SARASWATI

THE RIVER PAR EXCELLENCE

Edited by

S. K. Acharyya Kunal Ghosh Amal Kar

THE ASIATIC SOCIETY

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Evolution of Early Human Settlements in the Sarasvati River Basin: Archaeological Evidences and Site Distribution Analysis

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Introduction

The alluvial landscape located between the glacier-fed Himalayan rivers of Yamuna and Sutlej, bounded by the Siwaliks in the north and the Aravalli outliers and the Thar Desert in the south, poses a great enigma archaeologically due to the absence of perennial rivers and presence of a large number of archaeological sites, and yet it is configured with multitude of channels and palaeochannels. This region is vividly described in the Rigveda, the Mahabharata and other ancient works, and it houses one of the most revered settlements, namely, Kurukshetra. This region also houses one of the prosperous and well-developed urban civilizations of the third millennium BCE, and provides evidences of its formative phases datable to fourth millennium BCE. Human presence in this region could be traced even further back, albeit not in the plains, but in the lower Siwaliks bordering the upper reaches of the River Sarasvati. Various geological studies illustrate how the River Sutlej flowed into River Sarasvati and thereby contributed a bulk of the volume of water flowing through it. This region witnessed the human occupation in a major way from the fourth millennium BCE onwards. The recent radiocarbon dates from the sites of Kunal and Rakhigarhi further push back the antiquity to fifth millennium BCE. Ever since, a continuous human occupation could be noticed up to the end of the Harappan Civilization that came roughly around 1900 BCE. The recent geological and geomorphological studies, further aided by the dating techniques, also help in the understanding of the dynamics of River Sarasvati and its tributaries, and in the role of River Sutlej, thereby giving a better perspective of human occupation and continuity vis-à-vis the river system.

Identification of the 'Lost' Sarasvati

In order to understand the role of human occupation in this region in relation to the river dynamics, it is essential to review the history of investigations of the River Sarasvati itself, which led to the present state of knowledge, as aided by the scientific techniques.

Brief history

The beginning of surveys on the ancient course of River Sarasvati and its identification with present-day dry channels started in the 19th Century CE onwards. One among the earliest surveys was by Lt. Colonel James Tod (1832), a political agent of East India Company in Rajasthan (Rajpootana), the accounts of which can be gathered from the publication Annals and Antiquities of Rajasthan. Tod gathered information regarding a couplet in the folklores of Rajasthan, which mentioned the absorption of Caggar (Ghaggar) River that led to the desertion of northern desert of Rajasthan. The period of this desertion was attributed to the drying of the Hakra.

Bisht, R.S. and Prabhakar, V.N. 2020. Evolution of early human settlements in the Sarasvati River basin: Archaeological evidence and site distribution analysis. In, Saraswati: The River par Excellence (Eds., S.K. Acharyya, Kunal Ghosh and Amal Kar). The Asiatic Society, Kolkata, pp. 159-196.

Danino (2010) traces the reference to Ghaggar and Hakra, as different names of the same river on British maps since 1788 by James Rennel, Surveyor General of Bengal. The account of Major Colvin (1833) mentions about the River Chittung, or Chittang (Chatrang Nadi, as called by the locals, the modern Chautang, or the ancient Drishadvati, a tributary of River Ghaggar) and provides a map that traces its course. The same map also shows River Kaghar or Ghaggar which shows the ancient course of River Sarasvati as a dotted line from near Phoolud (Phulad) and passing nearby Eirwa (Bhirrana?), Futtehabad (Fatehabad) and Seersah (Sirsa), before joining the Ghaggar. Major F. Mackeson (1844) mentions about the traces of the course of a major river in Bahawalpur, marked by a series of villages along it. In the meantime, the course of River Sarasvati was identified between the Rivers Yamuna on the east and the Satluj on the west. Danino (2010) traces this identification to Vivien de Saint-Martin who also regarded all the streams and rivers like the Ghaggar, the Markanda, the Sarsuti and the Chautang, and their sub-streams collectively with River Sarasvati.

The mention of River Sarasvati with different names, albeit with the same or similar phonetic equivalent, could be seen in the various accounts and publications of the 19th Century. Sarsuti, Sankra, Soorsatty and Sotra are a few examples. Alexander Cunningham (1924), who published two maps, one on the campaign of Alexander in the Panjab and the second on the travels of Hwen Thsang in northwest India, showed the location of River Sarasvati joining the River Ghaggar to the north-northwest of Kaithal (Sastri, 1924).

A map (Fig. 6.1**),** published in 1865 by Spruner Menke, a German Geographer, clearly shows the Rivers Ghaggar, Sarasvati and Drishadvati, even though their names are not mentioned in the map. The upper course of the Ghaggar in the map has two streams, the right one being most probably the River Sarasvati. River Drishadvati is shown as a dotted line downstream before it joins the Ghaggar. The lower course of the Ghaggar is not shown in this map. However, the interesting aspect is that the upper course of River Drishadvati is shown jointly with River Yamuna, indicating a common origin. Another map published by Henry Beveridge (1867) also shows River Sarasvati (Soorsutty) and Ghaggar (Guggur) (Fig. 6.2). In this map, the river is shown just beyond Bhatneer (Bhatnair).

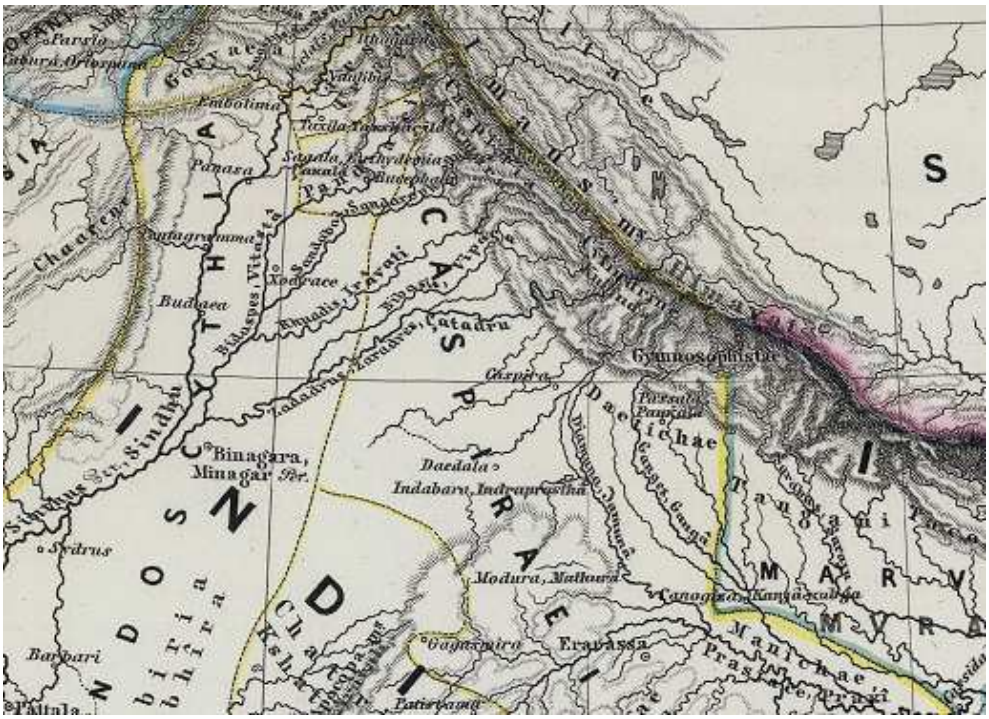

Fig. 6.1. Spruner Menke's map (1865), showing the rivers Ghaggar, Sarasvati and Drishadvati.

Fig. 6.2. Henry Beveridge's map (1867), showing River Sarasvati (Soorsutty) and Ghaggar (Guggur).

C.F. Oldham (1874) notes the still traceable dry course of a large river "from near the Himalaya, through Bhatiana, Bikaner and Bhawalpur, into Sindh, and thence towards the Rann of Kach (Runn of Cutch)". Oldham (1874, 1893) also mentions the 'old channel' running more than 600 miles (965 km), variously known locally as Naiwal, Sotra, Hakra, Wahind and Dahan. Oldham further mentions about a map of ancient India by Heinrich Kieper, wherein the River Sotra or Hakra is shown as a dotted line in continuation of River Gaggar (Ghaggar).

Firuz Shah converted the Chitrang or Drishadvati into an irrigation canal in the 14th Century CE, and connected it to the Sarsuti (Sarasvati) and the Gaggar (Ghaggar) and then to 'rivulet of Khera'. 'Khera' here is identified with 'Hakra' by Oldham (1874). Oldham (1893) observes that the upper course of the Hakra is known as Sotra or Sutra, which could be a corruption of Sutodra or Sutudri, the ancient name of River Sutlej. The name 'Hakra' is said to have been a 'modified form of Sagara', as 'S' is pronounced as 'H' in Rajputana and Sindh (Oldham 1874).

The map published by Oldham clearly shows the rivers Gugger (Ghaggar), Markanda and Saraswati, along with an old course of the Sarasvati. The map also shows the course of the Chitrang or Drishadvati River between the rivers Sarasvati and Yamuna. Oldham (1874) also notes, "course of this lost river, are scattered mounds, great and small, marking the sites of cites and towns; many of which must have been of considerable importance." Oldham further observes that River Satluj flowed originally in a 'southerly direction' and 'Sotra or Hakra is its ancient bed.'

Imperial Gazetter of India (Hunter, 1885) provides a brief account of River Ghaggar, tracing its route from the Himalayan slopes to the fort of Bhatner, and its dry bed as far as Mirgarh in Bahawalpur. The lower course of a river identified as the Saraswati or Sarsuti, which joined the Ghaggar downstream, is also mentioned. R.D. Oldham (1886) discusses in detail the course of Eastern Nara, which had sufficient water flow, even up to the 11th Century CE, and is known variously as the Hakra, Sakra, Wandan, Dahan, Wadhawah, Dadhawah and Wahind. The Eastern Nara and the dry riverbed upstream used to be continuous and are the sole remaining traces of that great river. The connection

between the Sarsuti (Sarasvati) and the Chitang (Chautang or Drishadvati) with Sotar is also pointed out by R.D. Oldham, and their probable connection to Vedic Sarasvati or Jumna. R.D. Oldham's map (1886) shows the present and the ancient courses of the Punjab Rivers in which the combined streams of the Ghaggar, Markanda and Sarasvati is named as the Sotra, Hakra, or Sankra River. In the Bahawalpur region, the dry bed is named as 'Wandan-Wahind' by R.D. Oldham (1886).

R.D. Oldham notices a dry riverbed upstream of Eastern Nara after nearly 97 km, known variously as Hakra, Sotra, Choya, and traced through Bhawalpur (Bahawalpur), Bikanir (Bikaner) and Sirsa, but lost again near Tohana. The toposheet published as late as 1955 clearly mentions several of the local names that were associated with River Sarasvati beyond Tohana as Joia Nadi, Sukru Nadi and Rangoi before it joins River Ghaggar near Sardargarh. In the same toposheet, the upper reaches of River Sarasvati is mentioned as River Markanda and named as the Sarasvati only beyond Pehowa. This toposheet shows Rivers Chautang, Markanda and Ghaggar from east to west. The tributaries of River Ghaggar are Dangri Nadi with its branch Bagliarli Nadi on the east, the Patialewali Nadi with its tributaries upstream, the Patiali Rao and the Choa Nadi to the west. The other smaller rivers to the west of Patialewali Nadi are Jahmbowah Choi and Jainta Devi ki Rao.

Archaeologically, the entire flood plain is dotted with numerous sites ranging from pre-urban / proto-urban / mature urban and late / decadent urban phases of the Indus Valley Civilization of Copper-Bronze Age, cultures of early Iron Age, early historical and different historical phases down to late medieval times, and all ranging from the 4th millennium BCE onwards. However, a perceptible decline has taken place in the settlement pattern, both quantitatively and qualitatively, which must be due to the changing water regime in the river. Water remained variable over time, and is even vouched for in the ancient literature. While the Rigveda describes the Sarasvati as a mighty river from the mountains to the ocean: "*ekachetat Sarasvati nadinam suchiryatigiribhya a samudrat*" (the Sarasvati moves on from the mountains to the ocean), by the time of the later Vedic period, the river was already on the path of desiccation as is evidenced in the Satapatha Brahmana, Panchavimsa Brahmana and the Mahabharata. Environmentally, it coincides with the onset of the global aridity around 2000 BCE.

Present pattern

The area is formed of two drainage systems, (i) the southeastern part that is much smaller and is drained by the monsoon channels of the Sahibi, Kasavati (Krishnavati), Kantli, and others, mostly emanating from the Aravallis in Jaipur area. Excepting the Kantli, all others suddenly turn to the east to meet the Yamuna, or get lost on the way now; (ii) the much larger area with a marked southwestern slope and showing numerous palaeochannels, all of which merge with an arterial palaeochannel that runs from east to west in its middle course. It is this trunk channel, which is known by different names in different segments, such as Sarsuti, Ghaggar, Sotar, Ghaggar, Hakra and Wahinda between the area from the Siwaliks to some distance below Derawar Fort (Pakistan), where it is lost in the sand only to reappear near about Alor and Rohri, where it is known as the Nara that runs almost parallel to the tortuous Indus to its west and finally meets the Great Rann of Kachchh. Most interestingly, the lower course of the Nara is still called the 'Hakro', which lends its name to local inhabitants as well. This arterial river is rightly identified with the Rigvedic Sarasvati by majority of scholars from the 19th Century onwards, although there are some dissenting voices too, mostly of the present time.

The 'lost' Sarasvati of the 'Rigvedic' fame has been identified ever since the 19th Century onwards by the geographers, geologists, cartographers, historians and archaeologists with the palaeochannel that originates from the Siwaliks and runs through parts of Haryana, Rajasthan, Cholistan in Pakistan Punjab, Sind, and Kachchh in Gujarat, and then meets the Arabian Sea through the Kori creek. The

different segments of its channel are variously known as the Sarasvati from the Siwaliks to Bahar in Haryana, as Jioia Nalah from Tohana to Chandu Khera – Kunal, as Rangoi from Kunal through Fatehabad to Sirsa, as Ghaggar from Sirsa-Otu to Binjor, as Hakra in Cholistan of Pakistan, and as Eastern Nara in Sindh, Pakistan. From there it runs through the Rann and passes through the Kori Creek to the sea.

Archaeology of Human Settlements

Prehistoric period

The evidence of prehistoric cultures in the combined basins of Ghaggar-Sarasvati-Drishadvati is lacking, except in the upper reaches where these rivers originate in the Siwaliks within the states of Punjab, Haryana and Himachal Pradesh. In the lower reaches, marked by the Hakra or Eastern Nara, evidence for palaeolithic culture is noticed in the Rohri hills, with a long sequence of cultures ultimately continuing up to the Harappan and Late Harappan periods. As the evidence for prehistoric culture comes from the Siwalik formations in Punjab, Haryana and Himachal Pradesh, it is presented here for all the three river basins, i.e., Sutlej, Ghaggar and Yamuna.

