but apparently not while he was GAL UKU.UŠ, see BILGIN OP. CIT.: 221, 230. Šaḫurunuwa, mentioned in his own land donation, might have held the position prior to the writing of the tablet, see BILGIN OP. CIT.: 222. Tattamaru, one of the witnesses in the Bronze Tablet and son of Šaḫurunuwa, seems to have acted as a kind of ambassador in Amurru, but maybe before his appointment as GAL UKU.UŠ, see BILGIN OP. CIT.: 224, 226–227. The unnamed GAL UKU.UŠ of the letter KUB 23.87 was involved in bringing back captives to Ḫattuša, see BILGIN OP. CIT.: 229. Finally, the equally anonymous GAL UKU.UŠ of the letter VSNF 12.129 might have been connected with the unjust imposition of *šabhan* and *luzzi* obligations on

the city of Tankuwa, but because this supervisor is one of the three recipients of the letter, his direct responsibility in this affair cannot be ascertained. For the attestations of these men, see n. 120.

<sup>123</sup> HOUWINK TEN CATE 1984: 65; BEAL 1992: 43.

<sup>124</sup> MILLER 2013: 280–281 sub §2'. See also HW<sup>2</sup>, Ḫ, 743, s.v.: (<sup>GIS</sup>)*hup(p)itanu-*; ROSI 1984: 113–114; BEAL 1992: 43–44, n. 172. For *huppidanu-*, see above 3.1 text [9] and n. 64.

<sup>125</sup> KUB 13.28+ (CTH 267) 11'–15', see MILLER 2013: 280–281 sub §2'.

<sup>126</sup> In l: 6', the term <sup>GIS</sup>*tiešsar*, “orchard,” in relation to irrigation is also attested in the “Instructions for the mayor,” see above 3.1 and n. 69.

<sup>127</sup> See above and n. 94.

<sup>128</sup> See also BILGIN 2018: 374, 377–379, 383.

garrisons established in their town<sup>129</sup> and supervised the tasks of the other groups of workers treated here: LÚ<sup>MEŠ</sup> KIN, ÉRIN<sup>MEŠ</sup> KIN and ÉRIN<sup>MEŠ</sup>. The mention of a “frontier post” (*ḫantezzi auriya*) could indicate that the UKU.UŠ were also managed, at least in the periphery, by these officials. In fact, Ḫimmiili, frontier post governor in Maşat Höyük/Tapikka, could order to place a LÚUKU.UŠ in front of the house of a man who was asking for protection.<sup>130</sup> All of the above, along with the fact that the ÉRIN<sup>MEŠ</sup> KIN carried out construction works for the army during a military campaign under the orders of the king (see above), explain why none of the aforementioned supervisors of the UKU.UŠ is mentioned in connection with any building project in a town, not even during a military campaign. They were most probably under the orders of either the king or, in towns, the frontier post governor or the mayor (see above 3.1 and text [6]). Unfortunately, the text is so fragmentary that it is not possible to know whether the type of work the UKU.UŠ carried out was specialised or not. Accordingly, it is also not possible to know if there were skilled workers among them, such as sappers or military engineers.

The recent discovery of several hieroglyphic graffiti painted on the largest postern gate of Ḫattuša, Yerkapi, compel considering this type of textual sources as well. Among the six different signs (A–F) covering part of both walls,<sup>131</sup> four stand out: A, B, D and E. A and D are located on the east wall, but they are present together only in the middle part of it, often—but not always—in the same arrangement: A above D.<sup>132</sup> A is a PN, Ari-Šadu,<sup>133</sup> whereas D is difficult to interpret, but its only sign (L. 409<sub>3</sub>) might be a logogram expressing a profession associated with stonework.<sup>134</sup> The combined vertical reading of A+D has been interpreted as a PN and a title which might designate some kind of stoneworker directly involved in the construction of the postern gate.<sup>135</sup> Something similar could be said for B and E. They are located on the west wall, appear together only on part of it, and one of them, B, is always located in a higher position.<sup>136</sup> The reading of B is also a PN, In(n)ara,<sup>137</sup> while the reading of E, MANUS/CAPER+SCALPRUM, might also indicate a title, a kind of “stonemason.”<sup>138</sup> However, the distribution of the latter two signs when they appear together seems to be much more inconsistent than in the case of the group A+D.<sup>139</sup> M. Marazzi and N. Bolatti Guzzo

<sup>129</sup> See above 3.1 and text [6].

