

CAUSES OF DECLINE OF THE INDUS VALLEY CIVILIZATION

Introduction:

The Harappan Civilization lasted for about one thousand years. Archaeological evidence shows that many of the major cities of the Harappan Civilization, like Harappa, Mohenjo-daro, and Dholavira faced abandonment and decline during the late 3rd and early 2nd millennium B.C. Many of the distinctive features of the Harappan Civilization like writing, standardised seals and weights, some standardised aspects of town planning and other traits of material culture also disappeared.

The decline of this civilization which was the largest in Bronze Age civilization has been an enigma even today. Earlier it appeared to be a sudden and total decline and abandonment. This was due to focus on the studies of cities, town planning, large structures and goods of splendour. However, mounting new evidence since the sixties compels that the decline was not as sudden and dramatic as earlier assumed. Some scholars have even argued for continuity and survival of the Harappan tradition in certain areas. We see abandonment or sparse occupation of certain areas like Sindh in the west and increase in settlements in other areas, particularly towards the east - northwestern India including the westernmost Yamuna -Ganges rivers region, and Gujarat in the southwest. Often, reoccupation of former cities is also noted. During this transitional phase we notice a shift from urban centres towards increasing settlements of villages, or deurbanisation. But many distinctive features of the Harappan Civilization, like Indus script, seals, architectural style, etc. disappeared forever.

Timing:

The abandonment of major Indus cities has been roughly dated to about 1700 B.C. References to Meluhha in the Mesopotamian literature does not occur after 1900 B.C.

After the Harappan Civilization, the major culture observed is Painted Grey Ware (PGW) culture which is found after a long gap. PGW sites have been dated variously to 1100-500 B.C. (Possehl 2002); 1200-800 B.C. (Kenoyer 1998) and 1700-1400 B.C. (Bisht 1998). The interface between PGW and the "Late Harappan" in the Punjab has been documented at places such as Dadheri and Bhagwanpura. However, the interface between the Cemetery H assemblage (Late Harappan or Post-Urban Harappan) and the PGW has not yet been defined in Pakistan. The interface between the Rojdi C/Lothal B and the Gujarat Early Iron Age is also not clear.

The chronology of the end of the Harappans still remains tentative (Table 1). We also do not know whether the major settlements were abandoned at the same time or at different periods.

Further there are various contradictory views with regard to the terminology

employed. Mughal prefers the term 'Late Harappan' instead of 'Post-Urban Harappan' coined by Possehl, because of the find of a large settlement at Kudwala in Cholistan during that period.

Moreover, the archaeological evidence for occupation in the Late Harappan/Post-Urban phase varies regionally and the distinctions are largely based on local ceramic types (Table 2). The Jhukar terminology for the Lower Indus is based on the excavations of a locally distinct culture, identified by ceramics.

Pattern of Decline:

There is very little evidence of habitation at Mohenjodaro between ca. 1900 B.C. and the Kushan period in the 1st century A.D. At Harappa too we find a major reduction and alteration in the settlement, the evidence from Cemetery H indicates continued settlement but without the characteristic material culture of the Mature Harappan period. Archeological evidence indicates abandonment or severe depopulation of many cities between the Mature and Late Harappan.

Cities like Harappa, Mohenjodaro, Surkotada, Dholavira, Lothal, Kalibangan and many other sites, particularly in Sindh and Cholistan witnessed a decline in many aspects of urban township. There was a decline in civic standards, with low quality construction, often with re-used bricks; houses were made in haphazard manner, often encroaching upon streets; drain and city walls were not maintained. We find appearance of industrial activity like pottery kilns and metal furnaces in residential areas, hasty burial in houses, streets and hoards of valuables left on the streets.

Deterioration of public works and architecture is also evident. Many entry points to the 'Great Bath' were blocked and later both the 'Great Bath' and the 'Great Granary' which were perhaps symbols of power and ideology fell into disuse.

We witness a degeneration of civic authority or breakdown of civic order and reorganisation of society where the ruling elites no longer controlled the functioning of the urban centre. This can be inferred as many of the hallmarks of elite culture during the Mature Harappan disappeared. Objects displaying prestige and splendour, like sculptures, beads, bangles, and other technologically elaborated arts and crafts like inlaid ivory work, seal carving, etc. became increasingly scarce. Cubical chert weights, meant perhaps for taxation and trade, were no longer used.