Prehistoric stone tools are reported from several locations in the Siwaliks, located along the rivers Beas, Banganga, Ghaggar, Sirsa, Sutlej, Chenab and Ravi (Gaillard 1995). Mohapatra (1981) reported the presence of about 65 Soanian and 21 Acheulian stone tool sites from the Hoshiarpur Siwalik. The Acheulian sites are reported from Chandikotla, Jatwar, Sabaur, Jhangrian, Karura, Garhi, Supalwan, Suna, Kangar, Kot, Lalwan, Palata, Samundri, Ghanaura, Kahnpur, Khuhi, Aitbarapur, Tikhni, Babahar, Rahmanpur, Daulatpur and Marwari (Mohapatra 1981). The Acheulian bifaces have been reported from the Upper Siwalik formations like Tatrot, Pinjore and from the boulder conglomerate formations. Acheulian stone tools are reported also from the Aravalli Ranges in Gurugram district of Haryana and from within the campus of Jawaharlal Nehru University at New Delhi.

The above occurrences indicate the early human presence in the upper reaches of the rivers Sutlej, Ghaggar and Yamuna. However, the evidence for prehistoric human occupation of the plains, watered by these three rivers, is largely lacking, which may be due to the absence of suitable stone raw materials for making the tools. Further, the entire area between the rivers Ghaggar and Sutlej had been geologically unstable as the Sutlej changed its course several times during its journey towards ultimate joining with the River Beas (Oldham, 1874). The shifting of River Sutlej might have modified the geomorphology of this region and also obliterated several settlements.

Chalcolithic and Proto-historic periods

The proto-historic period is the transition between the prehistoric and historic periods when the human started to settle down, leading a sedentary lifestyle and also started to domesticate plants and animals. This period includes the Neolithic, Chalcolithic and Bronze Age cultures of South Asia. Ever since the discovery of Indus Valley Civilization in 1924 from the excavation sites at Harappa (1921 onward) and Mohenjo-daro (by Marshall, 1922, and onward), investigations at several locations in the Greater Indus Valley have led to a better understanding of development of cultures, starting from the Neolithic period onwards. In the Indus basin, the combined evidence from the sites of Mehergarh, Nausharo, Pirak and Sibri indicates the settling of humans, domestication of plants and animals from around 8th millennium BCE, followed by several technological innovations, including pyro-technology, the smelting of copper, etc., which ushered in the Bronze Age, and coincided with the Harappan Civilization (Marshall, 1923, 1926, 1927, 1928; Kenoyer, 1991; Bisht, 2013).

In the Sutlej, Ghaggar and Yamuna basins, such evidence is lacking so far for the Neolithic and Early Chalcolithic cultures from around 8th to mid 4th millennium BCE, excepting the Rohri hills evidence from Sindh region of Pakistan, wherein evidence for prehistoric human occupation is noticed. From the 4th millennium BCE onwards, evidence for human occupation in the Ghaggar-Hakra-Sarasvati-Drishadvati river basins is noticed, which can be categorized into Early/ Pre-Harappan, Harappan, late Harappan, Painted Grey Ware and Rangmahal (early Historic) cultures. While the Hakra, Early Harappan, Harappan and late Harappan cultures fall under the Chalcolithic Age, the Painted Grey Ware and Rangmahal cultures belong to the Iron Age (Bisht, 1993, 2013). We discuss below the results of research on some of the important aspects of Harappan Civilization in the Sarasvati River basin.

Aspects of Harappan Civilization in the Sarasvati River Basin

Early Harappan / Pre-Harappan cultural phases

The early Harappan or pre-Harappan cultures represent the formative stages of Harappan Civilization and just preceded the urban phase (Fig. 6.3). These are Chalcolithic cultures, slightly advanced when compared to the Hakra culture in terms of sophisticated architecture, which at some sites like Kalibangan and Harappa have a fortification surrounding the settlement.

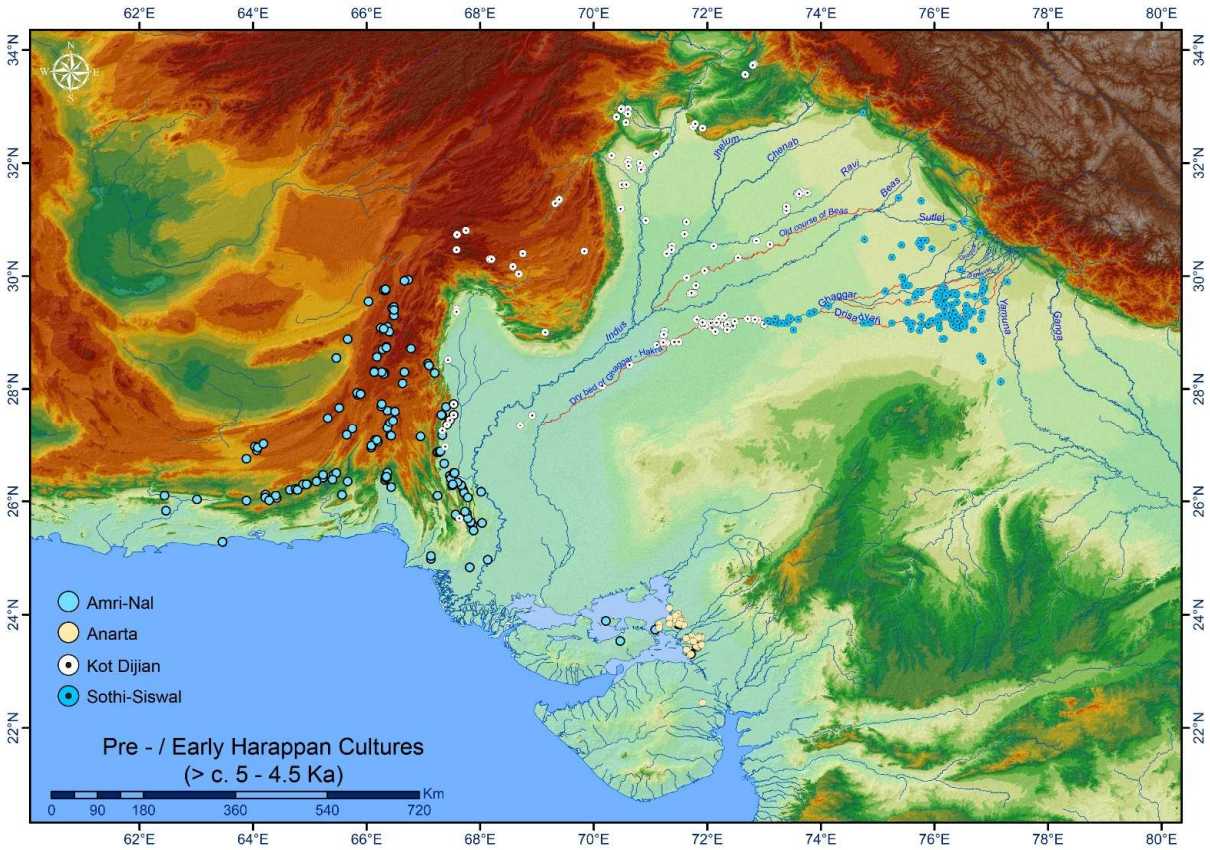

Fig. 6.3. Map showing settlements of Early Harappan period.

The early/ pre-Harappan cultures are dated to the first half of third millennium BCE, or more precisely from ca 2800-2600 BCE, when several of these regional chalcolithic cultures flourished in the Greater Indus valley. Ultimately this resulted in their integration around 2600 BCE. The early/ pre-Harappan cultures are distinguished from other cultures based on the material culture and geography,

and are named variously as Amri-Nal (south Sindh, Makran, Kachchh, Gujarat), Kot Dijian (north Sindh, Cholistan, Pakistan Punjab), Sothi-Siswal (Rajasthan, Haryana, Indian Punjab), Anarta (north Gujarat), and Damb Sadaat (central Balochistan). In the Ghaggar-Hakra basin, the Kot Dijian sites are found along the lower course, while the Sothi-Siswal sites are found along the central and upper courses including the Ghaggar, Sarasvati and Drishadvati basins. The Kot Dijian culture gets its name from the type site of Kot Diji in north Sindh, while Sothi-Siswal takes its name from two type sites, namely Sothi in Hanumangarh district of Rajasthan and Siswal in Hissar district of Haryana, both on the River Drishadvati.

Amri-Nal phase: One of the prominent regional chalcolithic cultures corresponding to the early Harappan phase is represented by the type-sites of Nal/ SohrDamb in Balochistan and Amri in Sindh (Fig. 6.4). Nal is located in the Khozdar area, linking the northern and the southern Balochistan. The site covers an area of 5 ha, and was excavated in 1925 by H. Hargreaves and later by the German Research Society and Government of Pakistan during 1997 to 2005. The typical Nal pottery is from Period II and is dated 3100-2700 BCE. The Nal phase consists of buff ware with polychrome painted motifs with different shapes that include ovoid, narrow mouthed pots, carinated pots with narrow mouth, straight walled jars, open and carinated bowls, canisters, etc. The painted motifs consist of both geometric and natural ones, including fish and ibex in colours like black, turquoise, red, yellow. The site also brought to light good evidence of burial practices.

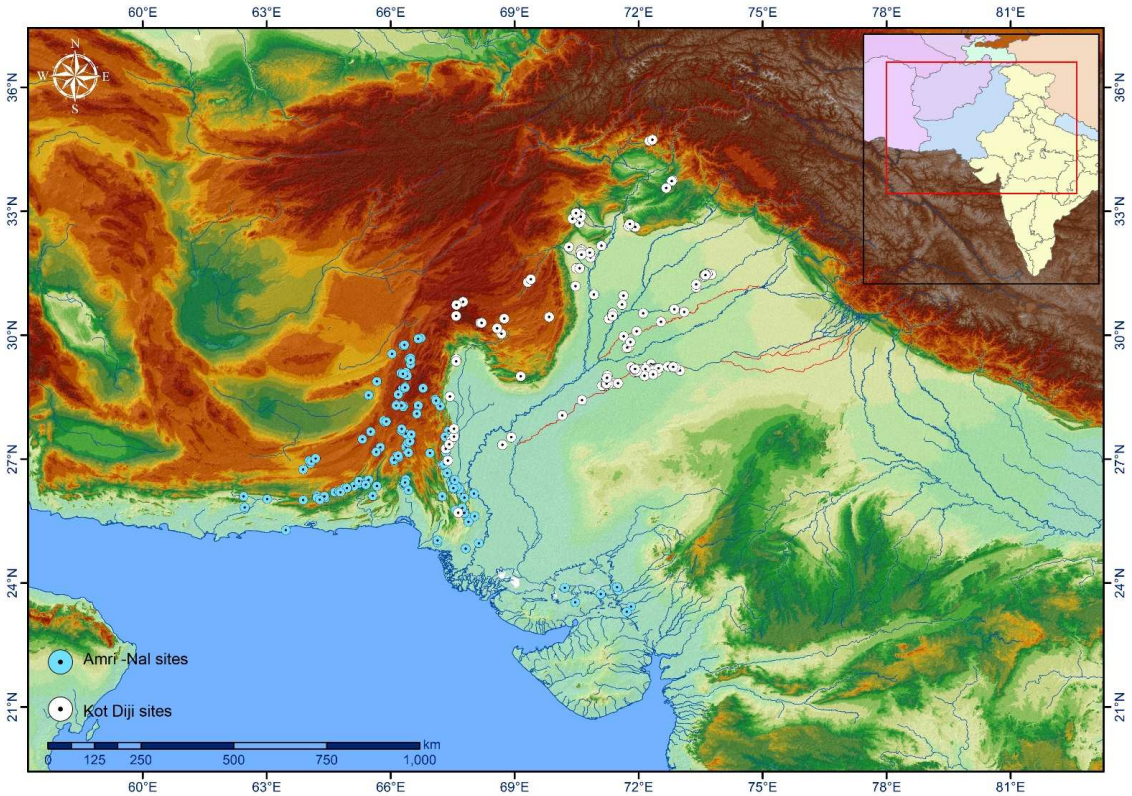

Fig. 6.4. Settlements of Amri-Nal and Kot Diji phases of Early Harappan period.

Amri is located in the Sindh region of Pakistan and on the right bank of River Indus. The earliest period at Amri corresponds to the early Harappan phase, which is sub-divided into four sub-phases. N.G. Majumdar (1939), who first identified the Amri-Nal diagnostic culture there, excavated the site in 1929 and 1930. Jean-Marie Casal carried out excavation from 1959 to 1962. Possehl (1999) considers the Nal and Amri assemblages of Sindh and Balochistan area as a singular complex. The Amri ware

consists of fine wares, generally fire light red or buff, along with red and buff slips with painted designs in black colour (Possehl, 1999). The painted motifs are mostly geometric, which transforms into curvilinear patterns towards the end of this early Harappan phase. The Amri-Nal assemblage is better represented at sites like Balakot near Somniani Bay to the west of Karachi, Ghazi Shah, Amri and Mehrgarh. The Amri-Nal culture spread into Gujarat during this period, when a few modest settlements with fortification came up.

Kot Diji phase: The Kot Dijian culture is found over a wider area than that by the Amri-Nal, but the two coexisted in a few sites in Balochistan (Fig. 6.5). However, the ceramics of the two cultures are different and easily identifiable. The absence of tall jars and short jars with featureless rims of the Amri-Nal assemblage and the fat-bodies pots and canisters of Nal assemblage from the Kot Dijian ceramic assemblage makes it distinct from other cultures.

The Kot Dijian ceramic assemblage is characterised by various forms, shapes, and surface treatments, and is found in red or buff fabric. The Kot Diji ceramic is also finished with a fine and smoothed surface. One of the prominent motifs is the 'horned deity' on the pottery vessels, which continues well into the Harappan period also, and is depicted on seals and ceramics as well. The horned deity motif was also found in the Neolithic period from Burzahom in Kashmir, indicating long distance trade contacts. Other distinct ceramic types of Kot Diji are 'Bhoot Ware', 'Wet Ware' and 'Sand-rusticated Ware'. The Bhoot ware was first noticed at a site called Bhoot in Cholistan region. The ware has distinct deep grooves on the surface of small globular pots, indicating its use as a water container. The Wet ware is distinguished by crinkled surface pattern, often with a dendritic pattern. The Sand-rusticated ware is similar to the ceramics of the Amri-Nal, Damb Sadaat and Sothi-Siswal (Fabric B of Kalibangan) assemblage and is identifiable with the application of a thick slip of sandy clay applied over the body portion of the ceramics.