<sup>130</sup> For the letter, see n. 103. For Ḫimmiili, see ALP 1991: 59–62; MARIZZA 2007: 112–118; HOFFNER 2009: 93–94; BILGIN 2018: 202–203, 245, 294–296.

<sup>131</sup> MARAZZI ET AL. 2023; MARAZZI/BOLATTI GUZZO 2024: 100, 103, and n. 233.

<sup>132</sup> MARAZZI ET AL. 2023: 83, Abb. 73b, 87.

<sup>133</sup> MANDARE-šà-túltu (L. 66\*-104-325/89), see MARAZZI ET AL. 2023: 75–79, Abb. 77–81.

<sup>134</sup> MARAZZI ET AL. 2023: 80–81, 83–84, Abb. 77, 85; MARAZZI/BOLATTI GUZZO 2024: Abb. 76b.

<sup>135</sup> MARAZZI ET AL. 2023: 83–84; MARAZZI/BOLATTI GUZZO 2024: 75.

<sup>136</sup> MARAZZI ET AL. 2023: 82–83, Abb. 74, 88; MARAZZI/BOLATTI GUZZO 2024: 104, Abb. 67–69.

<sup>137</sup> CERVUS<sub>3</sub>+RA/II (L. 103+383), see MARAZZI ET AL. 2023: 79, Abb. 77, 82; MARAZZI/BOLATTI GUZZO 2024: 109.

<sup>138</sup> Or maybe a verb related to stone work, see MARAZZI ET AL. 2023: 81–82, 84, and n. 166, Abb. 77, 86; MARAZZI/BOLATTI GUZZO 2024: 103–104, 106–107, Abb. 70, 74.

<sup>139</sup> Compare the photos and drawings in MARAZZI ET AL. 2023: Abb. 73a–b and 74a–b. See also MARAZZI/BOLATTI GUZZO 2024: Abb. 67–69.

consider that both groups, A+D and B+E, can be interpreted as the name and title of two stonemasons who most probably helped construct the postern gate.<sup>140</sup> These graffiti add to two other examples that have been documented in Building A of Kayalıpınar. Although both of them are difficult to read, the one in the higher position could be interpreted as a PN and the lower one as a job title. A. Müller-Karpe thinks that their combination might refer to the man responsible for the construction of the building,<sup>141</sup> although the two graffiti are separated and not entirely vertically aligned. The fact that the Yerkapı hieroglyphic group A+D is found only on the east wall, and B+E only on the west wall, precludes their interpretation as mere graffiti: they are too well organised to be the result of a spontaneous act. Thus, their painting must have been a conscious action. This particular composition sets them apart from other graffiti found in Hattuša.<sup>142</sup> Accordingly, although the reading of D and the exact meaning of E are still uncertain, there seems to be no doubt that the PNs are directly related to the construction of the postern wall, as M. Marazzi and N. Bolatti Guzzo already stated, and because this construction required skilled workers, those individuals can be considered as such.

If E (MANUS/CAPERES+SCALPRUM) can be interpreted as a noun rather than a verb, then it might correspond to <sup>LÜ</sup>NAGAR.NA<sub>4</sub>, “stonemason,” attested in cuneiform texts (see above 3.2). If this equivalence is correct, then both terms would refer to the same type of worker who was perhaps involved in the construction of, at least, the corbelled vault of underground fountains, which are structurally and typologically identical to the Yerkapı postern gate. And in this case, they would have been one of the skilled workers needed to build certain Hittite hydraulic structures. Unfortunately, this is merely a hypothesis awaiting further evidence.

