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WHY DID THE CITIES OF THE JAWF VALLEY COLLAPSE? AN ARCHAEO-GEOGRAPHICAL APPROACH¹

Jérémie SCHIETTECATTE²

Introduction

Pre-Islamic South Arabia is widely known for the events recounted in religious sources: the queen of Sheba bringing wealth to Solomon, described in the Bible (I King 10), or the breaking of the great dam of Ma'rib, mentioned in the Koran (Sura 34, 15-16). Through both events, the main components of this ancient area can be discerned: an aromatic bearing country, divided into several kingdoms, benefiting from a well irrigated agriculture. Historically, South Arabia covered the territory of present-day Yemen, overlapping southwestern Saudi Arabia (wâdî Najrân) and southwestern Oman (Dhufâr) (*fig. 1*). The emergence in this area, at the beginning of the 1st millennium BC, of a common alphabet and identical architectural and artistic features lead the scholars to describe the period as well as the culture by the word "South Arabian". This culture lasted until the 6th century AD, fading away on the eve of Islam.

During the 1st millennium BC, most of the South Arabian towns grew in these Lowlands, where the valleys open out on the inner desert, the Ramlat asSab'atayn. Such a context does not allow rain-watered agriculture. It was therefore necessary to develop irrigation systems to make the most of the flood caused by the heavy showers on the Highlands during the rainy season (spring and summer). As these systems expanded, reaching 10 000 ha in the oasis of Ma'rib, the social complexity they required for their improvement and their maintenance increased.

In this paper, we intend to focus on the Jawf valley, the most important one around the inner desert. This area was ideal for the settlement of sedentary communities and it is no accident that among the most ancient and largest cities in South Arabia were those of the Jawf. These towns are occupied at least from the beginning of the 1st millennium BC. They took the form of small independent entities. The town, its territory and the tribe dwelling in and around the town were designated by a single name. This led me to refer to these entities as "tribal city".³

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1. This paper is the translation of an earlier contribution published in French in the journal *M@ppemonde*, 84 (4-2006). I would like to thank Astrid Emery for the proofreading of this version.
 2. CNRS, UMR 8167 "Orient et Méditerranée", jeremie.schiettecatte@mae.u-paris10.fr
 3. These cities have also been called city states (M. Arbach, 2001, p. 14; M. Arbach, R. Audouin, 2004, p. 50; J.F. Breton, 1994, p. 165; C. Robin, 1991b, p. 52; H. von Wissmann, 1976, p. 337). Indeed, with only one exception they meet the conditions required by M.H. Hansen (2000, p. 19) to be defined as a city state: "A city-state is a highly institutionalised and highly centralised micro-state consisting of one town (often walled) with its immediate hinterland and settled with a stratified population, of whom some are citizens, some foreigners and, sometimes, slaves. Its territory is mostly so small that the urban center can be reached in a day's walk or less, and the politically privileged part of population is so small that it does in fact constitute a face-to-face society. The population is ethnically affiliated with the population of neighboring city-states, but political identity is focused on the city-state itself and based on differentiation from other city-states. A significantly large fraction of the population is settled in the town, the others are settled in the hinterland, either dispersed in farmsteads or nucleated in villages or both. The urban economy implies specialisation of function and division of labour to such an extent that the population has to satisfy a significant part of their daily needs by purchase in the city's market. The city-state

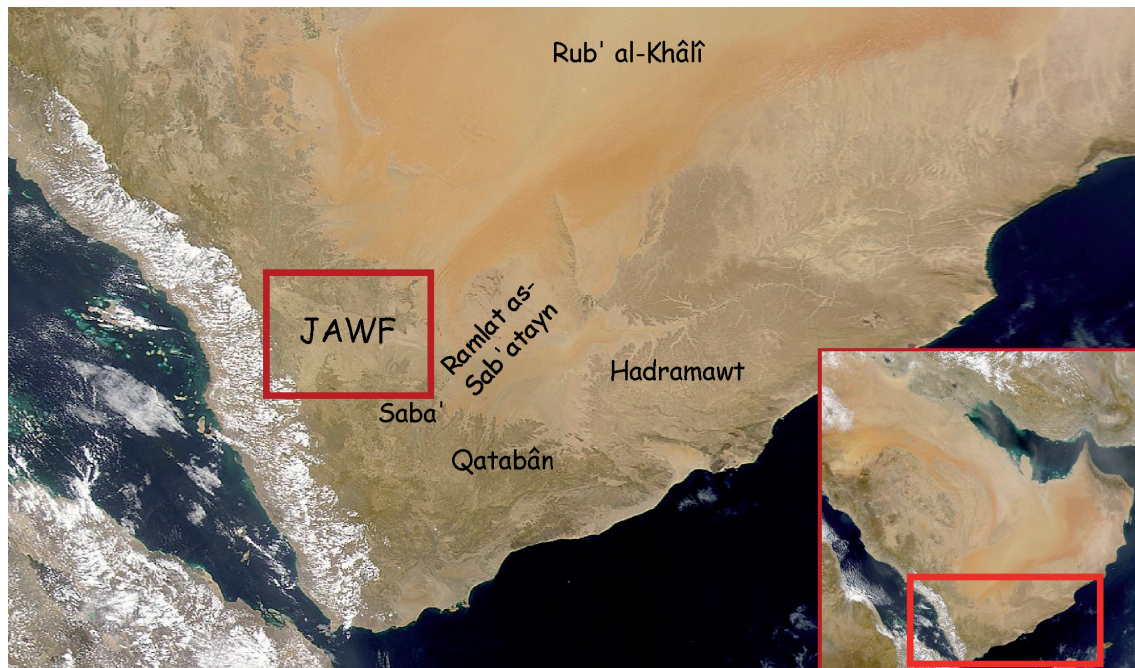


Fig 1 – Location of the Jawf.

How these cities formed is still unknown. Their origin dates back to the transition period between Bronze and Iron Age (end of the 2nd – beginning of the 1st millennium BC), if not earlier. Their disappearance occurred between the middle of the 1st millennium BC and the beginning of the Christian era. At that time, the cities of the Jawf were not the only to collapse; almost all the towns on the edge of the inner desert were abandoned. This phenomenon is intriguing. Through the study of the trends affecting the urban network in the Jawf valley, I will highlight below all the causes having led to the decline and the abandonment of these cities. I will show that new ground could lead to dismiss some of the reasons usually adduced.

Whereas archaeological research, with few exceptions, has been taking place for no more than forty years, there has been ongoing philological research for more than a century and a half. Therefore, there is a wealth of historical data to picture the chronological frame of South Arabia and explain the historical changes; archaeologists try to fit their own field-data into this frame, slightly modifying it by adding absolute dating, environmental data and cultural specificities.