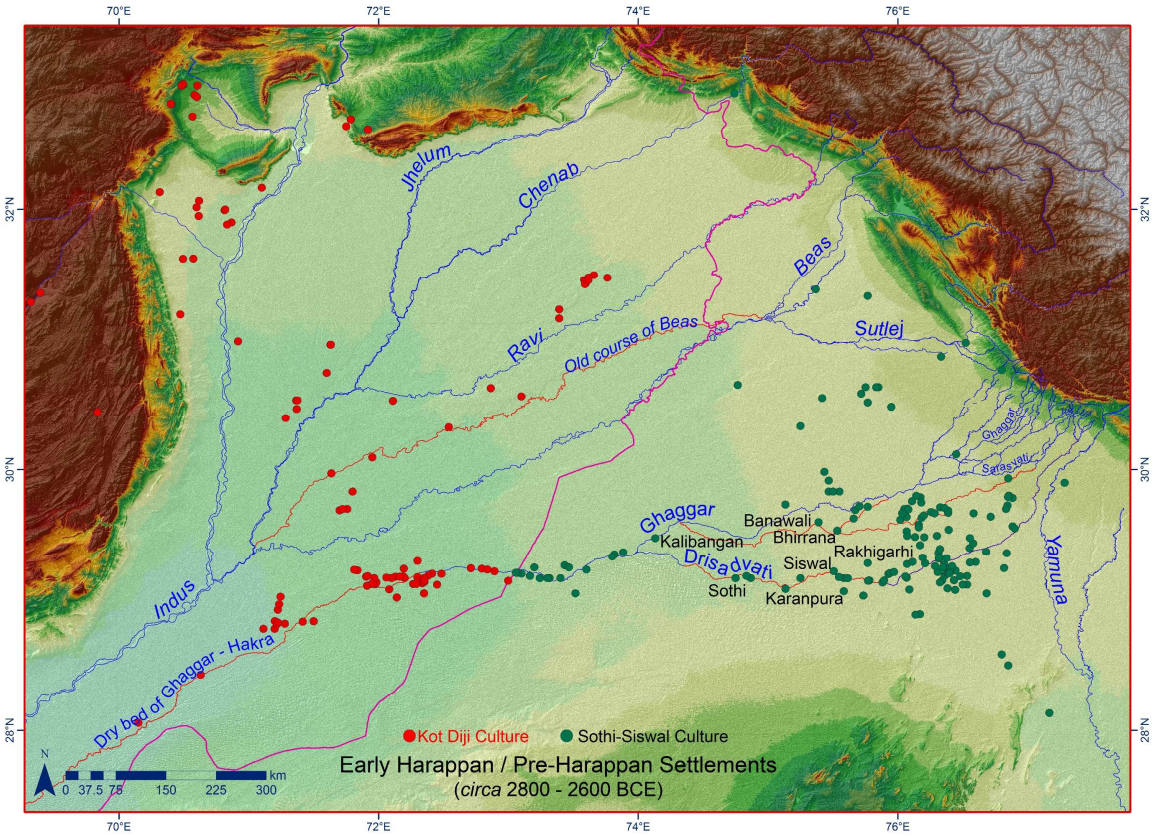

Fig. 6.5. Settlements of Kot Dijian and Sothi-Siswal Cultures.

Harappa is the largest Kot Dijian site, the other two large sites being Lathwala (30.5 ha) and Gamanwala (27.3 ha). Rehman Dheri, Sarai Khola, Lewan and Dabar Kot are the other important Kot Dijian sites. The culture was first identified from the site of Kot Diji, which is located at the southern edge of Rohri Hills and on a traditional trade route on the eastern side of River Indus. Mughal (1982) revisited the stratigraphy of the excavations and identified a large-scale conflagration all over the site, separating the early and the mature Harappan levels. Mughal (1995) defines the 'early Harappan' based on the findings from this site, and taking into account the continuity of cultural material during the mature Harappan period. The Kot Dijian phase is generally datable to the first half of the third millennium BCE.

Anarta phase: The ceramic assemblages found mostly in northern Gujarat and pre-dating the mature Harappan phase is termed the Anarta ware (Fig. 6.6). It is characterised by Gritty Red Ware and is accompanied by Fine Red Ware, Burnished Red Ware and Burnished Grey/Black Ware. The Anarta type of ceramics has been found from Surkotada, Padri (some typological similarities), Somnath (pre-Prabhas ceramics), Santhli and Loteshwar. R.S. Bisht identified the ceramics from the early periods of Dholavira also, having similarities to the Period II of Amri.

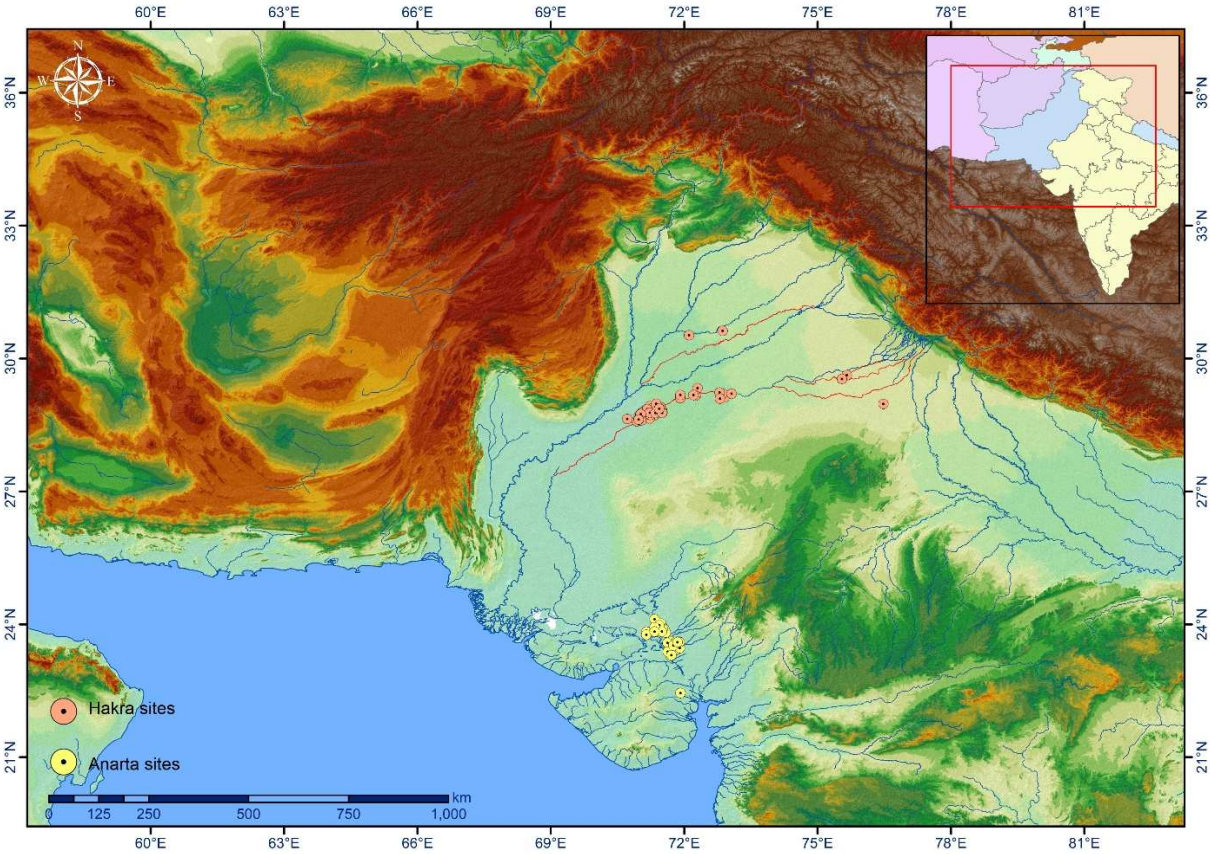

Fig. 6.6. Settlements of Anarta and Hakra phases of Early Harappan period.

The ceramics from Stage I and II of Dholavira consist of wheel-made red to pink wares, comb-incised wares and a reserved slip ware. Possehl (1999) noticed that the ceramics from the earliest levels of Dholavira correspond to the transitional phase of Amri (Period II). The ceramics of Stages I and II at Dholavira, which correspond to the early Harappan phase, also have the Anarta characteristics. The presence of the ceramic traditions of Amri at few sites in Kachchh, including Dholavira, suggests the influence of cultural traditions of Sindh region. Additionally, the regional Anarta traditions at Dholavira indicate cross-cultural interactions even during the early third millennium BCE.

Hakra phase: The largest concentration of the Hakra Culture within the Ghaggar-Hakra basin is found in the Cholistan region of Pakistan (Fig. 6.7). A total of 103 sites belonging to this culture have been discovered so far with a total settled area of 655.65 ha (Possehl, 1999). Mughal (1982), who carried out extensive survey in the area, characterized the settlements as '…low mounds in lesser Cholistan (Bahawalnagar and Bahawalpur districts) and are located to close to, or in the idahars (mud flats). In greater Cholistan (Rahimyar Khan district), they also occur on sand dunes." Based on radiocarbon dates and stratigraphic correlations from other sites, the Hakra culture settlements are datable to mid-fourth millennium BCE. This culture is identified on the basis of a distinct ceramic complex, which among others consisted of "mud applique" and "Hakra incised" wares (Mughal, 1982).

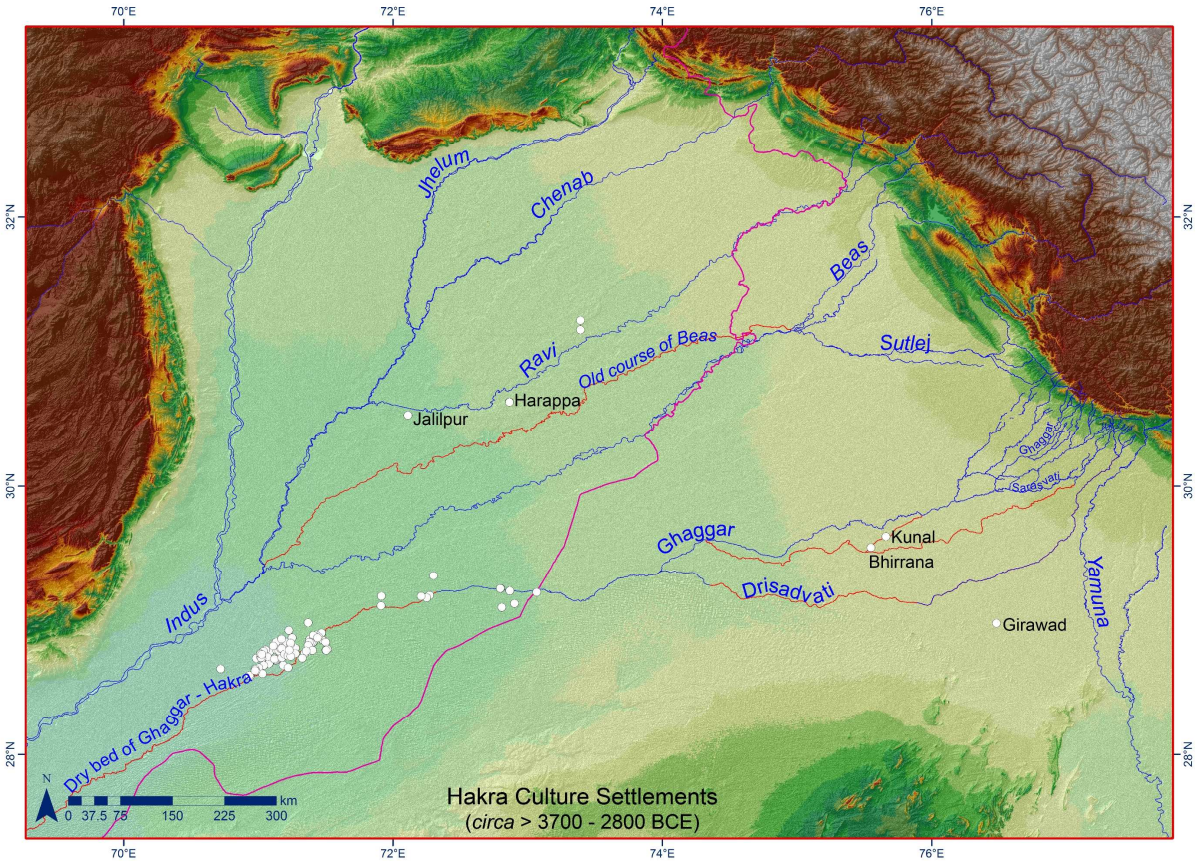

Fig. 6.7. Map showing the settlements of Hakra Culture.

A majority (54 in number) of the 103 reported sites have been identified as camp sites used by pastoralists, thus revealing the role of pastoralists during the early formative phases of Harappan Civilization. Among the Hakra culture sites, only two, the Jalilpur and the Harappa, have been excavated. The latter yielded a stratigraphic occurrence of this culture below the early Harappan ones that is dated from 3700-2800 BCE (Kenoyer, 2005, 2013). The nature of human occupation from Harappa consisted of several working floors along with hearths (Kenoyer, 2000), while at Jalilpur evidence of mud brick and earthen floors were encountered (Possehl, 1999). The ceramic assemblage of Hakra phase consists of "…both wheel-made and hand-made red wares with a variety of surface treatments" (Mughal, 1982). This consists of ceramics, "…treated on thee external surface with a secondary coating of mud mixed with bits of pottery called 'mud applique',…series of incised lines on the external surface called Hakra incised" (Mughal, 1982). The resemblance of some ceramic types of Hakra ware with Amri IA (Mughal, 1982) and also from Mehrgarh, Kili Ghul Mohammad (Possehl 1999) has been noticed, indicating the cultural roots and interactions with other cultural assemblages.

Another important ceramic type of Hakra ware is a red ware with black slip all over the body (Mughal, 1982). A small percentage of hand-made buff wares with black coloured paintings is also noticed that has parallels in the Pakistan-Iran borderlands (Mughal, 1982). The artefact assemblage from this culture consists of animal figurines of bulls and cows; bangles of shell and terracotta, grinding stone fragments, copper bits and pieces, and stone tools like blades, borers, arrowheads, scrapers and cores.

On the Indian side, three sites, namely Kunal, Bhirrana and Girawad, belong to Hakra culture (Shinde et al., 2011). The radiocarbon dates from Girawad puts the site at late fourth millennium BCE (Shinde et al., 2011), while for Bhirrana some very early dates have been proposed, which are not consistent with the fourth millennium BCE dates. The earliest phase of human occupation in the Ghaggar-Hakra basin can be traced to fourth millennium BCE.

Sothi-Siswal phase: An estimated 166 Sothi-Siswal sites have been discovered and out of these 19 are excavated (Fig. 6.8). The average size of these settlements is 4.28 ha with two sites more than 20 ha. Some of the important excavated sites are Kalibangan, Sothi, Nohar, Karanpura, Tarkhanawala Dhera (all in Rajasthan), Banawali, Siswal, Bhirrana, Rakhigarhi (all in Haryana). The Sothi-Siswal phase is based on the two type-sites, Sothi in Rajasthan and Siswal in Haryana, both on the River Drishadvati. Kalibangan and Banawali are typical examples of this phase, represented by a settlement surrounded by a mud brick fortification. The ceramic assemblage is distinct from other contemporary cultures and is characterised by prominently red, buff and grey coloured pottery, further classified into six fabrics based on the findings from Kalibangan. Fabrics A to D are red coloured pottery. Fabric A consists of hand-made pottery with black and white painted motifs, having parallels with few Kot Dijian types. Fabric B ceramics have '…rusticated lower portion and smooth upper portion...' (Possehl, 1999). Fabric C is a fine ware having smooth exteriors and slips of red, purple and plum red, while Fabric D is a sturdy red coloured pottery with deep incisions on the interior.

It has been found from excavations that both Sothi-Siswal and Kot Dijian cultures form an important phase, during which advancements in architecture, technology, trade and procurement of raw materials took place. Excavations at Kalibangan on the Ghaggar and Banawali on the Sarasvati indicate separate fortified settlements. Evidence for a ploughed field from Kalibangan is an important finding from this period. The palaeobotanical findings from Kalibangan indicate the presence of wheat, barley, chickpea and field pea. Wood remains include *Acacia* sp., teak, heartwood and axelwood. It has been estimated that except teak, the other species would have been easily found along Sarasvati River in gallery forests (Possehl, 1999). The presence of rhino bones from Kalibangan and Karanpura possibly indicates an ecosystem that was different from the present.