Though the distinctive Indus square, oblong stamp seals are no longer made, we continue to find evidence of graffiti from sites to the east of the Indus system, though it virtually disappeared in Sindh. Indus graffiti is found even at Iron Age 'Megalithic' pottery from Central India. This indicates that Indus writing system did not disappear with the Mature Harappan, though it did change.

The Mature Harappan style of architecture and material culture disappeared indicating a decline in internal socio-cultural complexity and deurbanisation.

Disruption in economy and trade also occurred. There was no longer any mention of Meluhha (Indus region) in trade records of Mesopotamia indicating that long distance trade network had started deteriorating. Production of

many special items like long-barrel cylindrical beads, etched beads, and inscribed stamp seals was reduced. Maritime posts of Sutkagen-dor and Sotka-koh were abandoned. However increasing interaction was noted with the BMAC cultures.

Strategic changes were noted in subsistence patterns in the form of double cropping with the growing use of millets. This reflected social and political reorganisation rather than an environmental crisis. There was also probably a change from centralised or communal crop processing to processing within households as large numbers of residues from threshing, winnowing, grinding and cleaning of grains are found. Reduced demand for traction animals indicated a less intensive agricultural system and reduced need for transport. The end of the Late Harappan saw the introduction of camel, horses and donkeys.

Reduction in the size and number of settlements was also noted (Table 3). Mohenjo-daro shrank in size from eighty five hectares to three hectares. Several sites in Baluchistan were burnt around during the end of the Mature Harappan period. Number of settlements in the Bahawalpur region along the Hakra river, which formed a core area of Harappan settlement reduced from 174 in the Mature Harappan to 50 in the Late Harappan. However, there is a net increase in the number of settlements during the Post-Urban/Late Harappan, but a decrease in the net settled area and average site size. This implies important changes in socio-cultural system, mainly in the mode of subsistence and settlement, or perhaps some kind of 'deurbanisation' or 'redistribution of population on the landscape'.

Recent evidences indicate that the civilization did not suddenly disappear. Craft production continued at a high level of sophistication as supported by the find of the Quetta treasure at around 1900 B.C. near Mehrgarh. We continue to see disconnected signs of the survival of certain Harappan traditions such as the binary-decimal system of mensuration, written signs, certain pottery forms like the scored goblet etc.

These arguments have been cited by proponents of cultural continuity and survival which include Possehl, Kenoyer, Malik, Jarrige, Mughal and Shaffer and Lichtenstein. Possehl opined that it was the state that died, not the Harappan civilization or its material culture. But, Allchins, B.B. Lal, Ratnagar, Wright and others are of the view that the civilization did indeed come to an end as the contrast with the succeeding cultures "is too great to allow for a case of tradition and continuity" (Ratnagar 2000).

Ratnagar sums it, "however many such elements we count as 'survivals', they are not tantamount to an integrated Bronze Age political economy." By the end of the Late Harappan, many cities were permanently abandoned and the basic character of the Harappan tradition in the form of its planned cities, system of weights, technologically elaborated crafts, seals, and script largely disappeared leaving echoes only in myths and general cultural traits. Unlike the Sumerian, Egyptian, and Chinese civilizations, all of which were known from historical sources, the Harappan Civilization was truly lost and forgotten until archaeologists rediscovered it.

Causes of Decline of the Harappan Civilization:

The downfall of the Harappan Civilization has been one of the most puzzling issues in Indian archaeology. A number of explanations have been put forward ranging from environmental causes like droughts, floods, changing river courses and sea levels, tectonic shifts due to Aryan invasions and disruptions in trade and social instabilities. These explanations are reviewed below in the light of recent understanding emerging from new explorations and excavations.