It is from the combination of both these kinds of data that we will be able to draw conclusions that do not overestimate the role of the sole historic events when dealing with the chain of causation. This can be undertaken through several approaches. Historical cartography is the one I chose to use in the following case study: the trends affecting the urban network and the collapse of the cities of the Jawf region from the 8th century BC, the date of the first epigraphic references to these cities,⁴ until the 6th century AD, when the last cities are mentioned.

Several historical events are adduced as possible explanations for this collapse, along with their limitations. Subsequently, I will explain how I have mapped the evolution of the urban network of the Jawf, taking into account the hierarchical weight of each site in a diachronic angle. This will lead me to show what is to be learned from the maps when studying the chain of causation and how maps help to revise some conclusions on the very nature of their collapse.

is a self-governing but not necessarily an independent political unit". The only restraint is what is to be meant by "highly institutionalised". Indeed, South-Arabia during this period, and more particularly the Jawf valley, is to be considered as a pre-state and segmentary society. Thus, it seems quite anachronistic to designate these small autonomous territories which focused on a single town by the word "city-state".

4. There have been very few archaeological excavations in this area. There is no doubt that the origin of the cities of the Jawf are more ancient than the 8th cent. BC if we look at the thickness of the tells at the top of which the structures dated from the 8th cent. BC come up; nevertheless, there is no tangible data for the moment.

Life and death of the Jawf cities, the traditional perspective

Geographical setting

The Jawf is a 20-km-wide west-east oriented valley. Two faults on its northern and southern edges form the boundary of a 70-km-long rift valley. This alluvial plain is watered by a wide drainage basin (c. 18 000 sq. km). It opens onto the margins of the Ramlat as-Sab'atayn, an erg with elongated dunes separated by broad corridors that constitute, along with the deflations and the regs, ideal transport links.

This setting is favourable to settlement: the plain is wide, covered with alluvia, very slightly sloping, benefiting from abundant flows, bordered by relief where one can find the building materials, and close to the major roads. It is no surprise to find there some of the most important sites of the South Arabian civilization.

The Jawf cities

At the dawn of the South Arabian period, territorial entities in the Jawf area that could be labelled as tribal cities are described by monumental inscriptions. Each city was populated with a single tribe subdivided into clans. These tribes shared a common language, madhabic. Each tribe had its own pantheon. The population satisfied most of its daily needs by irrigating and cultivating the territory under the control of the city. This territory was intimately connected to the tribe; both of them had the same name. These chiefdoms, politically independent, each recognized the authority of one leader.

These tribal cities are, from west to east: Nashshân including two towns, Nashq (today al-Baydâ') and Nashshân (today as-Sawdâ'); Kaminahû with a town also named Kaminahû (today Kamna); Haram with a town also named Haram (today Kharibat Hamdân); Ma'în with the town Qarnaw (today Ma'în); and Inabba' with a town also named Inabba'. There are two other towns to be added, under the domination of the kingdom of Saba': Yathill (today Barâqish) and Kuhâl (today Jidfir Ibn Munaykhir) (*fig. 2*).

All the cities constituting the urban network of the Jawf during pre-Islamic times (8th century BC to 6th century AD) had already reached maturity when the first monumental inscriptions attesting to the fact that a strong social hierarchy existed appeared (8th century BC). These towns are usually seen as stable centres, with defensive, religious, administrative and economic functions: shielded by a rampart, including a temple devoted to the main deity of the tribal pantheon and an elite managing the irrigation systems, they constituted a stopping place on the caravan road. Some of them also had a political function owing to the residence of the leader of the tribal city.

First recession of the urban network and decline of the Sabaean kingdom

The two first cities to disappear were Kuhâl and Inabba'. In the first one, **Kuhâl**, the inscriptions and pottery collected on the ground characterize the ancient South Arabian period (8th-6th centuries BC). The use of the Sabaean language, the cult of Sabaean deities (Sami', Almaqah) and the mention of Sabaean kings in the inscriptions prompt us to attach this city to the Sabaean area. The site seems to be abandoned for unknown reasons from the 6th century BC onwards.

Inabba' appeared as early as the beginning of the 1st millennium BC as an autonomous entity. Nevertheless, it is uncertain whether it was independent or not. A leader is attested and the language used for the inscriptions is madhabic but some of the devoted deities of its pantheon are Sabaean (Sami', for example, also worshipped in the large temple of Jabal al-Lawdh, nearby from Inabba'). This community might have been within the jurisdiction of the kingdom of Saba'. The location of the site halfway between Yathill and the Jabal al-Lawdh, both of them into the Sabaean sphere of influence, is in line with this hypothesis. The occupation of the site seems to decline swiftly. No inscription mentioning activity on the site is dated later than the 5th century BC.

Both Inabba' and Kuhâl belonged to the Sabaean sphere of influence. The first was autonomous, the second was not. They declined and were abandoned while the kingdom of Saba' died out, simultaneously with the boom of the neighbouring kingdoms (Qatabân, Hadramawt). At this time, the temple of Jabal al-Lawdh was also abandoned. The abandonment of both the cities might be seen as the consequence of the recession