Mature Harappan cultural phase

During the second half of the fourth millennium and the early part of the third millennium BCE several regions of the Greater Indus Valley witnessed an integration of the regional Chalcolithic cultures. This integration was driven by factors like a common ideology, expansion of trade networks for procuring exotic products from often distant lands, pooling of resources from different regions, external trade with Mesopotamia, etc. Several medium to large towns of Kot Dijian and Sothi-Siswal cultures saw enormous prosperity and expanded into cities. Two of the five largest Harappan sites of over 100 ha size are noticed on the Sarasvati River, namely Ganweriwala (>100 ha) in Cholistan of Pakistan, and Rakhigarhi (>150 ha) in Haryana, India. The other medium to large cities of this period on the Sarasvati are Kalibangan, Karanpura, Baror (all in Rajasthan), and Banawali, Bhirrana, Farmana and Mitathal (all in Haryana).

An estimated 1500 sites of Harappan phase have been identified so far (Kenoyer, 1998), which can be classified into small villages or hamlets (<1 to 10 ha), as well as few large towns and small cities (10 – 50 ha). Of these, the number of mature Harappan settlements in Cholistan in the west is about 174, while the number in the east (i.e. Rajasthan, Punjab, Haryana and Uttar Pradesh) is 218. About 80% of the total Harappan phase sites are located on the 'vast plain between Indus and Ganges' (Mishra, 1994). The total sites in Haryana and Rajasthan together is 74 (modified after Mishra, 1994), many of which are located in a narrow southwest-northeast belt along the dry bed of Ghaggar-Sarasvati basin and also along several tributaries emanating from the Siwaliks.

Majority of Harappan settlements are characterised by multiple divisions, each surrounded by massive fortifications, standardization in bricks in the 1:2:4 ratio, seals and sealings, weighing system, pyro-technology, copper and bronze tools, and evidence for long distance trade, to name a few. The mean age of the Harappan Civilization is put at ca. 2600-1900 BCE, which has been arrived at on the basis of radiocarbon dates from several excavated sites. Chronology of individual sites for origin and abandonment may differ from this overall time bracket. Since a large number of settlements were located along the Ghaggar-Hakra river system during the second half of the third millennium BCE, the possibility of a river system with considerable flow of water all the year round cannot be ruled out to support the settlements. Also, the lack of wells within the settlements at Kalibangan, Banawali, Bhirrana, Karanpura, etc., implies that the inhabitants used to depend on river water directly, and so strengthens the view of a perennial river system during the period.

Settlement characteristics of the Harappan culture

The archaeological investigations spanning for nearly a century has brought to the light about 1500 settlements of the Harappan culture, mostly spread along the Indus and its tributaries, as well as in the Sarasvati basin, Gujarat and Makran region of Balochistan. A few settlements in the Badakshan region of Afghanistan, close to the source area for lapis lazuli raw materials, are also found (e.g., Shortugai). All these settlements share the characteristic features of the Harappan culture and the ideology and location to tap procure and redistribute the raw materials. These settlements belong to various sizes, starting from small hamlets (< 1 to 1 ha) to villages (1 – 5 ha), small towns (5 – 10 ha), large towns and smaller cities (10 – 50 ha) and large cities (> 50 ha) (after Kenoyer, 1998).

Scholars have identified at least five large cities, with the possibility of a sixth one (Fig. 6.8). These are Mohenjo-daro and Lakhanjo-daro (>250 ha), Harappa (>150 ha), Rakhigarhi (>100 ha), Ganweriwala (>80 ha) and Dholavira (>70 ha). The cities are situated at prominent and strategic locations within the Harappan Civilization domain, as though to control a large hinterland of roughly 170,000 sq. km area, consisting of natural resources and craft specialities. Each of the large cities was supported by small towns, villages and hamlets, and used to be surrounded by vast agricultural tracts that provided a constant supply of food resources.

As per rough estimates, the Harappan Civilization is now assessed to have a spread area of about one million sq. km. The westernmost Harappan site is Sutkaden-dor, which is located on the Makran coast, at the Pakistan – Iran border. The northernmost site is Shortugai in Afghanistan. If Shortugai is taken as part of an isolated cluster of sites, then Manda in Jammu & Kashmir is the northernmost site. Several assessments have been made regarding the distribution of Harappan sites in Gujarat. A majority of scholars assess the entire Gujarat and even parts of Maharashtra to be under the Harappan domain, with the southernmost site being Daimabad in Maharashtra's Ahmednagar district.

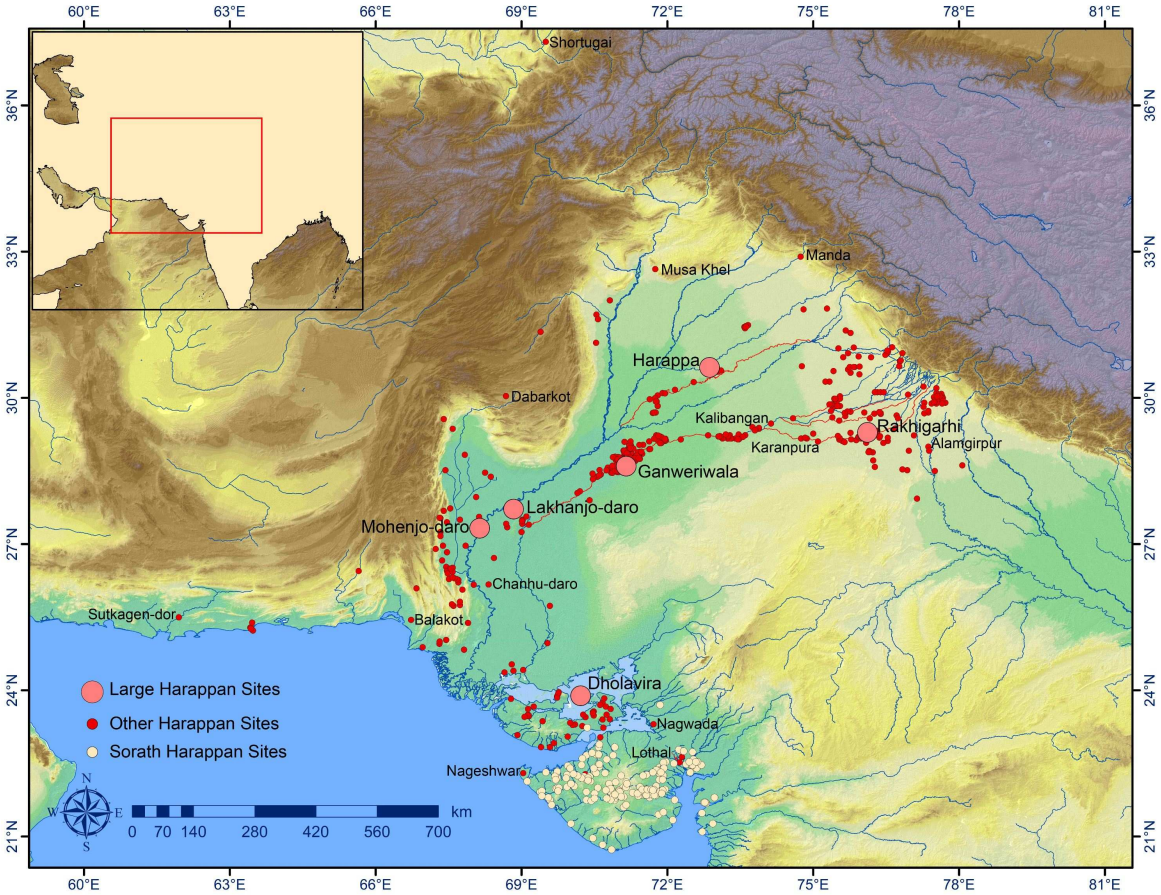

Fig. 6.8. Distribution of sites during Harappan period (ca. 2600-1900 BCE).

New studies indicate that the sites located in the mainland of Saurashtra peninsula, except the northern coast along the Gulf of Kachchh, do not share the characteristic features of the Harappan culture, even though they are contemporary. These sites are now put under the category of Sorath Harappan, after the type-site of Rojdi. The Harappan influence up the southern Gujarat and along the eastern periphery of Saurashtra is, however, clearly evident and the site of Lothal is a good example. The Harappan influence on the eastern domain is somehow less in comparison to the core area and Gujarat. The sites of Alamgirpur, Hulas in Uttar Pradesh are the examples of such sites, which have few elements of Harappan culture and were contemporary in time bracket.

Settlement planning and layout: One of the hallmarks of the Harappan Civilization is the town planning (Fig. 6.9) and layout of cities. The Harappan town/city is often demarcated into two or more divisions, each surrounded by a fortification, and often described with terminologies like perimeter wall, circumvallation, and so on. The excavations at Mohenjo-daro (Marshall, 1931), Kalibangan (Lal et al., 2003; Thapar, 1975) and Lothal (Rao, 1979) brought to light the examples of city and town layout, with the orientation tilted towards a few degrees to the west or east of the true North. The interior layout of the cities indicated proper planning and execution as witnessed from the gridiron pattern of arrangement of house blocks with the streets often cutting at right angle.

The fortification walls of most towns and cities used to be predominantly constructed using sun-dried mud bricks. The exceptions were the cities of Harappa and Mohenjo-daro, where baked bricks were used extensively. Even in those cities, mud bricks were used extensively during the early Harappan period. Baked bricks appeared during the mature Harappan period. The cities and towns of the Makran coast and Kachchh region, on the other hand, mostly used the locally available stone

blocks. At Dholavira (Bisht, 1989, 1991) mud bricks were used for construction of the core of fortification, while both the faces were veneered with stone blocks.

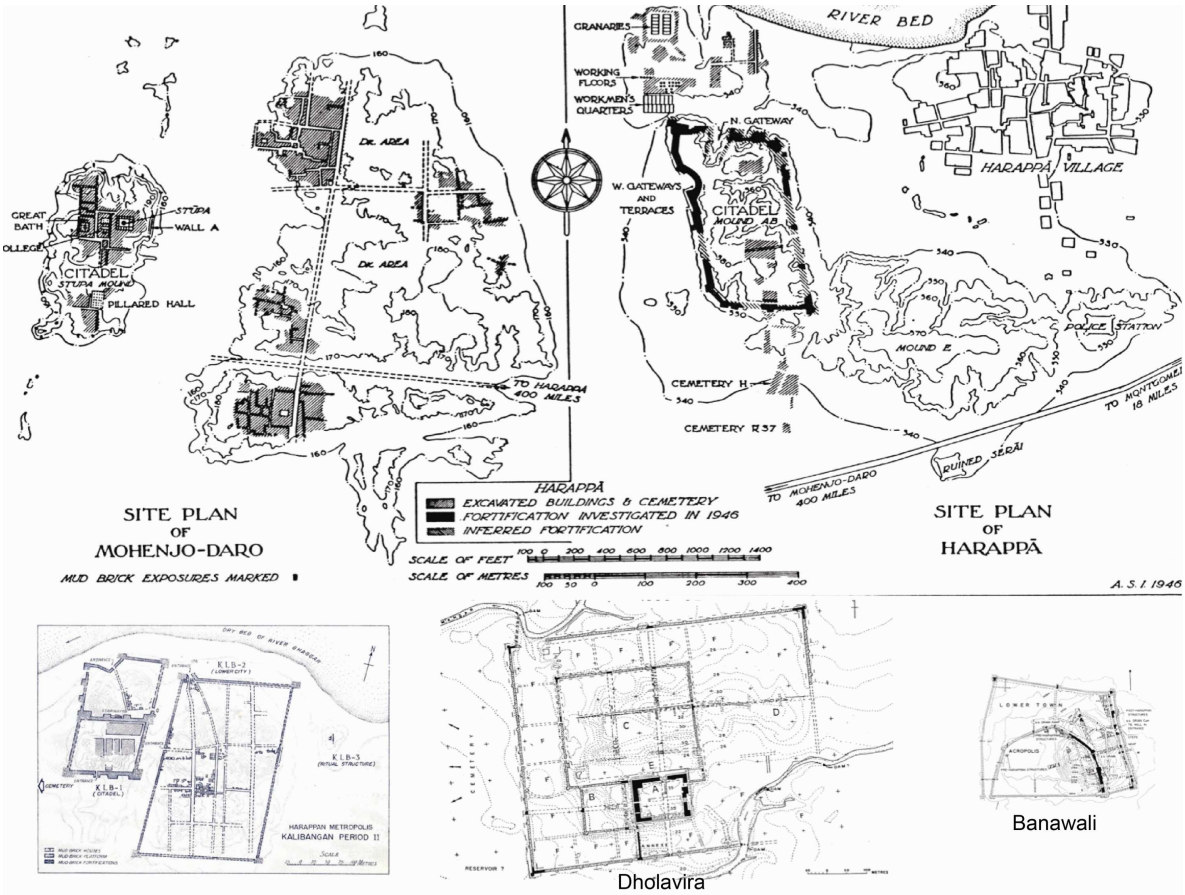

Fig. 6.9. Relative size and layout of Harappan settlements.

The city layout of Dholavira differs from the layout of other Harappan cities. Here, the entire city was circumvallated by a general fortification, within which three individual divisions were each surrounded by individual fortifications, while a fourth one, the Lower Town, was within the overall outer fortification. The location and layout of Dholavira between two seasonal streams in Khadir Island is a unique concept, which differs vastly from other site plans. The city layout of Banawali is also different from the other sites (Banawali, 1978, 1982, 1987). Here the upper town or Citadel follows a horseshoe shaped layout within an outer fortification, which also houses the lower town. Kenoyer (1998) observes that during the early Harappan period at Harappa (ca. 2800-2600 BCE), Kalibanga, Rehman Dheri, Nausharo and Kot Diji, the concept of laying out settlements along a grid was already in practice, with a circumvallation and a north-south and east-west running street. Another interesting feature of the Harappan settlement layout was the alignment along the cardinal directions, which had reached remarkable precision. Kenoyer (1998) attributes this achievement to the long-term observations of the movement of stars, moon and other planetary objects. Depending on the nature of the settlements, the city walls used to be pierced with gateways and large drainage networks. Gateways were found at Harappa, Kalibangan, Dholavira, Surkotada, Juni Kuran and others. Dholavira represents one of the most remarkably preserved evidence of gateways.

The construction of massive brick platforms at Mohenjo-daro is a unique feature noticed among all the Harappan settlements. Vidale (2010) notices that the entire Harappa township area was built on a ‘system of platforms’, the shape of which makes a huge triangle, the tip pointing towards the east, and

the evidence indicates the east-west face runs to a length of 600 m. Vidale (2010) also estimates that this massive platform provided a protection from the flooding of the settlement from the south, and also an independent 'fortified, segregated urban compound'. The investigations along the periphery of the area indicate the brick revetment all along its periphery. Thus, it may be observed that even though the Harappans followed the general concept of city planning and layout, they indeed situated their cities and town as per the local requirements and landscape also. The planning of cityscape along with the other urban features like settlement hierarchy, layout of the streets, drainage system, provisions for water management system (in particular at Dholavira), among others, are the hallmark features of Harappan Civilization.