They are

Foreign Invasions

Environmental Changes

Disruptions in Trade

Social Instabilities

Foreign Invasions:

Wheeler was the first to propound a theory for the decline of the prosperous Harappan Civilization. He believed that the Harappan Civilization was destroyed by Aryan invasions. He inferred this from interpretation of the circumstantial and historical evidence:

skeletons lying on the streets of Mohenjo-daro indicated that a massacre had taken place;

he uses Rigveda as a source of historical information for this theory -

a. Rigvedic mention of conflicts was equated to war between the incoming Aryans and the indigenous Harappans;

b. Reference to fortress of the 'Dasas' and 'Dasyus' was equated to the Harappan fortification walls as the geographical area of the Rigvedic Aryans correspond to the core area of the habitational sites of the Indus, that is, the Punjab and Ghaggar-Hakra region, and remains of no other historical culture have been found during the above period;

c. Mention of Indra, the Aryan war-god, as puramdara 'fort-destroyer' who shatters 'ninety forts' for his Aryan protege, Divodasa; and

d. Mention of Hariyupia located on the banks of the Yabyabati (probably Ravi river) where the Aryans had fought a battle was thought to be mentioned of Harappa.

However, this theory has been criticized on a number of grounds.

Chronological: The Harappan Civilization came to an end around 1800 B.C. while the Rigveda is believed to be written around 1000 B.C. even though the exact chronology of the Rigvedic Aryans has not yet been established.

Historical: Further, the exact nature of the historical content of the Rigveda has also not been established, though it is reasonably supposed that there is some important historical information in this text.

Skeletal: Scientific analysis of the skeletal remains from Mohenjodaro does not show any signs of trauma due to massacre, they appear to be just hasty interments. The skeletons show phenotypic differences from other Harappan populations indicating a heterogenous population, but they do not show evidence for the 'introduction of a novel phenotypic pattern' just before or after the decline of the Harappans suggestive of new groups migrating into

the region.

Cultural: Harappa had a final stylistic phase that seems to reflect some foreign influence, particularly from Iran. But there was no radical replacement or change that might indicate an invasion. Many scholars have cited continuities in architectural traditions and technologies, and artistic and religious symbols. It would seem that if indeed Aryan's invaded India, then there would be evidence of a completely different sort of religion, craft making, significant changes in art and social structure. But none of this has been found. What changes have occurred, were largely due to internal factors.

b)Environmental Changes:

Often hydrological calamities like floods, droughts, changing river courses and sea-levels have been cited as responsible factors for the collapse of civilizations. Even for Harappan Civilization, this has been considered as an important factor leading to its final demise.

Floods:

There have been records of flooding at Mohenjodaro, Kalibangan and Dholavira, as cited in the excavation reports. This was inferred from collapsed buildings and houses and streets covered with silt clay intervening actual periods of occupation. This clay is thought to be left by the receding floodwaters. At Mohenjodaro these abnormal floods and consequent rebuilding of the town seems to have happened at least thrice. Chanhudaro was also twice-destroyed by 'massive' inundations. The devastating floods obstructed the normal process of irrigation, leading in turn to the economic decline of some of the Harappan settlements.

Raikes Hypothesis:

Raikes and Dales believed that such catastrophic floods as evident from massive silt deposits could not be accounted by the normal behaviour of a river. Since, the Indus River lies in a seismically active zone, upliftment of the plains must have blocked the passage of Indus water, creating a natural dam in the vicinity of Sehwan, leading to prolonged submergence of cities like Mohenjodaro. This was first proposed by Sahni (1956) after noting thickly bedded alluvium at Hyderabad.

However this theory has been criticized on many grounds:

Lambrick argued that even if earthquakes raised a bund, this could have been easily breached by the huge discharge of Indus water. The evidence from the Allah Bund along northern Kutch on the borders of Sindh, which was raised during the earthquake of 1819 shows that such damming did occur in the past, but this dam was subsequently breached by the first significant floods from a small stream of the Indus, the Nara river.

This also proves Wasson's argument that the unconsolidated Indus sediments have little structural integrity to impound Indus water.

Lambrick also opines that the silt deposition at Mohenjodaro is not due to flood deposits, but it is actually a result of deposition of eolian sand and silt combined with disintegrated mud, mud brick and baked brick structures.

Possehl argued that though this could have served as an immediate cause of

change, but the collapse of the civilization could only be accounted for, by some deeper, internal structure within the society and culture, geomorphology alone cannot explain it.

Shifts in River Courses:

Changes in hydrographic networks and consequent impact on farming systems have also been used to explain the decline of the prosperous civilization of the Mature Harappan period. The Indus and Ghaggar-Hakra river system which were the loci of Harappan settlements and the Harappan agrarian economy was dependent on the natural floodwater of the rivers. They were however subject to many changes in the river systems with grave consequences. Use of aerial photography and remote sensing imagery accompanied by regional geoarchaeological surveys in the recent times, have helped provide a better picture of the river dynamics.