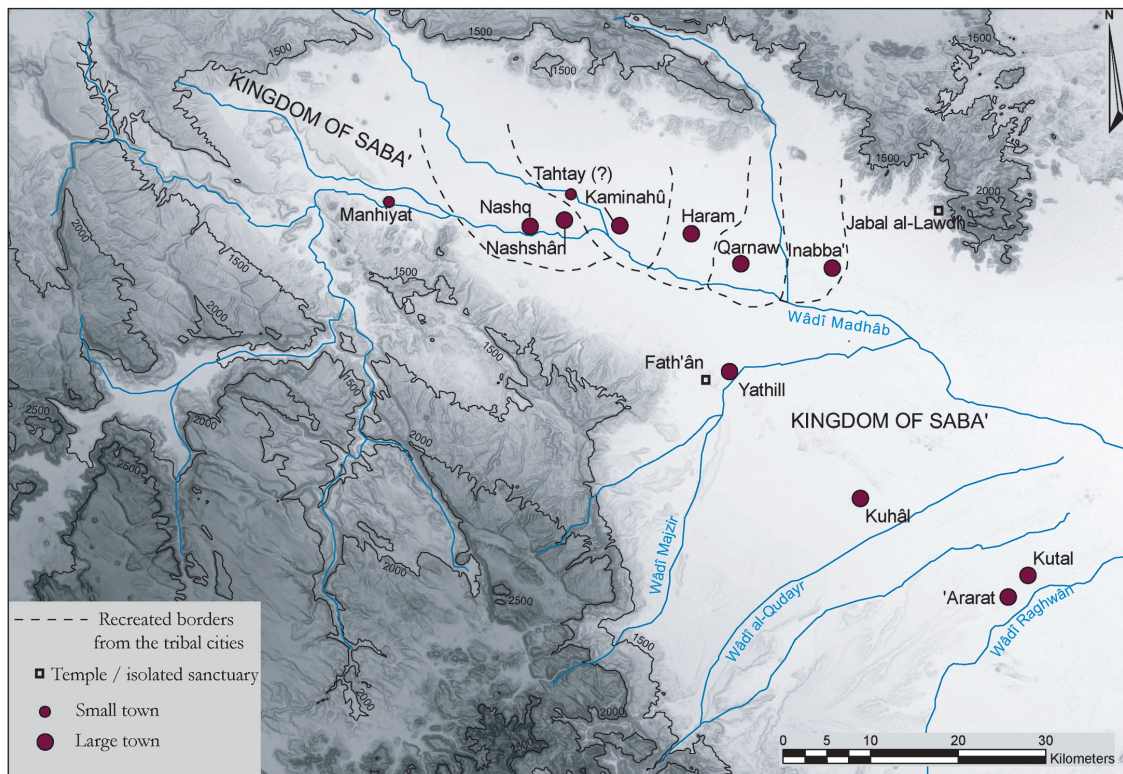


Fig. 2 – The Jawf valley in the 8th century BC.

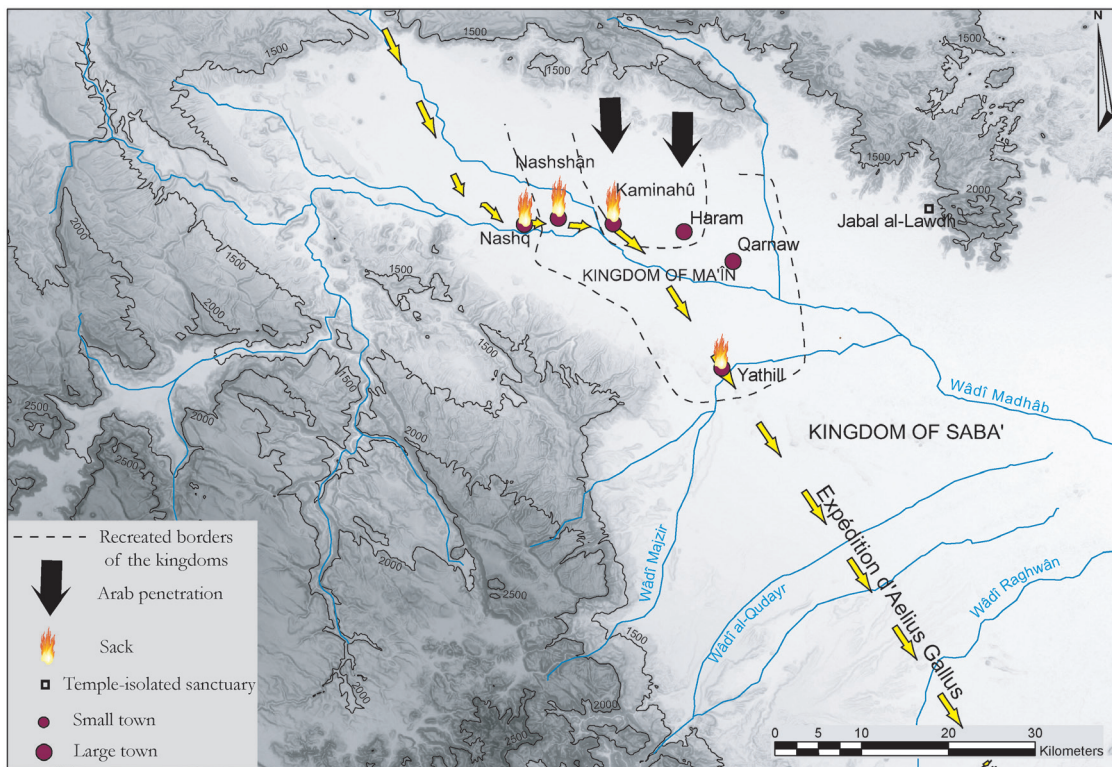


Fig. 3 – The Jawf valley in the 2nd and 1st centuries BC.

of the kingdom of Saba'. It is all the more likely that the Sabaeen site of Hizmat Abî Thawr, upstream from the Jawf, seems to be abandoned at this time. Nevertheless, this explanation is not good enough if we consider the continuity of occupation in Yathill, also belonging to the Sabaeen area during this early period. This town not only survived but even went through a growth during the following centuries. The reasons of the decline of Kuhâl and Inabba' must be sought elsewhere.

Second recession: the result of Arab migrations and a Roman expedition

Between the 1st century BC and the 1st century AD, four major towns died out in the region: Yathill, Kaminahû, Qarnaw and Haram. This phenomenon has been explained through two main events: the entering of Arab tribes coming from the North and the expedition led by the Roman prefect Ælius Gallus in 25 BC, who undertook the conquest of South Arabia (fig. 3).

Yathill, in the 2nd century BC, belongs to the kingdom of Ma'în, which was declining at that time. The town was still a defensive and religious place; a new irrigation system was built; at that time, an Arab population was established on the site. Yet, in the 1st century BC, the classical literature shows that the site was no more the large fortified city known during the previous centuries. In the account given by Strabo (*Geography* XVI, 4, 24), the town Athroula, identified with Yathill, surrenders without resistance; the Roman army is supplied there with wheat and dates. Nevertheless, a thick burning level discovered in the excavations of the site marks the beginning of the abandonment of the site in the course of the 1st centuries BC/AD (De Maigret 1991, p. 4). Was the town burnt by the Roman army on its way back? If the connection cannot be made with certainty, this hypothesis has sometimes been put forward to explain this level of ashes. The toponym Yathill appears as a landmark in two monumental inscriptions from the 1st and 3rd centuries AD. But the very reasons of the abandonment of the site are not clearly known.