Standardisation of bricks: A hallmark feature of the Harappan Civilization is the standardisation of bricks in the ratio of 1:2:4 across the entire extent of the spread of the culture. The standardisation of brick ratio was probably invented during the early Harappan stage itself as witnessed from the sites of Kot Diji and Harappa. However, the ratio varies in the eastern domain, at sites like Kalibangan, Banawali and others, wherein the ratio is 1:2:3. Once the integration of Harappan culture was achieved around 2600 BCE, it has been observed that the ratio was also standardised across the entire length and breadth of the civilization into 1:2:4. Even though the ratio was 1:2:4, different brick sizes were also used by the Harappans, e.g., 7x14x28 cm, 8x16x32 cm, 9x18x36 cm and 10x20x40 cm. Kenoyer (1998) observes a gradual decrease in the size of bricks from the earliest to the last phase at Harappa. While during the earliest phase, the size of bricks was 7x14x28 cm, it decreased to 5x12x24 cm at the end of the Harappan phase.

The larger brick sizes were used prominently for the construction of fortification walls around the settlements. The ratio and sizes were also followed for the sun-baked as well as baked bricks. Wherever the Harappans did not use the baked bricks extensively and as per the local environment, the building materials were also varied from sun-baked bricks to stones. For example, at Dholavira, wherein the limestone and sandstone formations are extensively noticed, as well as in Makran and Balochistan, the Harappans used them as the building materials. Interestingly, at Dholavira, even though the Harappans used the stone as building materials, for the construction of core of fortification, they extensively used sun-dried bricks in the ratio of 1:2:4 (Fig. 6.10) and veneered them with stone blocks. Even for the construction of house blocks, the stone elements were used for the foundation and up to the plinth portion, above which the superstructure consisted of sun-dried bricks (Bisht, 1991).

Fig. 6.10. Mud bricks of Mature Harappan phase from Karanpura, Rajasthan.

Scholars have hypothesised various reasons for the standardisation of the bricks by the Harappans. This varies from ideology, administrative control indicating a strong centralised government, and functional requirements among others. Kenoyer (1998) observes that the standardisation could be the result of 'concept of measurement and proportion…passed from one generation of builders to next and gradually spread to distant communities'. The unique feature is the almost equal importance attached to the fixed ratio of 1:2:4 among the different quarters of the Harappan Civilization, be it the isolated settlements in the Badakshan area of Afghanista, or the southernmost settlement of Lothal in Gujarat.

This is a remarkable feat and achievement given the considerations of the time and space of third millennium BCE. Another remarkable feature in the construction of the fortifications noticed from the excavations at Harappa and Dholavira is the different colour patterns of the sun-dried bricks. All these multi-coloured bricks also follow the same ratio, i.e. 1:2:4. The use of multi-coloured bricks clearly indicates the use of clay from different sources, apparently produced by community participation for large-scale ventures like building the fortifications. If such is the scenario, the Harappans probably represents one of the earliest examples of community participation in construction of public spaces for the overall benefit of the society as well as for themselves.

Building materials: Depending on the resources available in the surrounding areas of habitation, the Harappans used different types of building materials, e.g., sun-dried bricks, baked bricks, stone members for the construction of houses, fortification, gateways, drainages. This was supplemented by the use of wood extensively for the doors, windows, furniture, coffins for burials, roof materials, etc. The roof of Harappan houses could have been made of wooden rafters covered with reeds and secured by plaster of clay, which hardens over time. The evidence for windows and doors come from terracotta models, which clearly indicate the patterns. One interesting pattern is the lattice window, indicated both in the terracotta model as well as from an actual latticed fragment made of alabaster. The woods generally used by the Harappans were Shisham (*Dalbergia sisoo*; also traded with Mesopotamia), dark heartwood (particularly useful for doors, windows and furniture), and cedar or Deodar (*Cedrus deodara*). The detailed documentation of the house blocks from the site of Mohenjo-daro by Jansen brought to light different categories, consisting of smaller houses to large and palatial ones, often having more than 50 rooms. A typical house consisted of a central courtyard surrounded by rooms all around, the doors and windows facing the side lanes and not the main streets, often with two storeys, and rarely three storeys, connected by brick staircases.

Dressed stone blocks were also used in the construction, consisting of long beams for basal stones, to lintels, architectural members like pillar columns, and pivot for doorways. In this regard, the discovery of a quarry site along with unfinished pillar elements, concentration of chipped stones, fragments and working areas at a site northeast of Dholavira clearly indicates the achievement of Dholavira Harappans. The pillar members finished from here were not only used in the gateways at Dholavira, but also exported to Mohenjo-daro and Harappa as indicated by the scientific analysis (Bisht, 1991, Law, 2011).

Public buildings: Some of the important buildings that could be categorised as 'public' buildings and architecture come from the sites of Harappa, Mohenjo-daro and Dholavira. At Harappa, the Mound F brought to light evidence of 'granary' consisting of long rectangular rooms, two rows of six rooms each on either side, and separated by 7 m wide passageway, all resting on a large mud-brick foundation. This large building measures 50 m (N-S) by 40 m (E-W), while each room measures 15.2x6.1 m, with provisions for air passage. Another imposing structure from Mohenjo-daro and identified, as 'granary' is located close to the Great Bath. This building has a different plan from that of Harappa. The

Mohenjo-daro example again is an imposing structure, laid on baked-brick foundation and measures 50x27 m (EW x NS). The building is divided into 27 blocks, separated with the aid of narrow passageways, and with the provision of square sockets sunken at the junctions. These sockets could have held wooden pillars, over which the superstructure rested. The imposing building is also identified variously as a granary (Wheeler, 1947, 1953), or a 'great hall' (Kenoyer, 1998).

A large rectangular water tank on the high western mound of Mohenjo-daro is identified as 'Great Bath' and is identified as the 'earliest public water tank' (Kenoyer, 1998). This tank measures 12x7 m (NS-EW) with a depth of 2.4 m. On the northern and southern sides of the tank are steps leading to the tank, with a brick ledge extending across the entire tank. A nearby well could have supplied water for the tank, as the river was close by. The importance of wells for the residents of Mohenjo-daro is highlighted by the documentation done by Jansen (1993), who estimates more than 700 wells from the excavated remains. The construction of the tank with joints aided by gypsum mortar made it watertight. A layer of thick bitumen was also laid on the sidewalls and floor of the tank to provide an additional protection layer for the tank. A drain in the middle of the western wall enabled the drainage of water for maintenance and upkeep, which terminated the water at the edge of the city. This drain might have been covered by wooden planks and a corbelled brick arch cover. The remains of other large buildings from Mohenjo-daro from the 'lower town' have also been unearthed, for e.g., an extensive courtyard that could have been a market or assembly area from DK area and a large complex of house identified as a residence of a chief or a temple from the HR area, which also brought to light a large number of seals and sealings. Vidale (2010) identifies a large palace in HR area, including several house complexes, consisting of a total of 136 rooms and three courtyards (the largest one measuring 14x19 m, while the entire complex measures 80x40 m). Vidale (2010) also identifies a smaller version of 'Great Bath' from the House Complex XXIII within this palace area.

Among all the public spaces noticed from different sites of Harappan Civilization, the most significant and remarkable ones are from Dholavira, which consists of a series of water reservoirs, including a central rock-cut one to the south of the 'citadel' (Fig. 6.11). This central reservoir measures three times the size of the Great Bath of Mohenjo-daro. Another huge reservoir is noticed to the east of the 'citadel' at Dholavira, measuring 73x33 m. A huge open space is noticed in between the 'citadel' and the 'middle town', known as the Ceremonial Ground by the excavator (Bisht, 1989, 1994). It measured 200x25 m, which could have been used as a multipurpose ground for market, assembly place, stadium, and other purposes of social congregation.

Fig. 6.11. Rock-cut reservoir to the south of the Castle, Dholavira.

Harappan script and function

The Harappan script is so far undeciphered. The evidence of writing is found from various mediums, consisting of seals & sealings, tablets, ceramics, stoneware and terracotta bangles, copper implements, gold tools, copper tablets, faience tablets, ivory, shell and bone objects, beads and others. The most common medium for inscriptions is the seals and their impressions on clay. The seals were manufactured on soapstone or steatite (Fig. 6.12), carved with animal motif and an inscription at the top, then glazed with an alkaline material and heated at high temperature to attain the typical white colour. Very rarely the seals were manufactured in metal. Two such examples in silver from Mohenjo-daro and examples in copper from Lothal, Oman and Harappa are the exceptions. Another important and unique medium on which inscriptions were written is found from Dholavira, wherein a large 'signboard' of ten large-sized letters was discovered from the western chamber of North Gate and a partially preserved stone inscription was obtained from the same site (Fig. 6.13 and 6.14). These discoveries add to the importance of multiple applications of writing during the Harappan Civilization, from the mundane graffiti and inscriptions on pottery to the more sophisticated signboards, and clearly indicate the versatility and the knowledge of the Harappans.

Fig. 6.12. Seals and sealings, Dholavira.

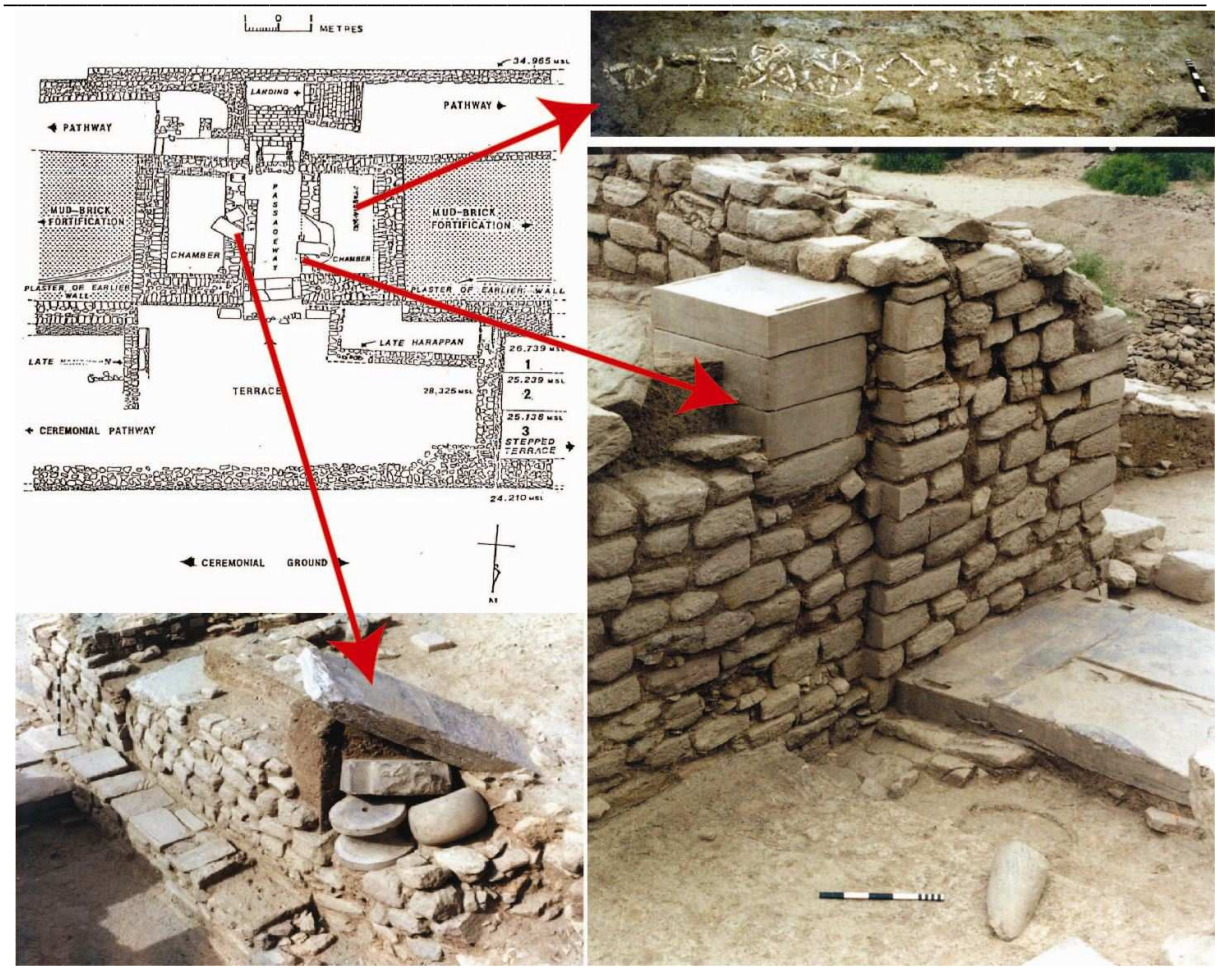

Fig. 6.13. North Gate, Dholavira, and the location of ten large-sized inscriptions.

Fig. 6.14. Ten large-sized inscriptions on a signboard, Dholavira.

Kenoyer (1998) estimates some 4500 inscribed objects, the number crossing well over 5000 now, as results from many more excavations are added. Nearly 3700 objects have so far come from Mohenjo-daro and Harappa alone, indicating their special status among the settlements. The Harappan inscriptions are very short when compared to the other contemporary civilizations, and the average length of an inscription is five signs or grapheme, while the longest so far discovered is 26 grapheme (Kenoyer, 1998). The total number of signs or graphemes is estimated to vary from 400 to 450 and the nature of script is logo-syllabic (morphemic) in character. This means that a single sign may either represent a phonetic value, syllable or a complete word in itself. Based on the overlapping of letters of an inscription found on a potsherd from Kalibangan, Lal (1966, 1975) proposes that the script was written from right to left, which is accepted by many scholars. This if further substantiated by the cramming of signs towards the left from a seal inscription found from the site of Mohenjo-daro. Instances of writing in opposite direction, i.e. from left to right in some of the earlier inscriptions are also noticed. The script was also written in a boustrophedon way for longer inscriptions, as indicated

from an inscription on a seal. Seals with only one sign have also been found from the Harappan sites, for example Karanpura in Rajasthan. Seals with only the motifs carved without inscription from sites like Harappa and Dholavira indicate the nature of seal carving and the modus operandi of the seal manufacturers for catering to the needs of the trader community.

Kenoyer (1998), on the basis of analysis of graffiti marks from the sites of Harappa and Nausharo, suggests that a writing system existed during the early Harappan period, and a few of the signs continued through the Harappan period. Thus the script and the writing system was not the invention made during the Harappan period; it was actually in use from the early Harappan period, even though the exact meaning and phonetic values could have been different.

The various attempts by scholars to decipher the Harappan script and its computer concordances (Mahadevan, 1977; Parpola, 1994) have revealed that the most frequently used signs were the jar and the fish signs along with their positions. The vertical signs, either in single or in multiple numbers, are identified as the numerals. Seals with Harappan motif (water buffalo) and cuneiform inscription have been found from Mesopotamian sites, which strengthen the possibility of Harappans actually living in distant lands and mingling with the society to further their commercial transactions. The discovery of Harappan seals, sealings and inscriptions on pottery from sites in Oman (copper seal and inscription on pottery) also indicate the long-distance trade of the Harappans, as well as the presence of the Harappans in distant lands. They used to receive the commodities and read the content of the sealings.