Indus River:

Mackay was the first to argue that Mohenjodaro was abandoned due to the shifts in the course of the Indus river. Later, Lambrick furthered this theory. He argued that Indus being an unstable river shifted its course many times during the Harappan occupation which led to the collapse of the civilization.

Flam documented major changes in the Indus river system in its lower reaches since Pre-Harappan and Mature Harappan periods. During the period from 8000 to 4000 B.C., there were two main courses unlike the present single course, the Jacobabad course on the western edge for the Indus river and the Nara river running parallel to the Indus on eastern edge of the plains which was part of the Ghaggar-Hakra system. Between 4000-2000 B.C. the course shifted eastward and now followed the Sindhu river course and the confluence of the Nara river with the Sindhu river shifted farther south, just north of the coastline. Even the coastline was situated 95 miles north of its present location during the Mature Harappan. These shifts may have been a result of tectonic or environmental forces. Mohenjodaro which was located between the two courses may have been abandoned due to these river regime fluctuations as this led to water shortages and need for frequent restructuring ultimately leading to desertion of the city.

The upper reaches of the Indus have also been subject to extensive studies, which include the Ravi and now - dry bed of the Beas river near Harappa. Many Harappan settlements are located on terraces of the Beas river suggesting that the river was active at that time. Further relict channels have also been identified.

Ratnagar criticize the theory saying that though shifts may have occurred, but no pattern is evident in the location of Early, Mature and Late Harappan sites indicative of adjustments to river shifting.

Yet it can be said that frequent shifts in river courses of the Beas, Ghaggar-Hakra and Lower Indus and rainfall fluctuations did have an impact on local adaptations, resulting in group migrations, abandonment of many towns like Ganweriwala, reduction in size and number of settlements during the Late Harappan. Major dislocations occurred to the east of Cholistan towards northwest India.

But it was not the ultimate cause. It does not explain the collapse of the entire civilization which was so widespread; it can at best explain the demise of specific regions like Mohenjodaro. Possehl labels it as the "Domino Effect" - "as Mohenjo-daro went, so went the Harappan Civilization".

Ghaggar-Hakra River:

Changes in the course of the Ghaggar-Hakra (often identified with the lost Saraswati- Drishadvati rivers of the epics), has also been cited as a major factor in the decline of the Indus Civilization. The drying up of Ghaggar-Hakra and increased aridity, has left many sites without a viable subsistence base.

The Ghaggar rises in the foothills of the Himalayas and flow seasonally, but the Hakra is visible only as a relict channel in the deserts of Cholistan in Pakistan. The Ghaggar-Hakra probably flowed south into the Nara river. Today, the relict channel of the Ghaggar-Hakra disappears into semi-arid Haryana and Rajasthan.

A number of settlements have been located along the now dry beds of the Ghaggar-Hakra system with a relatively high density of sites in 'Hakra Ware' phase indicating a strong flow in the river, which decline in the Early Harappan and then again increasing during the Mature Harappan, indicating a resurgence of the river, perhaps arising from the presence of a rich inland delta. Sites of the Early/Mature Harappan transition, ca. 2600-2500 B.C. have however not been identified in Cholistan. Then in the Cemetery H and Painted Gray Ware (PGW) periods we see the retreat of the river to the east, eventually with insufficient flow even to reach the Fort Derawar delta. By Painted Grey Ware (PGW) period (ca 1200 -500 cal B.C.) the river must have been dry indicated by few sites (Fig. 9), many of which are found in river bed contexts

This change is thought to have been brought by tectonic movements. It induced the capture of Ghaggar headwater flowing from the melting of the Himalayan glaciers by Yamuna which now flows east into the Ganges system and Sutlej which was captured by the Indus river. This led to increasing aridity in this semi-arid region and drying up of the Ghaggar-Hakra river which supposedly worked as a major factor in the de-urbanisation of the Late Harappan period, as reduced water and moisture availability must have affected agriculture, forcing protohistoric farmers to move to more viable areas.

The population declined in Cholistan, but the number of villages increased in the Late Harappan period in the Sutlej-Yamuna divide. Shaffer noted an increase from 43 Siswal A-B and Harappan sites to 127 Siswal C-D sites.