Kaminahû, from the 7th till the 2nd century BC, is the centre of an independent territorial entity. In the 2nd and 1st cent. BC, it experienced a revival which may be correlated with the decline of the kingdom of Ma'în, and with the settling of Arab tribes in that area. These tribes took advantage of the reshaping of the political frame to take control of the kingdom of Kaminahû. But from the 1st cent. AD onwards, there is no inscription known on the site and the place name is not mentioned anymore in the neighbouring cities. If we agree to identify Kaminahû with *Caminacum* mentioned by Pliny the Elder (*Nat. Hist.* VI, 32, 160), it may be assumed that the site was devastated by the Roman expedition led by Ælius Gallus, as mentioned in this account.

Qarnaw was the capital of the kingdom of Ma'în, which disappeared some time between the 1st centuries BC and AD. No inscription dated to after this period has been found there. The last mention of Qarnaw dates from a few decades later. The reasons for this decline might be sought in a weakening of the kingdom linked to the penetration of the Arab tribes in the nearby cities, and in the loss of the monopoly in caravan trade that had made the fortune of Ma'în. Qarnaw is not mentioned in the account of Ælius Gallus' expedition although he crossed the nearby country. Strabo mentioned the town as a *metropolis* (*Geography* XVI, 4, 2) but he based himself on the account of Eratosthenes of Cyrene from the 3rd century BC; Pliny's mention of the town (*Nat. Hist.* VI, 157) in his description of Arabia might be based on the same ancient source. The same is probably true of the account of Claudius Ptolemy (*Geography* VI, 7, 34) who described Qarnaw as a *basileion* while the site is not cited anymore in the local data since two centuries. Was the site still inhabited at the time of Ælius Gallus? We are not able to make any positive statement.

Haram, from the 2nd century BC onwards, went through several changes: linguistic changes, replacement of the ancient cults by new Arab deities (Halfân and dhû-Samâwî), modifications of the social structure (the sovereign is replaced by a tribal council). These changes result from the settling of new populations and the development of links with Arab nomads (Robin 1991a, p. 77, Robin 1992, *passim*). The tribes of 'Athtar and Amîr, who had recently taken up residence in the town, controlled the caravan trade, replacing the declining kingdom of Ma'în. Haram was the centre of an autonomous territory. Haram, in which one recognizes *Carmei* mentioned by Pliny (*Nat. Hist.* VI, 157), does not appear in the list of sites the expedition of Ælius Gallus passed through. Relatively important activity can be assumed during the 1st century AD, based on the presence of the clans 'Athtar and Amîr, and the active irrigation system. Nevertheless, the occupation of the site was rather short: no inscription later than this period has been found on the site, and there are no further references to the site. Nothing is known of the reasons of its abandonment.

Nashshân and Nashq are the only sites remaining after the beginning of the Christian era among all the towns which constituted the urban network of the Jawf. At that time, they joined the kingdom of Saba' which went through a revival between the 1st and the 3rd century AD. Scanty clues tend to indicate that they were possibly inhabited until the 6th century AD (Robin 2004).

Cartography and thematic analysis: the urban network in a diachronic approach

Until now, all the studies discussing the reasons of the decline of the Jawf cities relied on epigraphic data and historical arguments. For security reasons, the Jawf is still inaccessible. Only two sites have been partly excavated: Yathill, located on the southern edge of the valley (Maigret 1991, 1993, 2004), and Nashshân (extra-muros temple: Breton 1992; intra-muros temple: Arbach, Audouin 2004).

For this article, I conducted an archaeo-geographical study of the settlement pattern of the Jawf valley so as to analyse the trends affecting the urban network from another point of view.

Data processing

The methodology I used attributes each site, for each century of its occupation, a factor whose weight varies according to the hierarchical importance of the site. The aim was to map, century by century, the importance of each site within the urban network. The hierarchical importance of the site is therefore reflected on a map by a circle whose size varies according to the weighting factor.

This factor is defined on the basis of qualitative and not quantitative descriptors, since sizes or population figures cannot be obtained for each site and each century. These are the presence or absence of functional structures (rampart, temples, market place, political centre, etc.). Twenty-eight descriptors have been used. Their presence (or absence) on each site has been ascertained through archaeological and epigraphic data.

Including the chronological dimension

In order to reflect the evolution of each weighting factor through time, I had to consider the life span of every functional structure defining it. A site rarely combines all the functions mentioned in the sources during the whole period of its occupation. Therefore, it was necessary to consider not only the presence or absence of each descriptor, but also the span of their use, century by century, between the 8th century BC and the 6th century AD. This degree of accuracy cannot always be obtained; therefore, the maps include some sites labelled "indeterminate occupation" so as to compensate for the gap in the documentation.

Cartography and thematic analysis

After inputting all of the known data, a weighting factor was obtained for each site and each century, reflecting the hierarchical importance of the site in question. It varies from 0 to 30. Afterwards, by looking at the global result and at the archaeological data which may be correlated with the sites in a large variety of situation, I determined thresholds defining the nature of the sites. Four main categories have thus been outlined:

- Hamlets and villages: these are the sites with a weighting factor between 2 and 6, with a dense dwelling area smaller than 0.3 ha for the hamlets and 0.8 ha for the villages. The subsistence economy is based on the cultivation and the maintenance of an irrigated area. This corresponds to the association of a small dwelling site surrounded by a hydraulic system and terrace cultivation/irrigated fields. It can be combined with the presence of a well and/or a temple;
- small towns: they are the sites with a weighting factor between 7 and 10, with an area over 0.8 ha. To the aforementioned functions, we may add the presence of fortifications, sometimes tower-houses. These sites are thus characterized by their defensive function, subsistence function and administrative function linked to the maintenance of an irrigated system;

- local urban centres: their weighting factor is between 11 and 15 and their area exceeds 2 ha. They bring together the defensive function, the subsistence function with the management of a land with hydraulic structures, the religious function marked by the presence of the temple dedicated to the main deity of the tribal pantheon, and the political function expressed through the houses of a local elite;
- over 15, we are dealing with a *regional or large urban centres*, including a federal sanctuary devoted to the main deity of a kingdom, a place of pilgrimage, the residence of a regional authority, etc.

Contribution of the cartographic analysis to the comprehension of the decline of the Jawf cities

The mapping of the data integrates a temporal perspective by several successive maps (*fig. 4a-4e*). Figure 4a shows the Jawf urban network in the 8th century BC. At this time, the tribal cities of the Jawf appeared in the epigraphic data, thus revealing their social structure. The situation in the Jawf changed noticeably between the end of the 7th and the beginning of the 2nd century BC with the fading away of the kingdom of Saba' and the emergence of the kingdom of Ma'în. Within this time span, the 4th century BC offers the most abundant material. Figure 4b illustrates the urban network for this century. Figure 4c shows the situation during the 2nd and 1st centuries BC, when the kingdom of Ma'în was declining and Arab tribes settling in the area, causing major cultural changes on the sites of Kaminahû and Haram. Figure 4d shows the situation just after the Roman expedition in the Jawf led by Ælius Gallus in 25 BC. The last map, Figure 4e, reports the situation in the 3rd century AD; at this time, the Jawf cities are explicitly mentioned for the last time in South Arabian inscriptions.