The writing on the seals and subsequently on clay continued till the end of the Harappan phase, and then through the localization era, even though the motifs had disappeared by then and the seals changed their form and shape. The shape became rectangular with a plano-convex knob at the rear, with only the inscription on its face. Such seals are found from the Harappan sites of Dholavira, Mitathal, etc. At Harappa the seals continued till about 1700 BCE (Kenoyer, 1998), while at Dholavira till Stage VI (Bisht, 1994, 2013). The continued presence of bead manufacturing activities at Dholavira during Stage VI indicates the continued prosperity of the settlement during the de-urbanised phase. It necessitated the use of seals, even though the shape of the seal changed to rectangular, the motifs of Harappan phase was replaced, and the script disappeared.

As stated earlier, the Harappan script is yet to be deciphered. The length of the inscriptions being very short, barely 17 letters in the longest inscription, understanding it becomes more difficult. Scholars opine that the same script might have been used during the Harappan period to write different languages across a vast area of nearly one million sq. km. As the Harappan script is neither a syllabic nor an alphabetic, and since it is logosyllabic in nature, it is felt that without the knowledge of the language(s) spoken then, the script may be difficult to decipher.

Harappan technology and crafts

Harappan Civilization had some unique and varied craft technologies, which are different from the technologies in other civilizations. The sophisticated jewellery and other commercial products from the Harappan Civilization attracted other civilizations to import the products, thus contributing to a brisk inter-regional trade during the third millennium BCE, lasting for nearly 600 years. The development of craft activities in the region occupied by the Harappans can be traced back to the Neolithic period, especially at the site of Mehrgarh, which also witnessed the beginning of several technologies like pyro-technology that aided ceramic production, heating of stones that aided proper chipping, colouring of stones, copper smelting, hardening of steatite, glazing techniques, etc. The inventions gradually developed into sophisticated art forms during the Harappan Civilization.

Ceramic technology: The ceramics or pottery from any culture of the past is an important cultural material that is often used to understand the spread, culture, belief system and other elements. A gradual evolution of the ceramic forms in the Greater Indus region is observed from the Neolithic period onwards. A landmark site in this respect is Mehrgarh with its sophisticated pottery having painted motifs from the Chalcolithic period. Regional variations in the ceramic form during the Chalcolithic period, followed by integration of those regional Chalcolithic cultures, some new ceramic forms emerged that can be termed as typical Harappan ceramics, although the ceramics of earlier period also continued to a certain extent.

The typical Harappan ceramics consist of well-potted pottery, slipped brightly with red colour and painted with various motifs on the exterior. The pottery, the figurines and smaller objects of various kinds were fired in an updraft kiln, the evidence of which starts to emerge from the early Harappan period. At Harappa, a continuous occupation of an area in Mound E on the north-western corner is noticed from around 2800 BCE onwards. The site was in use for pottery for well over 700 years, continuing into the Harappan period (Kenoyer, 1998). The evidence for updraft pottery kilns is also found from Mohenjo-daro, Chanhu-daro and Nausharo in Pakistan, and from Baror, Rakhigarhi, Tarkhanewala Dhera and Khirsara in India (Fig. 6.15).

Fig. 6.15. Updraft kiln and its details, Khirsara, Gujarat.

During the course of this evolution, the size of the kiln increased manifold along with improvements in design. The pottery was both hand-made and wheel-made. The wheel-made pottery was both on slow and fast wheel methods. Different techniques were followed for smaller and larger vessels. Coiling technique was used to manufacture some types like tall jars by rolling coils of clay in a sequential pattern and finally finished on a wheel by creating patterns like burnishing, application of slip and carrying out of painted motifs. Some of the larger vessels were slipped with black on both sides, a typical example of which is the Black Slipped Jar, a pointed-base tall jar, which was used for long distance trade. Fragments of this pottery are found from the site of Ras al-Jinz in Oman with a four-lettered Harappan inscription.

The shapes found from the Harappan period include medium sized and large storage vessels, often with a pointed base, tall jars known as ‘S’ shaped jars and highly decorated jars of various shapes and sizes, dish-on-stand, bowl-on-stand, goblets, tumblers, plates, shallow bowls, cooking vessels with a typical carination at the shoulder, perforated jars, and so on. The functional analysis of these vessels indicate that the large storage jars without painted designs could have been used for storing the grains; smaller globular pots were for storing and serving liquids of various kinds, plates for eating and the large black slipped jars for interregional trade. The highly decorated and painted vessels, along with the bowl-on-stand and dish-on-stand, could be tableware and also for presentation during important events. The painted motifs on Harappan pottery consist of floral and geometric designs sometimes extend from

the rim to the base of the vessel. The typical motifs of Pipal (*Ficus religiosa*) leaf, fish-scale pattern, intersecting circle pattern, can be traced back to the early Harappan period (Kenoyer, 1998). It has been observed by scholars that even though these patterns continue, the Harappan style of decoration consists of a combination of motifs and its execution in a characteristic new style that could be easily discernible. Further, the painted motifs on the typical red slipped ware could be noticed across the entire Harappan Civilization, along with continuation of regional pottery styles in different areas.

Kenoyer (1998), based on his observation from the burial pottery from Harappa and ceramic styles from Nausharo, identifies an evolution in the style of decoration. The ceramics belonging to the earlier phase datable to ca. 2600-2400 BCE have the elaborately painted floral and geometric motifs on Harappan pottery. This is similar to those from the habitation areas. The middle level pottery from the burials consists of the same pottery forms, but larger in size and painted only with geometric motifs. The pottery belonging to the last phase, datable to ca. 2000 BCE, are the plain and unslipped ones, which is also similar to those from the habitation areas. Evidence for copper, copper-bronze vessels is also found from large settlement like Mohenjo-daro, Harappa and Dholavira, but is few in number. Scholars feel that due to the intrinsic value of copper as a metal and its recycling possibility, this technology was passed on at the locations from one generation to another.

Faience technology: The Harappans fashioned refractory materials from the naturally occurring crushed quartz, mixed with flux and colouring agents. Faience can be termed as ancient glass due to the same chemical properties but with the absence of translucency and transparency. The Harappans used to manufacture various artefacts using faience, like beads of medium and tiny sizes, plain and decorated bangles, tokens, figurines, vessels, etc. The earliest occurrence of faience is from the site of Harappa in 3300 BCE. The site has also brought to light an extensive faience manufacturing industry from the early Harappan period onwards. The faience used to be manufactured using a technology known as efflorescence, wherein the colour of glaze and core is identical in colour (Kenoyer, 1994).

The analysis of Harappan faience artefacts indicates two distinct efflorescence processes. The first process involved powdering the quartz fragments, followed by mixing with flux and a colourant to produce a fine faience paste, and then fired in a kiln. The second process consisted of producing a quartz powder and partly melted with a colourant to produce a frit, which was then mixed with additional flux to produce a fine faience paste. The scientific analysis of faience artefacts indicates that the first manufacturing process allowed the use of large quartz grains of 50-100 microns, while the second process allowed the 30-50 micron grains. The quartz, mixed with the frit and colouring agents used to be heated to a temperature of about around 950ºC. The process of faience manufacturing can be presumed from the discovery of quartz pebbles from sites like Harappa and Mitathal, along with the presence of furnaces of various sizes. The analysis of Harappan faience also reveals the presence of alumina, sodium and potassium, which were used as adhesives, flux or colourant (Kenoyer, 1994).

The stages involved in the manufacture of faience bangle are discussed by Kenoyer (1994). The process consisted of the preparation of a coil of faience paste and winding it over a tapered mandrel, joined together at the ends and left for drying. This initial coil used to be taken out when partially dried for carrying out decoration on the surface with various patterns like cross lines and chevron pattern, and then slowly heated to produce the efflorescence effect. The typical Harappan faience objects have a distinct blue or blue green colour. The other colours noticed among the faience beads are yellow and white. The technology further evolved during the late Harappan period, when additional colours like red, black were also introduced.

The late Harappans produced a variety of bi-chrome and multi-coloured faience objects like beads, as evidenced from the site of Sanauli in Uttar Pradesh (Fig. 6.16), which often reminds of the glass beads of later periods. The other interesting objects produced using faience are the imitation of stone eye beads and decorated carnelian beads. A combination of white and brown colours was used to produce the faience eye beads, while white and red colours for imitating the decorated carnelian beads. The best examples of such types are found from the late Harappan burial site at Sanauli, Uttar Pradesh.

Fig. 6.16. Faience beads, Sanauli.

Stoneware bangle technology: The stoneware bangles are among the rare items found from several Harappan sites, and were produced mostly during the mature Harappan phase. The bangles have been discovered from sites like Harappa, Mohenjo-daro and Dholavira. Blackman and Vidale (1992) consider the stoneware to be important due to their "unique technological features and micro-inscriptions", and describe them as "highly siliceous partly sintered, homogenous ceramic body usually free from inclusions or voids visible to the naked eye, and characterized by very low porosity." The stoneware bangles were "produced in two basic varieties – one fired in a strongly reduced atmosphere, assuming colours ranging from pinkish-grey to black, and others from reddish shadows resulting from partial re-oxidation" (Blackman and Vidale, 1992). Halim and Vidale (1987) describe in detail the mechanism involved in the production of the stoneware bangles based on the evidence of slag, kiln wasters and a sophisticated double container system from Mohenjo-daro. Blackman and Vidale (1992) find that although the bangles were produced at both Mohenjo-daro and Harappa, the distribution was unidirectional from Mohenjo-daro to Harappa. The stone bangles used to have short inscriptions, probably indicating ownership records. A considerable number of stoneware bangles are also found from Dholavira (Fig. 6.17), along with typical terracotta saggers that were used as base to hold the

canisters during manufacturing process. Only 108 examples of bangles could be collected, of which 17 are terracotta rings, commonly used in their manufacture.

Fig. 6.17. Stoneware bangles, Dholavira.

Shell Working: An important craft activity of the Harappans was shell working, the origins of which can be traced back to the 7th millennium BCE Neolithic levels at Mehrgarh. The varieties of shell used at Mehrgarh suggest long distance trade with the coastal tracts of Karachi, Gulf of Kachchh and Oman, especially for raw material acquisition, processing and manufacturing of artefacts. In Gujarat, the Harappan shell working sites were found at Golo Dhoro (Bagasra), Navinal, Dholavira and Nagwada. The shell types found are *Turbinellapyrum, Chicoreusramosus, Lambistruncatasebae* and *Fasciolaria trapezium* of the gastropod variety. As per the morphology and properties of the different shell varieties artefacts like ladles, bangles, beads, inlay patterns and geometric tools were manufactured.

Kenoyer (1998) identifies specific types of artefacts manufactured from different shell species, like *Turbinellapyrum* (bangles, inlay from body whorl and solid objects from central columella), *Choreusramosus* (ladles, bangles and spoons), *Lambistruncatasebae* (large flat inlay pieces) *and Fasciolaria trapezium* (inlay from thick body whorl). All these shell types are primarily found along the coast of Gujarat to Karachi. The coastal region of Oman is also a source for shell like *Chicoreusramosus* and *Fasciolaria trapezium.*

The site of Bagasra yielded thousands of complete shell bangles primarily produced from *Turbinellapyrum*. In contrast, the site of Nagwada used to produce smaller objects likes inlay pieces and beads from the columella portion. This clearly indicates the social organisation and craft specialisation in which some sites were chiefly engaged in the manufacturing of bangles, while others used the left over portions from the shells to produce smaller artefacts and inlays. According to Kenoyer (1998), the shell type determined the type of finished products. Shell type *Turbinellapyrum* used to be sawn off to

produce complete circles, and then a chevron design engraved on it. For the shell variety *Chicoreusramosus*, the large spiky portions on the exterior portion used to be struck off first, followed by chipping off the spiral columella and grinding the remaining unwanted portions to create different sizes of ladles. The columella of shell species was used for manufacturing a variety of inlay pieces, beads, discs, weights, and other geometrical/ non-geometrical objects. The depiction of shell bangles on certain artefacts like 'dancing girl' from Mohenjo-daro and contextual evidence of shell bangles from the Harappan burials help in understanding the pattern and design of multiple bangles worn by the ladies. Dholavira provides evidence for a brisk shell artefact manufacturing industry by the Harappans.

Lapidary working: Beads occupy an important position in antiquity record. Along with beads, pendants and amulets were also in use for creating a combination of necklaces, sometimes with carious coloured stones and precious metals like gold. In the Indian sub-continent, beads of turquoise, steatite, shell, dentalium, calcite, lapis lazuli are noticed from the Neolithic levels of Mehrgarh (7th-4th millennium B.C). The presence of turquoise beads from the Neolithic levels is a clear evidence of long distance contacts, as turquoise had to be procured from either Iran or Central Asia, nearly 1500 km from Mehrgarh.

Similar is the case with other materials like lapis lazuli and shell, which had to be procured from sources that were located far away from Mehrgarh. The Chalcolithic levels at Mehrgarh show further sophistication, and new materials appear, which include carnelian, calcite and garnet beads. Also found were the used and unfinished drills of phthanite among the debitage of semi-precious stones like chalcedony, agate, carnelian and turquoise. Kenoyer suggests that the term phthanite should be discarded as it is not an officially recognised scientific term. The evidence from Mehrgarh indicates a diversity of materials used for making beads. Through the course of transition from Neolithic to the Indus levels, harder stones were introduced, while the length of the beads also increased. The mineral used for one of the drills is also identified as pumpelleyite.

Among the other Neolithic and Chalcolithic sites where beads are noticed are Mahagara in the Belan valley which also yielded terracotta beads from the Neolithic levels. The Chalcolithic levels of the numerous sites in the Indus plains saw a gradual increase in the quantity as well as diversification of raw materials for making beads. This culminated in the succeeding Harappan period with an explosion in the bead industry. The Harappans were technologically much advanced in the raw material procurement, production and distribution of various kinds of beads. They exploited a wide variety of semi-precious stones for bead manufacturing. A recent study by Randall Law (2011) from Harappa indicates that during mature Harappan phase, the Harappans exploited nearly 40 different kinds of rocks and minerals from different geographical zones. Of these, only 11 varieties were present in the preceding early Harappan and Hakra-Ravi phase of the Harappa Culture at Harappa. Mackay (1937) noticed at "Chanhu-daro numbers of unfinished beads were unearthed,……not only large numbers of incomplete beads but also the raw material from which they were made, and, still more interesting, the actual stone drills by which they were bored, Chanhu-daro has proved to have been a great centre of bead-making".

Gujarat being close to the agate raw material sources has a large number of sites, which have evidence for bead manufacturing. The example of a bead-manufacturing furnace from Lothal is a classic example. The modern bead manufacturing tradition at Khambhat, (Gujarat) is another example on the continuity in traditional techniques even though the present-day bead-makers have adopted modern technologies.