Courty studied of paleosols from the Ghaggar-Hakra region and concluded that a piedmont hydrographic network was rejuvenated between ~12,500-7000 BP due to re-establishment of a strong monsoon circulation. But again during the middle Holocene (around 5000 years BP) there was reduced seasonal flooding, primary drainage arteries retreated 100 to 150 kms northward and there was formation of localised sand-dunes. However, despite present day climatic conditions, low-lands and interdunal basins were favorably utilised by protohistoric farmers due to high water table (despite

moderate saline conditions). Sometime around 2500 years BP, microrelief disappeared due to increased eolian activity and silting up, lowering the water table and the effect was enhanced due to anthropogenic landscape leveling leading to abandonment of the region.

Recently Rajani (2011) utilised digital image processing and enhancements techniques on multisensor satellite data along with field investigations to trace the palaeochannels of Saraswati river through parts of Indus alluvial plain in Thar Desert. Pattern of palaeo-channels identified westward migration of the Saraswati river. Settlement patterns indicated a good distribution of Mature Harappan (2200 - 1700 B.C.) sites along the palaeo-channel of the Saraswati and its tributaries in north-west India, but Late Harappan (1700 - 1500 B.C.) sites are limited to further west in adjoining regions of Pakistan (Bahawalpur) indicating that settlement relocation followed the pattern of river migration towards west.

As regards the timing it is said that sometime between 2500 B.C. and 1900 B.C. the Yamuna shifted its course eastwards, allegedly reaching its current bed by 1st millennium B.C. The Sutlej several times shifted its channel northwards and was eventually captured by the Indus system around 2500-2000 B.C. (Mughal 1997) or 5000-3000 B.C. (Valdiya).

The drying of the Saraswati indeed had a major impact as can be seen from the drastic reduction in the number and size of settlements from Mature to Late Harappan. This had some kind of 'domino effect' leading to general collapse of the civilization (Possehl 1997). However, we do not have reliable chronological information to support this theory. Further, despite large scale migrations and relocations, hydrological factors cannot be singled out as the cause of the collapse, because we continue to find thriving settlements in Gujarat and Ganga-Yamuna doab. Further, Harappan settlements were deserted not only along the Hakra river in Cholistan, but also in Makran, Kutch, Sind and southern Punjab.

Tectonic Shifts:

Earthquakes can accelerate decline by causing change in drainage patterns due to alteration in elevation levels thus affecting water supply, disrupting trade routes, necessitating rebuilding or forcing migration.

Kovach et al. (2010) have emphasised the effects of earthquakes on Harappan settlements. In their studies they noted that the Rann of Kutch which earlier formed as a delta for three rivers, became an inland sea during the 3rd century B.C. and ultimately became a salty marsh. These changes were induced by a combination of sea level changes, truncation of the three rivers by tectonic uplift and the deepening of the Rann by earthquake induced subsidence. They opine that events analogous to the 1819 Allah Bund earthquake, which dammed the Puran river for seven years, would have significantly altered the water source for downstream settlements. Support has been garnered from data from the recent 2001 Bhuj event to show that Harappan settlements would have suffered considerable shaking damage from an analogous historical event.

There is also direct archaeological evidence for at least one major earthquake

at Dholavira in 2200 B.C.

Further, a number of the mature Harappan settlements are located along the dry Ghaggar-Hakra river system. These sites however declined during the Late Harappan coinciding with the divergence of the Ghaggar-Hakra system to the Indus and Ganga river systems. This was supposedly induced by tectonic forces and aridity.

Although the Ghaggar-Hakra region has not had any large earthquakes in historic times, there is archaeological evidence of two large events at the Harappan site of Kalibangan, at 2900 and 2700 B.C. Excavations at Kalibangan have shown evidence of faulting in the form of horizon displacements and tilted brick walls. This layer was sealed by infertile windblown sand indicating abandonment and then reoccupation indicating a date of around 2700 B.C.

All the above evidence has been cited to demonstrate that earthquakes were an instrumental factor in bringing about the demise of several Harappan sites either by direct shaking damage, altering the water supply or by changing the relative sea level.