#### 4. Conclusion

The complexity of some Hittite hydraulic structures for both storing and accessing water—such as dams, cisterns dug into the ground and underground fountains—indicates that their design and construction required skilled workers capable of implementing the necessary engineering solutions and building techniques. Some of these solutions and techniques are documented not only in the archaeological record, but also in textual sources. The latter include the use of stone membranes [1], the transformation of springs into fountains [2–3] and some of the constituents of fountains [4–5]. At the same time, this very complexity also entails managing a considerable labour force, which must have included those skilled workers.

<sup>140</sup> MARAZZI/BOLATTI GUZZO 2024: 109. See also MARAZZI ET AL. 2023: 84.

<sup>141</sup> MÜLLER-KARPE 2017: 73–77, Abb. 13. See also MARAZZI ET AL. 2023: 79, 83–84; MARAZZI/BOLATTI GUZZO 2024: 107, 110.

<sup>142</sup> See GÜTERBOCK 1969; HAWKINS 2000: 35 sub Appendice 1; DİNÇOL/DİNÇOL 2002; MARAZZI 2016; HAWKINS 2024: 78–84 sub Nr. 21–26.

In a centralised state in which the supreme power of the king was exercised in the cities by delegation to certain officials, we might expect to find in the texts some reference to an official or supervisor who managed that workforce connected with hydraulic structures or who was capable of designing them. This, however, is not the case. The only term explicitly connected to a hydraulic structure, Sum. LÚ PA<sub>5</sub>, Akk. *gugallu(m)*, “canal inspector,” is never documented in relation to an official, but rather only to the Storm-god because this is a term imported from Akkadian that finds no referent whatsoever in the Hittite reality. Nonetheless, that someone knew how to design and construct these structures is clearly proved both by the archaeological record and by the prescription on the need of covering with a stone membrane any structure dug into the ground which could be filled with water or ice [1].

Texts show that, during a military campaign, the labour force could be directly under the king’s command, as in the case of the ÉRIN<sup>MEŠ</sup> KIN who reconstructed the city of Almina. But in peacetime, workers were managed by officials [6, 10], in particular by frontier post governors [1, 7–10] and the mayor, even though they were ultimately subjected to the king’s orders [11]. These two officials were also responsible for constructing and maintaining the buildings and the infrastructure of the cities under their jurisdiction [1, 4, 7–9]. However, there is no textual evidence that supports that they had a specialised knowledge on hydraulics or engineering.

While some tasks related to building projects do not require expertise, others, in particular those related to the complex hydraulic structures treated here, do indeed rely on skilled workers. Cuneiform sources provide some terms for workers who might have been involved in this type of building projects: LÚ<sup>MEŠ</sup> KIN, ÉRIN<sup>MEŠ</sup>, ÉRIN<sup>MEŠ</sup> KIN, LÚ<sup>MEŠ</sup> UKU.UŠ/ÉRIN<sup>MEŠ</sup> UKU.UŠ and LÚ<sup>MEŠ</sup> NAGAR.NA<sub>4</sub>, “stonemason”. Of these, only the ÉRIN<sup>MEŠ</sup> in Syria and the UKU.UŠ in Anatolia are connected to hydraulic structures, although not particularly complex ones (canals and *conduits*) [11], and only the LÚ<sup>MEŠ</sup> NAGAR.NA<sub>4</sub> can be considered as specialised workers. The tasks of the ÉRIN<sup>MEŠ</sup> and the UKU.UŠ are not specified, and evidence points their interpretation as a type of labour force without any specialisation, such as the ÉRIN<sup>MEŠ</sup> KIN. The latter, LÚ<sup>MEŠ</sup> NAGAR.NA<sub>4</sub>, are documented only without any mention of the work they could do.

In sum, no cuneiform text refers to an official whose main task was either to design hydraulic structures or manage the skilled workers needed to construct them. Nor does any text refer to specialised workers directly related to these structures.

Nonetheless, the hieroglyphic groups A+D and B+E of Yerkaḫ most probably refer to skilled workers who took part in the construction of the postern gate. And, if E (MANUS/CAPER+SCALPRUM) does indeed indicate a title, it might be equated with Cun. LÚ<sup>MEŠ</sup> NAGAR.NA<sub>4</sub>. In that case, these “stonemasons” can be connected at least with the construction of the corbelled vaults of underground fountains.

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