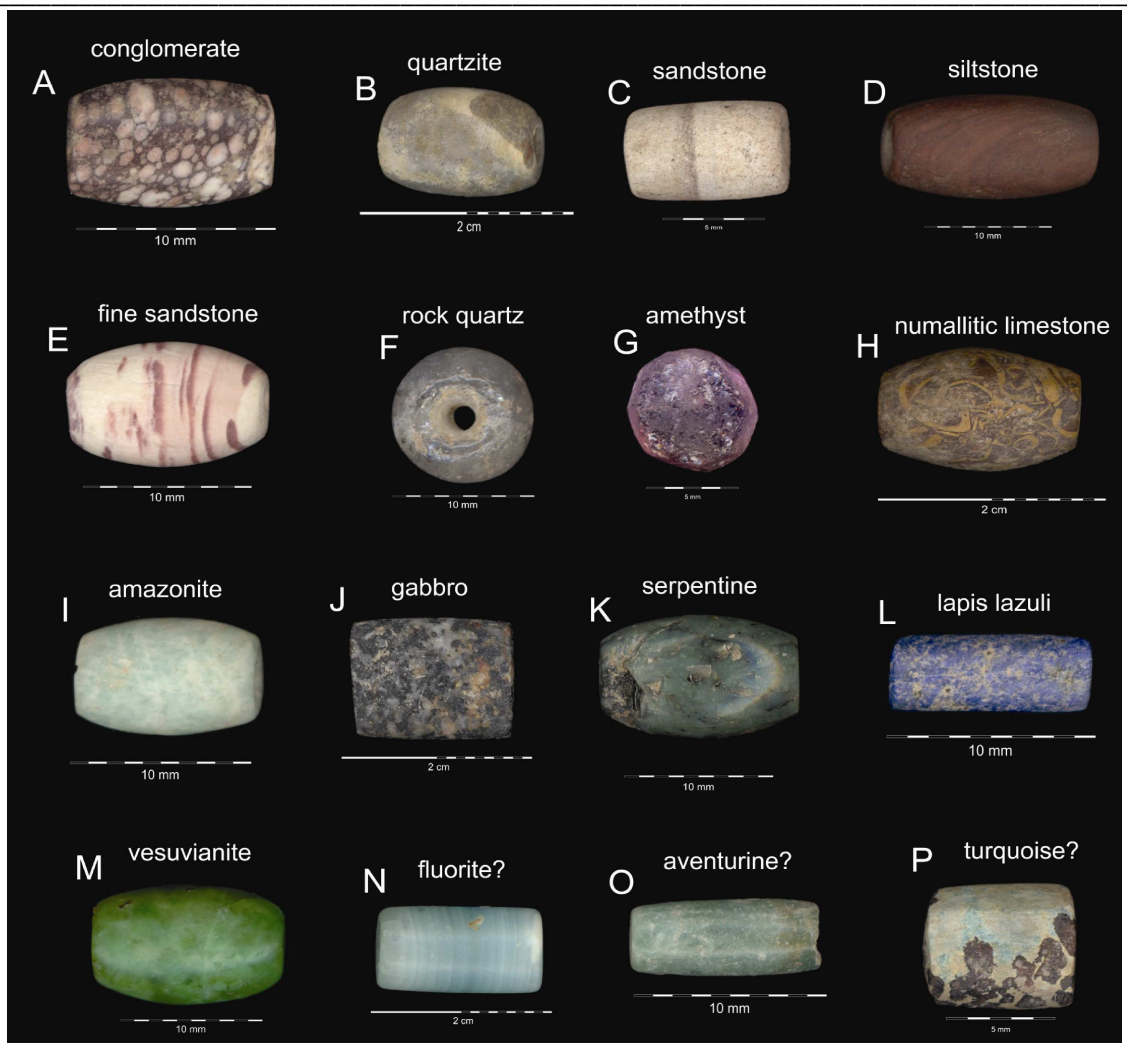

Fig. 6.18. Raw materials for making beads, Dholavira.

Dholavira represents another excellent evidence of flourishing bead-manufacturing industry using various materials (Fig. 6.18), right from the earliest stage. Existence of at least three bead workshops at different localities of the city, one during Harappan phase and two during late Harappan phase (Fig. 6.19) indicate the industry's continuity over a long period. The presence of anvils, bead polishers and polished beads without perforation from the workshops indicate a flourishing bead trade at Dholavira. The various raw materials and chipped stone wastage (debitage) at the sites help to understand the manufacturing processes.

The Harappans used to manufacture beads in a variety of shapes and sizes. Steatite was preferred to manufacture disc and micro beads, the latter often less than 1 mm in diameter. Certain special category of beads, like the long barrel cylindrical and decorated carnelian beads, were important export items to Mesopotamia. The long barrel cylindrical beads alternated with copper spacer. Terminal beads were used in the production of waistbands for women, like the design seen on the Harappan terracotta female figurines. So far, only three such complete waistbands have been discovered, one each from Harappa, Mohenjo-daro and Allahdino.

The Allahdino example of carnelian beads was found kept in a small pot inside a room, along with other jewellery of silver and gold. The decorated carnelian beads (Fig. 6.20) consist of a white coloured

'eye'. Geometrical patterns are made with the help of alkali on red coloured agate-carnelian beads and heated. The alkali fuses into the matrix of the bead and creates a distinct pattern.

Fig. 6.19. Bead workshop areas of late Harappan period; (a) Workshop for polishing beads, Bailey; (b) Details of bead polishers *in situ*; (c) Bead workshop in Castle, Dholavira.

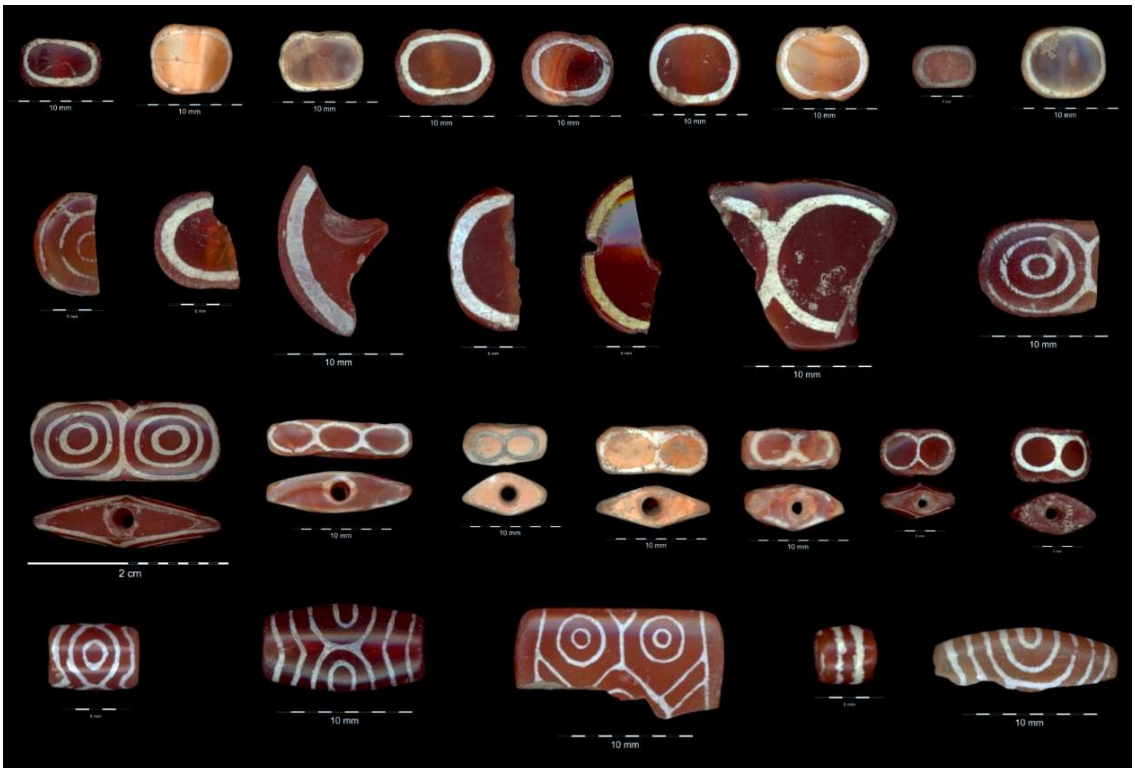

Fig. 6.20. Decorated carnelian beads, Dholavira.

Excellent examples in stages of manufacturing of long barrel cylindrical beads are found from Chanhu-daro (Mackay, 1943), and special polishers for these beads are found from Dholavira. Examples of long barrel cylindrical and decorated carnelian beads are found from as far west as the upper reaches of River Euphrates in Syria.

The raw materials for the beads consist mainly of agate-carnelian, jasper, bloodstone, chalcedony, quartz, amazonite, claystone, lapis lazuli, sandstone, limestone, faience, steatite, paste, amethyst, vesuvianite, serpentine, turquoise, and others. The proximity of prominent raw material sources in Gujarat, like those at Khandik, Mardak Bet and Ratanpura, helped the Harappans to dominate in bead manufacturing. Raw materials like lapis lazuli came from far off places like Badakshan in Afghanistan. The workers of Dholavira used a special type of drill bits made of a material known as 'ernestite'. More than 1500 drill bits of ernestite were found at Dholavira, the largest so far recorded from any Harappan site. The drill bits of ernestite are slightly harder than agate-carnelian silicates and hence suitable to drill harder materials and were a superior technology during the third millennium BCE. This technology was replaced by diamond tipped drills during the first millennium BCE, which made the drilling process very easy and faster.

The contemporary bead manufacturing industry at Khambhat in Gujarat has helped in understanding the *chaineopertoire* processes At Khambhat, one can see a long continuity of manufacturing in terms of some of the same techniques in sorting, chipping and several stages of heating to create the distinct reddish orange colour to agate-carnelian. The traditional drilling at Khambat consists of double tipped diamond drills driven by a bow. A pot filled with water and provision for its dripping over the drilling surface enables the bead to remain cool and not to split due to extensive heat produced due to drilling. The polishing of the beads at Khambhat is at present carried out on a mechanised emery wheel.

Weights and Measures

The necessity for trade contacts and mechanisms led to the development of a sophisticated weight system by the Harappans. These were mostly made of banded chert from Rohri and are found from all Harappan sites. The presence of a typical cubical chert weight is a characteristic feature of the mature Harappan phase. Along with the cubical chert weights, truncated spherical weights in different mediums like chalcedony, agate and other shapes are also reported from Harappan sites, in particular from Dholavira (Fig. 6.21).

Terracotta, shell and stones of different varieties were also used for making the weights. Kenoyer (1998) observes that the standardisation of weights is unique to the Harappan Civilization and not noticed in the other contemporary civilizations. The continuity of the Harappan weighing system is also traced up to the historical period in South Asia and even during modern times.

The earliest excavations at Harappan and Mohenjo-daro during the beginning of the last century brought to light among all the classical elements of the Harappan Civilization, the highly developed and standardised weighing system. A.S. Hemmy (1931, 1943) was among the earliest scholars to have a detailed account of weights from Mohenjo-daro and Chanhu-daro. Later, M.S. Vats (1997 edition of a detailed 1940 Report) gives an account of the weights found from the excavations at Harappa.

Hemmy (1931) identifies two series at both Harappa and Mohenjo-daro and also concludes that there is 'no local variation between the weights in the two places, although 500 miles apart.' Hemmy (1931) also notes that the sequence of ratios is striking, and doubles in ratio as 1, 2, 4, 8, 16, 32 and 64,

after which it progresses in decimal system like 160, 200, 320, 640, 1600, and concludes that there was no sexagesimal system and all the 'ratios are binary or decimal.'

Fig. 6.21. Chert cubical weights and chalcedony truncated spherical weights, Dholavira.

Kenoyer (1998) notices that the incremental step from the 1600 unit onwards progresses with 3200, 6400, 8000 and 12800. Hemmy (1931, 1937-38) suggests various possibilities of arriving at the weighing system, based on the weight of grains such as wheat, barely and 'ratti', and concludes that the mean value of the most commonly occurring weight is of ratio 16 and weighs 13.71 gm at Mohenjo-daro. Based on the analysis of a large number of weights from Harappa and Mohenjo-daro, Hemmy (1943) calculates the 'Mode', or the value of maximum frequency to be 13.625 gm. The truncated spherical weight is also found to conform to the same weight system of cubical weights.

As indicated above, the Harappan weight system is based on both decimal and binary systems. Kenoyer (1998) estimates that the basic weight could have been derived from poppy seed ('Ganja'), which is still used in several parts of the sub-continent. Ganja seed is equivalent to two 'mung bean' seeds or two barley seeds. The average weight of a Ganja seed is 0.109 gm, and the weight of eight Ganja seeds is equivalent to one of the smallest known Harappan weight of 0.871 gm.

The actual function of the small and the large weights is highly debated. While the function of smaller weights has been attributed to weighing of jewellery and smaller objects, the bigger weights are for grains and larger artefacts. Kenoyer (1998) has hypothesized on the basis of contextual evidence of the discovery of weights at the city gateways that the weights were actually used for taxation of the goods as these enter and exit the city limits. Interestingly, the find of cubical weights from sites in Oman also highlights the importance of Harappan weights for interregional trade. The Harappan traders used to carry them.

Religion and disposal of the dead

The religious beliefs of the Harappans can be deduced from several depictions of narrative scenes in different seals. These indicate a preference for nature worship by the Harappans. The Pipal (*Ficus religiosa*) tree is shown worshipped in a seal from Mohenjo-daro. The tree might have attained wide acceptance as it is depicted in various mediums. Several narrative scenes on terracotta and seals also indicate nature worship. Scholars like B.B. Lal put forth that the Harappans used to worship fire. Lal et al. (2003) cite the fire altars from Kalibangan as evidence.

The Harappans used to follow different methods for disposal of the dead bodies. The presence of post-cremation urns from sites like Mohenjo-daro, Chanhu-daro and Harappa indicates that the bodies used to be cremated, and then the remains used to be kept in the urn. Elaborate burial positions are found at sites like Kalibangan, Farmana, Rupnagar, Lothal, etc., which suggest extended inhumation in a north-south orientation.

The skeletons used to be interred either in simple burial pits, or inside mud-brick lined pits in wooden coffins. Evidence of pot burial, alongside the normal burial modes, is also found from sites like Kalibangan. Various pottery items are found alongside the skeleton remnants in many burial pits. In addition, personal belongings like bangles, necklaces, beads, mirror, kohl jar, etc., are also found in the pits, suggesting a common belief in afterlife.

Trade contacts with Mesopotamia

Ever since Sir John Marshall announced the discovery of Indus Civilization (Marshall, 1924), the contact of the Harappans with the outer world is known. Similarity of a number of seals and other objects from Harappa, Mohenjo-daro and Chanhu-daro with those from sites in Mesopotamia and Susa provide evidence for trade links between these two great civilizations (Sayce, 1924; Gadd and Smith, 1924, Mackay, 1925, 1934, 1937). Some of the earliest finds abroad that were found to match with the Harappan objects came from Kish. The objects included a typical unicorn seal with Harappan signs, long barrel cylindrical beads of carnelian, as well as some etched carnelian beads (Mackay, 1925).

Harappan Civilization is also identified with “Meluhha” in the cuneiform records of Mesopotamia. The mention of “Meluhha” is made for the first time in the cuneiform inscriptions of the Early Dynastic Period of the mid-third millennium BCE (Possehl, 1996). There is a reference by Sargon of Agade (2334-2279 BCE) that the ships from Meluhha, Magan and Dilmun were coming up to Akkad (Agade):

> “the ships from Meluhha,
>
> the ships from Magan,
>
> the ships from Dilmun,
>
> He made tie-up alongside quay of Akkad.”

Dilmun has been identified with the Island of Bahrain and the near shores of the Arabian Peninsula. Magan is identified as Oman, including perhaps a part of the Iranian coast along the Straits of Hormuz, and Meluhha with the Greater Indus region, including the Harappan Civilization.

Possehl (1996) found 76 references to Meluhha and trade with it in the ancient cuneiform texts. Table 6.1 provides a list of citation to items imported from Meluhha during the Early Dynastic Period (ca. 2500 BCE) to the Isin-Larsa Period (ca. 1900-1800 BCE).