Resilience of towns confronted with historical events

Several observations can be made. The first one is the high resilience of urban settlements confronted with socio-political changes. The first events likely to have initiated changes in the urban network in the Jawf valley are Sabaeen military interventions in the 7th century BC. Admittedly, the hierarchical importance of the towns was slightly altered and the borders between the tribal territories redefined, but the urban network went through this troubled period with only limited changes. Yathill and Qarnaw grew from the status of small town and local urban centre to the status of large urban centres. Nashq remained a large urban centre whereas Nashshân dropped to the same status than its neighbour, Nashq. The only towns to disappear were Inabba' and Kuhâl for reasons that have not yet been identified.

The second major socio-political element is the active part of the kingdom of Ma'în in the trans-Arabian caravan trade from the 6th century BC onwards. The inhabitants of Yathill, Qarnaw and Nashshân traded myrrh and incense through the Arabian Peninsula, as far as Greece and Egypt. These traders settled in many Arabian towns. Could they at that point have been tempted to turn this wealth to their advantage, to lead an expansionist policy and to increase their importance to the detriment of their neighbours? The urban network does not reflect any change in line with this guess; on the contrary, towns in this area appear stable (*fig. 4b*). The historical explanation is probably to be sought in an incomplete emancipation of the kingdom of Ma'în. Its activity seems to be carried out with the approval of the major neighbouring kingdoms, under the influence of whom Ma'în might have been placed intermittently. Thus, in the middle of the 4th century BC, a king of Hadramawt (a large kingdom located in the oriental region of the present-day Yemen) financed the construction of a part of the city-wall in Qarnaw as a response to the threat of the Sabaeen kingdom; in the 3rd century BC, the king of Ma'în dedicated hydraulic structures to the gods of Ma'în and Saba', indicating at best an alliance, at worst a kind of submission to the neighbouring kingdom; several years later, the king of Ma'în, in a dedication of the newly restored temple of Nakrah at Yathill, invoked the gods of Ma'în and Yathill, but also the deities, patron, kings and tribes of Saba'. Lastly, Ma'în benefited from a preferential treatment from the kingdom of Qatabân (a large kingdom that stretched along the southern edge of the inner desert of South Arabia).

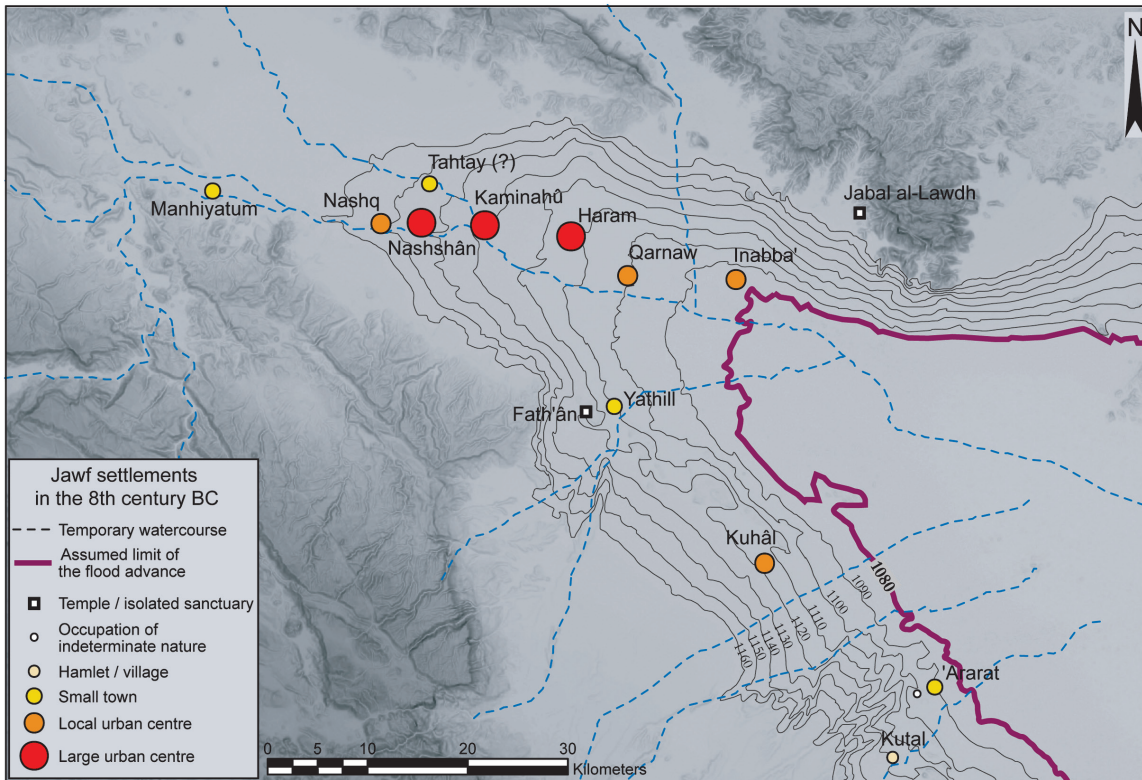


Fig. 4a – The urban network of the Jawf valley in the 8th century BC.