Increased Aridity and Drought:

Singh propounded a 'Culture -Climate' hypothesis, wherein he attributed the florescence of the Mature Harappan Civilization to a period of higher rainfall during the 3rd millennium B.C. and its decline to increasing aridity, on the basis of pollen sequences from three salt lakes (Sambhar, Lunkaransar and Didwana) of Rajasthan-between 3000 to 1800 B.C.

Later Bryson and Swain argued that till 4000 B.C. there was a wet phase due to efficient winter rains. But later shift of westerly circulation to the south and a weak monsoon resulted in drying.

Weiss and Bradley also mention that a larger-scale dry climatic event at 4200 cal BP led to the fall of many Bronze Age civilizations, including the Akkadian empire, old kingdom of Egypt, the Early Bronze Age civilizations of Greece and Crete and the Harappans.

However, this theory has been criticized by many scholars on a number of grounds:

Misra (1984) said that pollen frequencies are not a direct measure of past climatic changes because there is often a time lag between climate change and vegetation change.

Misra stated that no agricultural sites have been found in Rajasthan, whereas Singh identified pollen of cereal plants from 7000 B.C. onwards.

Changing salinity cannot definitely be attributed to increasing aridity as freshwater and hyper-saline lakes can coexist in one climatic regime as can be seen today in Rajasthan.

These conclusions have also been criticized on grounds of imprecised chronology.

Besides, even if rainfall decreased, it is difficult to say that aridity in central and northern Rajasthan was responsible for the eclipse of the civilization as a whole.

Further shifts in winter or monsoon rain-bearing winds would have had a

marked effect as Sindh lies between the two belts. In fact the drought in 1972 occurred because of the southeastward shift of wind and pressure belts.

The system of agriculture and reliance on rainfall also influences the effect of change in rainfall pattern. It may be pointed that Mohenjodaro which receives less than 12 cm of annual rainfall and depends on the Indus floods has a viable agro-pastoral economy.

Further, settlements continued to exist in large numbers in east Punjab, Haryana, western Uttar Pradesh, and northern Rajasthan right from Mature Harappan through Post-Urban times with an increase in the number of sites, though the site size diminishes (Table 5).

Since then however Harappan environment has been investigated using new improved scientific techniques and better-dated sequences using sedimentology, mineralogy, geochemistry and pollen analyses.

Recent studies based on pollen sequences from Rajasthan indicate that the Harappan Civilization in fact emerged during increasing aridity. Enzel's study of the Lunkaransar playa identified a dry phase from 2894 to 2643 B.C., thus showing that drying or reduced rainfall had started even 1000 years before the Harappan occupation, and the peak of the Mature Harappan period corresponds to an arid period of sand-dune destabilisation. Sediment studies from Ghaggar river in northwest India also showed that fluctuations began around 10,500 years ago with abundant rainfall. Around 5000 years ago, rainfall reduced and there was onset of aridity which coincided with the peak urban period of Harappan Civilization from ca. 4000 B.C. to 2500 B.C.

Stable isotope records on marine foraminifera near the Indus delta provide a paleo-discharge record for the Indus river during the last 6 ka which showed a reduction in Indus River discharge at 4.2 ka BP. The 4.2 ka BP event is said to be global as similar climatic changes are noted in the eastern Mediterranean and the Middle East.

Wright et al. (2008) came across a similar general pattern of drying using the 'Macro-Physical Climate Model' to reconstruct the Holocene flow of the Beas river. They concluded that rainfall increased between 8000 and 5000 B.C. and was stabilised between 5000-4000 B.C. After 3500 B.C. summer monsoon reduced, while winter rains increased. Rainfall was lowest around 2000 B.C. but recovered a few hundred years later. Harappan settlements continued after 2000 B.C. till as late as 1300 B.C. by making adjustments in cropping patterns from more intensive agriculture and control of surpluses to a multiple cropping system which provided strategic risk buffering for smaller, local groups.

Recent studies by Macdonald based on Pacific sea surface temperatures (SST's) and El Niño Southern Oscillation (ENSO) variability in the strength of the Indian Summer Monsoon (ISM) also showed a pronounced increase in aridity in the late Holocene and a steep drought at ~4,200 ca BP. However, transition to the deurbanised Late Harappan phase may have begun some 300 years prior and the persistence of the Late Harappan phase until 3000 cal BP suggests a more complex story.