Table 6.1. References to items imported from Meluhha (ca. 2500 BCE to 1900-1800 BCE)

Category	**Reference**
Stone and pearls	Carnelian: 8 attestations Lapis Lazuli: 1 Pearls: 1
Woods and Plants	Gis-ab-ba-me-luh-ha: 12 Mesu wood: 7 Fresh dates: 1
Animals	A bird: 8, but 5 as figurines A dog of Meluhha: 1 A cat of Meluhha: 1
Metal	Copper: 2 Gold: 1
Meluhhan style objects	Ships of Meluhhan style: 2 Meluhhan style furniture: 3 Figurines of Meluhhan birds: 5

There is, thus, a strong possibility that groups of Harappan merchants used to visit Mesopotamia, and might even have colonies there. A cylindrical seal depicting a Meluhhan interpreter in the Akkadian territory strengthens the possibility of some Harappan settlements or colonies in Mesopotamia. The Harappans could have carried along with them large quantities of native pottery and other trade items. The external trade that the Harappans had with Mesopotamia has been discussed by many scholars (Ratnagar, 1981; Tosi, 1982; Rao, 1979; Possehl, 1994, 1996, 1997, 2002). Ratnagar (1981) provides an object-wise analysis of the Harappan materials found in the Mesopotamian region. Mery (1996) found the Harappan potteries, seals and ornaments like ivory comb, etched carnelian beads, segmented silver beads, etc., from sites in Oman. The most famous find in the Oman peninsula is a typical Harappan pottery with a four-letter Harappan graffiti on one black-slipped jar sherd at Ras-al-Jinz (Tosi, 1982). The black-slipped jars are stated to be the most common Harappan pottery found in Oman, and is placed in the second half of the third millennium BC (Mery, 1996).

Among the items exported from the Indus Valley, the important ones used to be the long barrel cylindrical beads and etched carnelian beads. The long barrel cylindrical beads are well defined as "long and slender, in excess of 5 cm, sometimes with a slight thickening at the centre" by Possehl (1996). These used to be manufactured from a variety of materials, the most beautiful being of carnelian and banded agate, the latter after heat treatment, attained the typical reddish colour of carnelian. The other materials in which these beads were made include that of jasper, terracotta, etc. Mackay (1937) states that from Mohenjo-daro "some no less than 4.85" long and made of the finest translucent carnelian that it was possible to obtain" were found and it was a favourite item worn by the people of Harappan culture. The long barrel cylindrical beads are also reported from Ur (NHK, 2000), Kish (Mackay, 1925, 1931; Possehl, 1996), and from Susa, Jalalabad and Marlik from Iran (Possehl 1996: 160). That the carnelian was in high demand is indicated by a large number of Mesopotamian citations mentioning carnelian from Meluhha. These citations do not mention the exact finished product but broadly speak of carnelian only. The popularity of long-barrel cylindrical beads continued even during the post-urban Harappan period, as could be seen from similar beads from the late Harappan site of Sanauli (Sharma et al., 2007). The excavations at Mari brought to light a hoard in 1965, termed as 'treasure jar' under the courtyard of a temple belonging to the pre-Sargonic palace. The antiquities were

found in a pottery jar containing 52 objects. The hoard consists of a large number of carnelian beads, some bicone in shape and others of the typical long-barrel cylindrical ones. The long-barrel cylindrical beads from this hoard are undoubtedly of Harappan origin (Fig. 6.22 and 6.23) and shape and conform to those found from many Harappan sites. The discovery of a variety of artefacts including seals, sealings, beads, ceramics of Harappan origin from sites in modern Iran, Syria an Iraq indicate the extensive trade between these two regions (Fig. 6.24).

Fig. 6.22. Agate-carnelian long barrel cylindrical beaded and gadrooned lapis lazuli necklace, Mari, Syria.

Fig. 6.23. Lapis lazuli and agate-carnelian beaded necklace, Mari, Syria.

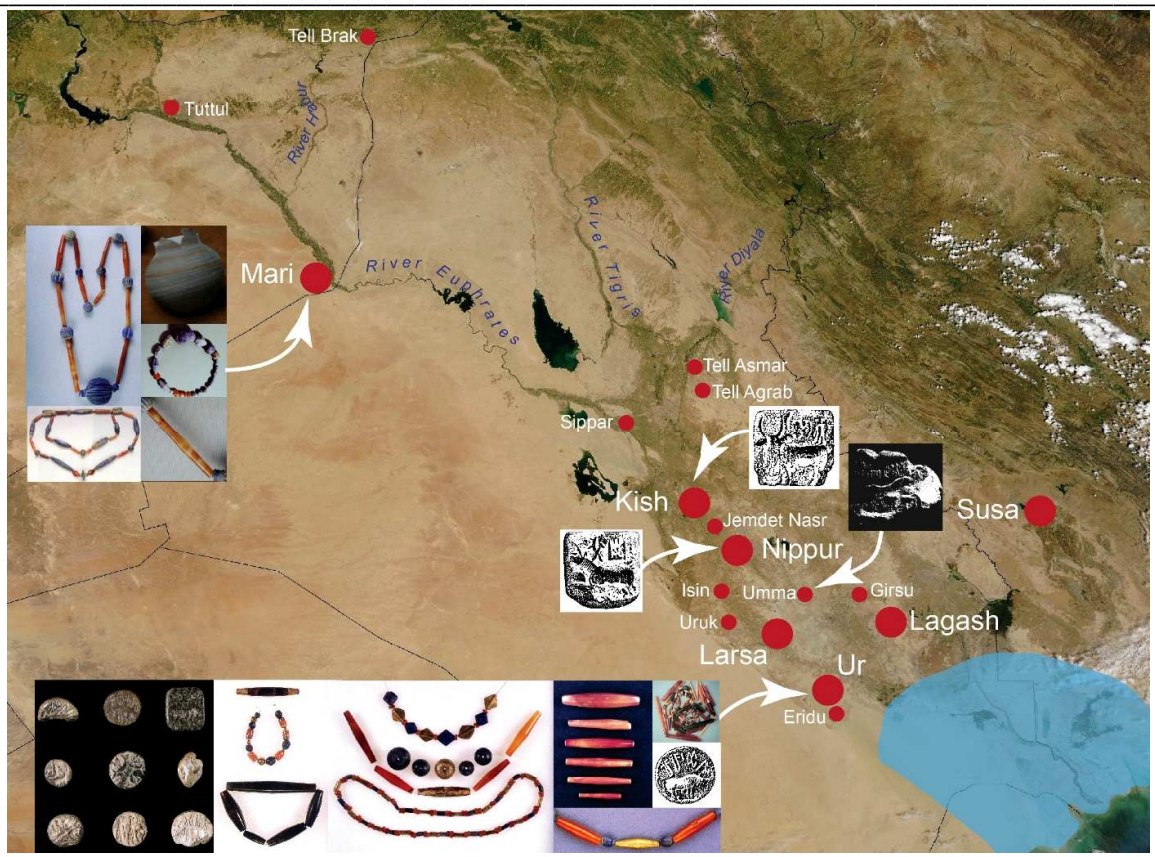

Fig. 6.24. Locations in Mesopotamia yielding artefacts of Harappan origin.

Late Harappan and Post-Urban Harappan phases

The early understanding of the Harappan Civilization was that of a sudden abandonment and vanishing after the peak of urban phase. This view was based on findings from the urban centres like Mohenjo-daro. Possehl (1977) summarizes the understanding as, "the civilization arose quickly from whatever formative base might have been present, and that it ended with equal rapidity." Possehl (1977) also observes that a clear evidence for the presence of 'late Harappan' phase of Indus Civilization was always there but largely ignored by the archaeologists due to the "distinctiveness of the Mature Harappan material culture" and less understanding of the transformations preserved in the habitation mounds of the different settlements. Kenoyer (1998) observes that there was a gradual shift, which marked the fading of the first urban civilization into the background, as many new cultures began to emerge along the eastern, southern and northern edges of the Indus Valley. Kenoyer (1998) further states that it took nearly a thousand years for the shift in cultural and political centre from the Indus Valley to the middle Ganga region. The transformation marked the end of the urban phase of the Indus Civilization after nearly seven hundred years. The beginning of this late Harappan transformation has been documented at sites like Harappa and Dholavira.

The transformed late Harappan/ post-urban culture is known in different parts of the Greater Indus Valley by names such as Cemetery H (Pakistan Punjab and Cholistan), late Harappan / Bara (Haryana, Punjab and western Uttar Pradesh), Jhukar and Jhankar (Sindh). The settlement pattern of the period (dated as ca. 1900-1300 BCE) suggests abandonment of several settlements along the central and the lower Ghaggar, including the larger ones like Kalibangan and Ganweriwala (Fig. 6.25). The decrease in the number of settlements in Bahawalpur (Pakistan), Ganganagar and Hanumangarh (Rajasthan) areas, and a sharp increase in the number of settlements in Haryana, Punjab and Uttar Pradesh becomes more

apparent when the post-Harappan sites are plotted on a map with the preceding mature Harappan phase (ca. 2600-1900 BCE). In Haryana, a dramatic increase in settlements is noticed in the districts of Jind, Kurukshetra, Karnal, Hissar and Ambala, while Mahendragarh and Gurgaon districts recorded their first Harappan settlements. In Haryana the number of sites increased from 44 (Harappan) to 297 (late Harappan), but in the adjoining Rajasthan all the Harappan sites were abandoned. The important excavated late Harappan settlements are at Harappa, Mitathal, Bara, Sanghol and Alamgirpur. Another very important and a large cemetery site of the late Harappan period, Sanauli, was excavated to the east of the Yamuna River, which helped in understanding the contacts of the Harappans with another culture characterised by Copper Hoards and Ochre Coloured Pottery in the Ganga-Yamuna Doab (Sharma et al., 2007).

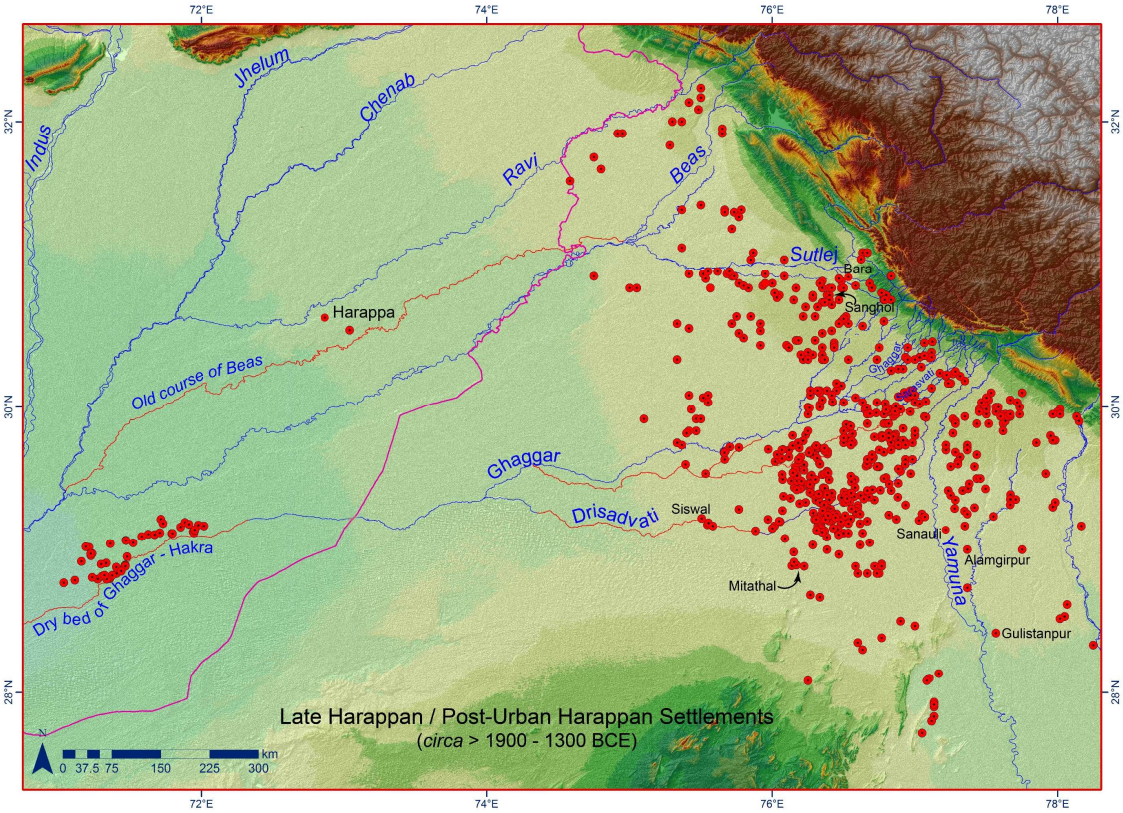

Fig. 6.25. Settlements of the late/ post-urban Harappan period.

After the late Harappan period there was a major break in settlement along the Ghaggar valley and elsewhere. Lal (1955) discussed the discovery of some settlements at Hastinapur and other places in the Ganga-Yamuna Doab, as well as in the plains between the Yamuna and the Sutlej, which provided cultural continuity in the 'Dark Age' between the Late Harappan and the Early Historical periods. In the Ghaggar valley this next period of occupation, known as the Painted Grey Ware (PGW) period, grew up right along the floodplain that was inhabited few centuries ago, and was then followed by the settlements of the early historic period, the Rangmahal period. This suggests a control of river flow on the continuation of the settlements.

Conclusions

Based on a survey of archaeological evidences of various periods it can be surmised that the River Sarasvati had supported a large number of settlements at least from the fourth millennium BCE onwards. The geographical location of this river, along with its major tributary, River Drishadvati

(Chautang), clearly indicates its historicity, if viewed with the numerous settlements along it. As it has been rightly observed and concluded by several scholars, River Sutlej joined the River Sarasvati and contributed enormously for its flow of water, which is also indicated by a wide flood plain ranging from 7-10 km, particularly in Rajasthan and further downstream. The settlement of Kalibangan right on the edge of this floodplain is a clear indicator of the active river during its heydays. The abandonment of Kalibangan towards the end of Harappan culture coincided with the drying of River Sarasvati and also possibly with the shifting of River Sutlej away from the former, thereby diverting the major water source elsewhere.

A brief survey of the characteristic features of the Harappan culture indicates the unique geographical and ecological zones of the Civilization. The distribution pattern of the settlements, including the six large cities, indicates a pattern of settlement planning to exploit the necessary raw materials for both internal consumption and external trade with Mesopotamia. The cuneiform texts of different periods in Mesopotamia, beginning with the Early Dynastic III period, indicate the nature of commodities exported by the Harappans.

The shifting of settlements to upstream locations during the late Harappan period is a clear indication that the River Sarasvati dried up during the second millennium BCE, and a reason why the valley did not support human occupation until the Painted Grey Ware period. The occupants of the Painted Grey Ware period founded their settlements at a few locations right on the floodplain, indicating the vast different of flow of water a few centuries back. This was also the case during the early historical period (Rangmahal period) when settlements again were founded on this river.

Thus, the journey of at least three millennia clearly indicates how the settlements were founded, grew in size, formed part of a thriving civilization and then got abandoned with the drying up of River Sarasvati, clearly indicating that the river sustained settlements for a considerably long period. The settlement patterns during the late-second and first millennium BCE were not as dense as during the Harappan Civilization.

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