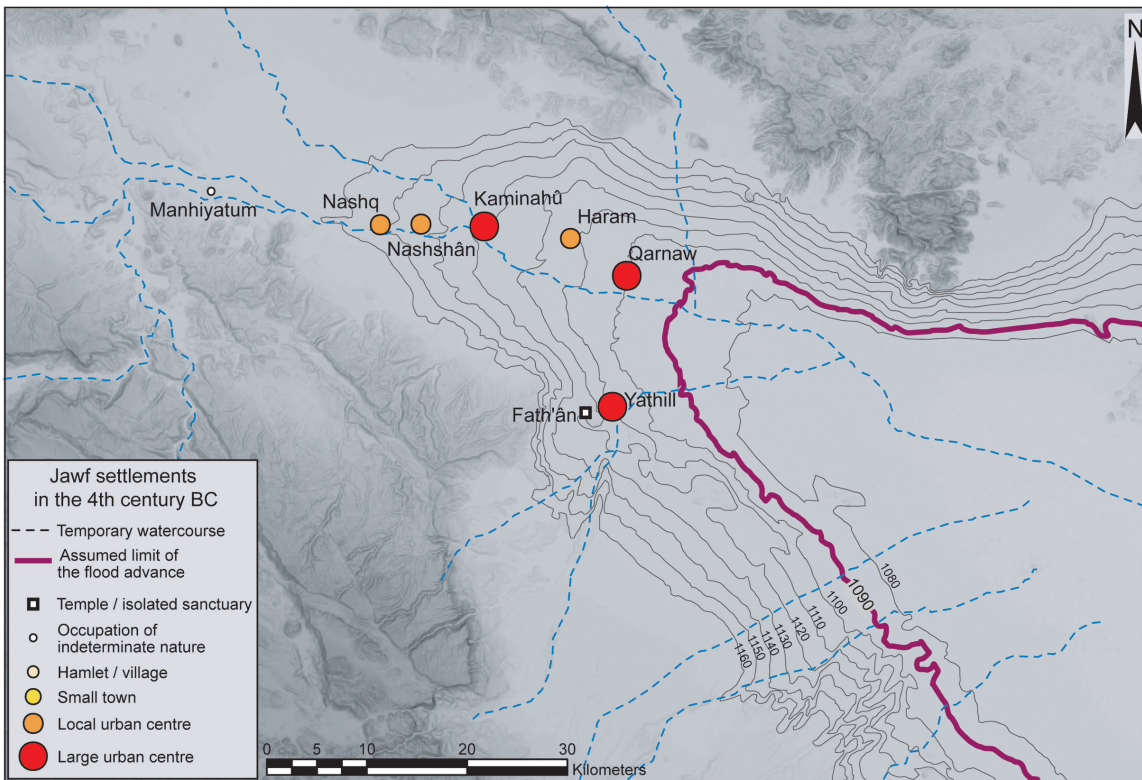


Fig. 4b – The urban network of the Jawf valley in the 4th century BC.

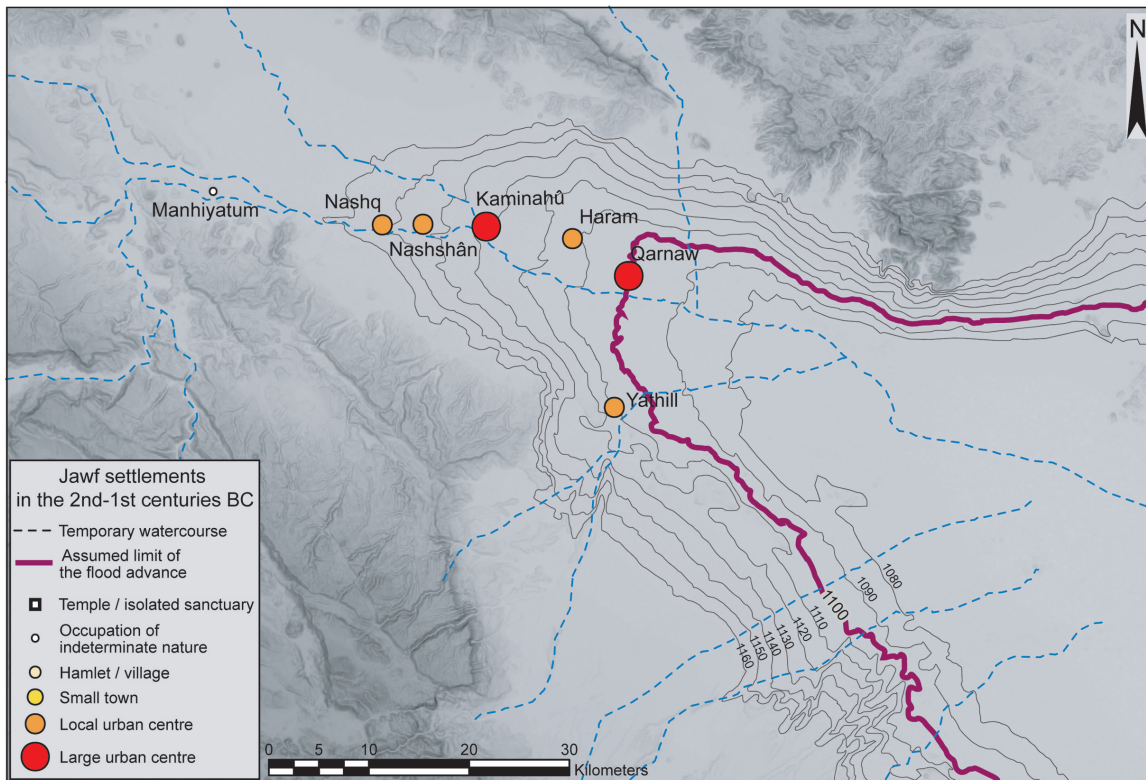


Fig. 4c – The urban network of the Jawf valley in the 2nd and 1st centuries BC.

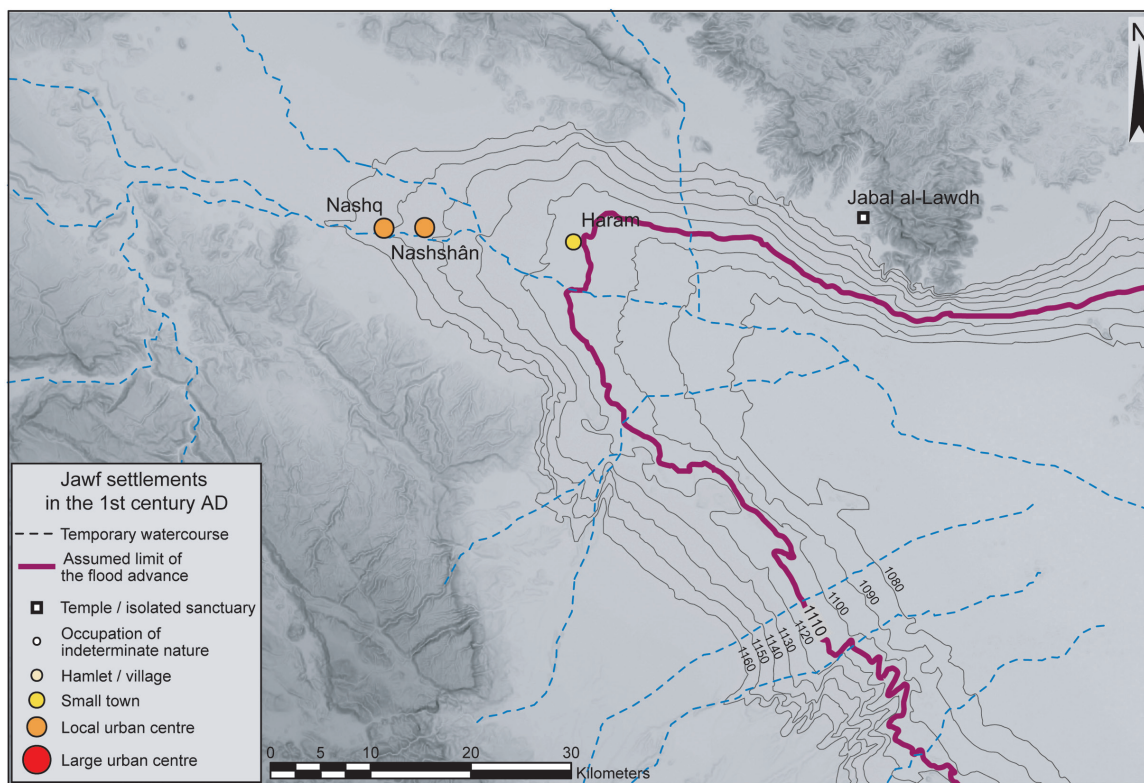


Fig. 4d – The urban network of the Jawf valley in the 1st century AD.

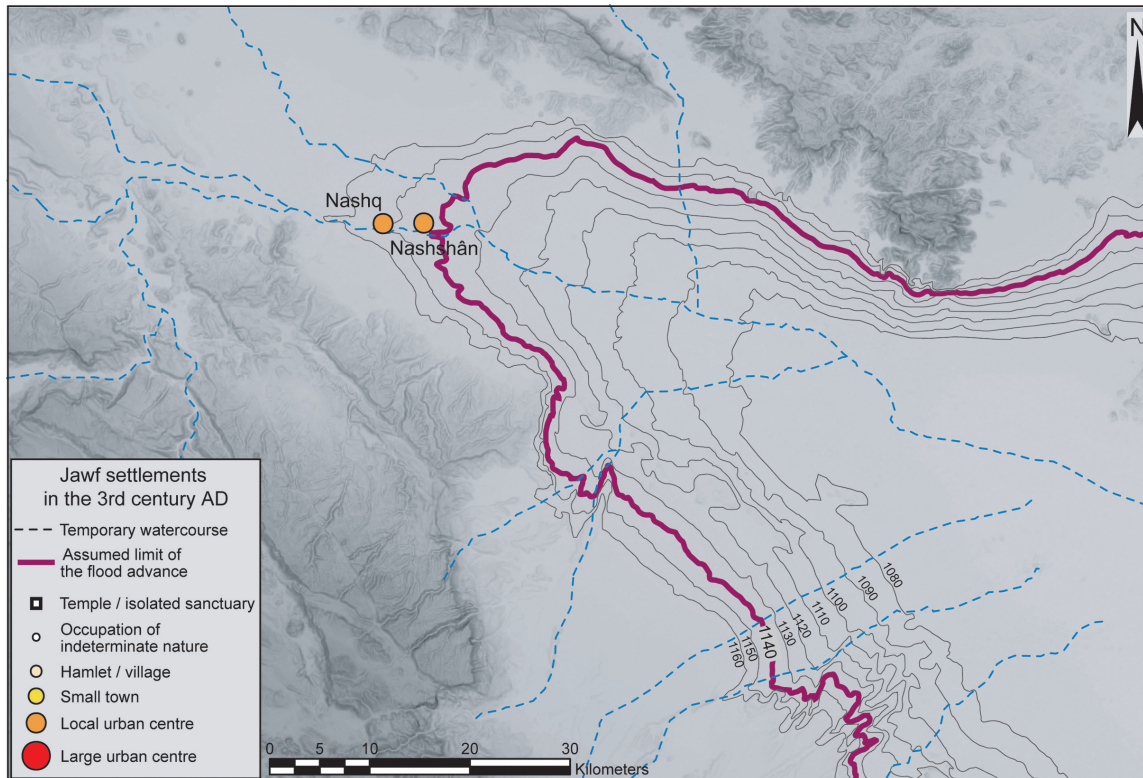


Fig. 4e – The urban network of the Jawf valley in the 3rd century AD.

What about the Arab penetration in the Jawf which introduced many changes from the 2nd century BC onwards? The map of the 1st century BC (*fig. 4c*) does not reflect many changes in the organization of the urban network except for the decline of Yathill, which became a local urban centre. The political entities re-formed and the population changed; nevertheless, the urban network remained stable.

The expedition of Ælius Gallus (*fig. 3*) did not noticeably affect the urban network in the area. When comparing the situation between the 1st centuries BC and AD, we notice the abandonment of two main towns: Qarnaw and Kaminahû, and of a small town: Yathill (*fig. 4c-d*). Yet, Kaminahû is the only town to be sacked by the Roman army. Qarnaw is not listed in the towns destroyed by the expedition; its abandonment and that of Yathill may have other causes. On the contrary, Nashq and Nashshân, sacked by the Romans, survived this event.

Thus, the resilience of the urban network confronted with political, economic and military events is high. Admittedly, towns disappeared in the course of the 1st millennium BC, but for other reasons than those usually put forward, except for Kaminahû, which fell victim to the men of Ælius Gallus.

The hypothesis of a recession of the boundary of annual or biennial floods

The profound cause of the decline of the towns in the Jawf is to be sought elsewhere than in historical events. Looking at the maps of the evolution of the urban network (*fig. 4a-e*), it is obvious that the first towns to decline and to be abandoned are those located the furthest downstream, below the isometric line of 1100 m; the other towns are progressively abandoned from the lowest part of the valley to the highest part, following the bed of the wādî Madhâb. Therefore, environmental reasons seem to be the best way to explain the contraction of the urban network. Indeed, the progressive drop of the hierarchical weighting factor of the sites and then their abandonment following the course of the wādî towards upstream lead me to correlate this decline with a decreasing flow of the wādî and a recession of the flood boundary: the flood did not reach the lowest part of the valley as it did before. Let's not forget that the subsistence of the local population is

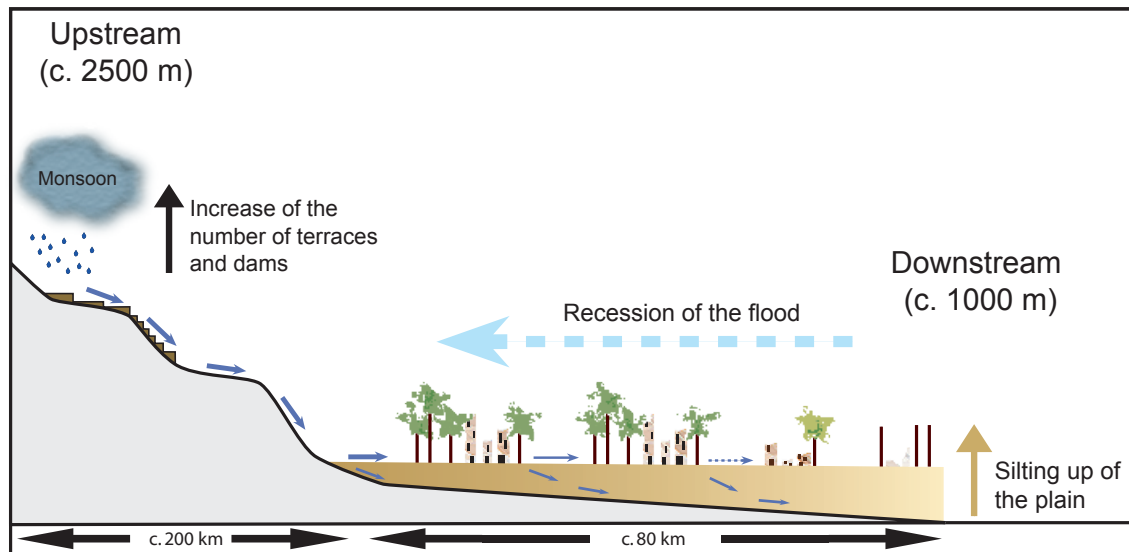


Fig. 5 – Outline of the causes of the recession of the flood advance in the Jawf valley.

made possible through biennial floods allowing irrigation and cultivation. Therefore, following a recession of the flood boundary, the land downstream might have dried up progressively, leading to the decline of the towns and their abandonment, sometimes hastened by an historical event (the Roman expedition for example).

Thus, Inabba' (1083 m a.s.l.) disappeared first, between the 7th and the 4th centuries BC, along with Kuhâl, Kutal and 'Ararât, three towns supplies with water by two other drainage basins, which probably disappeared for the same reasons. During this period in the only valley of the Jawf (wâdî Madhâb), it is possible to suggest a recession of the flood boundary from the isometric line of 1080 m in the 8th century BC to the line of 1090 m a.s.l. in the 4th century BC (fig. 4a-b).

In the 1st century BC, we postulate a recession of the flood advance to the isometric line of 1100 m a.s.l. The decline of Barâqish could be an indicator and a consequence of this phenomenon (fig. 4c). During the 1st century AD, the flood advance seems to reach the isometric line of 1110 m a.s.l. (fig. 4d). Qarnaw and Yathill, settled in the space between the isometric lines of 1100 and 1110 m disappeared from the map. Kaminahû also disappeared although it is settled on a higher point (c. 1130 m) but the probable link between its abandonment and the sacking of the city by the Roman army has already been mentioned.

Lastly, between the 1st and the 3rd centuries AD, the flood boundary seems to retreat from the isometric line of 1120 m to the line of 1140 m a.s.l. This recession is characterized by the disappearance of Haram in the 1st cent. AD, settled at c. 1120 m a.s.l. (fig. 4d-e).

The influence of the environmental factor on the evolution of the urban network can hardly be denied. A recession of the flood boundary seems obvious and might be echoed by an inscription dated from the 1st century, mentioning a year without water.⁵ If historical events could have hastened the fate of some towns, the profound cause to their abandonment is probably to be sought in the weakening of the structure of the urban society, due to environmental changes (fig. 5).

Nashq and Nashshân, situated upstream (respectively at 1146 and 1153 m a.s.l.), were still occupied for several centuries. The persistence of this occupation can partly be explained by this location; in addition, the inhabitants of these towns inherited age-old know-how in irrigation techniques. This is not the case for the neighbouring sites where a non-indigenous population had settled at the end of the 1st millennium BC. This population was probably less skilled in the harnessing of hydraulic systems as it seems to be illustrated

5. This inscription is labelled Haram 10; it has been published by C. Robin (1992).

by the second irrigation system in Yathill.⁶ Moreover, Nashq and Nashshân benefited from the will of the Sabaean kings to preserve cities with a heritage consolidating their legitimacy. This Sabaean voluntarism is a product of an ideological need to found anew the Sabaean state,⁷ it is also obvious in the rehabilitation of the ancient cults in the Jabal al-Lawdh temple, in the northeast of the Jawf.

In this new political context of the early Christian era, the kingdom of Saba' is confronted with a new kingdom, that of Himyar; the ancient political entities from the Jawf have disappeared; Nashq and Nashshân, associated with Ma'rib, appear as the political heirs of the old Sabaean aristocracy (Avanzini 1995, p. 59). They outlasted the neighbouring cities by five centuries.

Conclusion

The environmental impact on the decline of towns in the Jawf is very likely, in light of the historical cartography presented here. However, some of the reasons traditionally put forward to explain the abandonment of the towns cannot be rejected on the sole basis of these determinist considerations. The environmental argument has to be justified; the determinism has to be put into perspective.

Justifying the hypothesis of a recession of the flood boundary can be done with several arguments that could be confirmed by a geomorphologic study. Firstly, the heavy rainfalls were concentrated on the highlands; steep and impermeable slopes led the runoffs downstream, in the valleys, among which the Jawf valley. Every year, the flood carried sediment, which collected progressively in the valley. The increasing thickness of sediments would absorb an increasing quantity of water for equal surface. Secondly, the development of terrace cultivation in the highlands, very important at the beginning of the Christian era, along with the building of dams, probably deprived the population settled downstream of a large part of the runoffs (fig. 5).

Putting the environmental determinism into perspective means that, although the underlying cause of the decline of the Jawf towns is environmental, as proved by the high resilience of the urban network in view of historical events, the latter could nonetheless have hastened the decline of towns weakened by the receding flood and an increasing drought. Therefore, it is necessary to put things in perspective; cartographic analysis makes it possible.

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6. B. Marcolongo (1996, 1997) pointed out the existence of two irrigated areas used during two different periods. The older one shows an accumulation of silts sometimes exceeding 10 m high and covering an area of 400 ha. A second 300-ha-large irrigated area is established about the 3rd century BC; the canalizations are circumscribing larger and more irregular plots of land than in the first irrigated area. The thickness of the silt is less important, and does not exceed one meter high on the eastern edge of the cultivated area. This area does not seem to have been cultivated for a long time.

7. "bisogno ideologico di rifondazione dello stato sabeo", A. Avanzini 1995, p. 60.

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