The above review shows that although most studies agree that there were

fluctuations in rainfall regime, the datasets are marked by chronological uncertainties and opinions vary on the timing of these changes.

However, the impact of climate would vary according to local conditions while Harappan decline took place across the entire Indus Valley region and therefore we must seek causes that had a wide, rather than local geographic scope. Madella and Fuller argued that climatic events were not responsible for the end of Harappan Civilization, although shifting agricultural strategies at a local level in response to climatic change, probably contributed to the emergence of Harappan urbanism at ca 2600 B.C. and again to de-urbanisation and restructuring of human communities starting ~2200 -2000 ca B.C.

Fairservis: Ecological Imbalance:

Fairservis tried to explain the decline and abandonment of Harappan cities in terms of anthropogenic causes dismantling the ecological balance in the region. He calculated the impact of Harappan land use around Mohenjodaro by computing the population of Mohenjodaro and its requirements. He estimated the population of Mohenjodaro as 41250 inhabitants and the area under cultivation in the vicinity of Mohenjodaro at around 22715 acres (on the basis of pre-modern rates of wheat output per acre in the region). On the basis of the number of cattle needed for ploughing, he estimated the total cattle population at 8700 or more. He however underestimated the cattle requirements by missing the use of cattle for lift irrigation. It must have also required a large network of villages serving the needs of the city.

He suggested that the growing demands of the increasing human and cattle population led to depletion of forest, food and fuel resources. Over-cultivation and over-grazing disturbed the symbiotic ecological balance of the region. Over manipulation of natural resources and such large scale alterations to the landscape resulting from human activity perhaps caused floods and salinity further aggravated the problem. This is reflected in the gradual deterioration in town planning and living standards. Depletion of resources for subsistence caused a shift eastwards towards more viable regions.

However, it has been pointed out that the Indus region has been a fertile area serving the needs of its teeming population over the last two millennia, which puts under doubt soil exhaustion. Further, computation of Harappan population and its requirements is based on very little evidence. Such a computation would require understanding the relationship with neighbouring villages and areas supplying raw materials and the trade networks with contemporary civilizations and cultures. This theory is based on the assumption that the climate of the region has remained much the same. Yet, as Ratnagar (2000) puts it, it is an 'important approach to the question of the relationship between a people and their land.' She favours environmental degradation as a cause of demise over natural catastrophe, though its impact must have been non-uniform.

Ratnagar mentions that huge requirements of wood charcoal fuel for ancient copper metallurgy must have also considerably depleted the wood resources. She cites:

Horne's estimate that for 5 kgs of copper, about 100 kg of charcoal was burnt which required 700 kgs of fresh wood, or the wood of 25 to 30 trees.

Wertime's mention of the end of ancient metallurgy in Oman at around 3rd millennium B.C. because they ran out of charcoal sources.

At Lothal, which lies near the boundary between tropical thorn forest and dry deciduous forests, in the mature Harappan levels II and III, charcoal from diverse species like acacias, teak, albizzia and lauraceae indicates a mixed dry deciduous forest. However, in level IV, only large quantities of acacia were found which was interpreted as indicating arid climate. But preponderance of harder and rapidly growing acacia is said to be a result of biotic interference by man.

The evidence of an ash dump near a carnelian heating kiln of level IV as use of animal dung for fuel. Though it is not clear whether this was due to shortage of wood charcoal or suitability of animal dung for slow heating.

She further wonders if drinking water problems aggravated the demise of towns like Mohenjodaro. She reasons that Jansen calculated 700 wells dug in Mohenjodaro indicating that Indus River was quite far to serve as a source of drinking water.

c) Disruptions in Trade:

The growth of trade and the expansion of Indus settlements onto the Ganges river plain and Gujarat in western India led to the overextension of the Indus political and economic system.

But sometime during the end of the 3rd millennium B.C. there is considerable evidence for the disruption of trade between the Harappans and other civilizations. Textual references to Meluhha (Indus region) decrease at the end of the 3rd millennium B.C. in trade records of Mesopotamia indicating that long distance trade network had started deteriorating. On the other hand references to Alashiya (Cyprus) and its copper start occurring.

Production of many special items like long-barrel cylindrical beads, etched beads, and inscribed stamp seals was reduced. Further many exotic materials like shells from the coastal regions and lapis lazuli from the north were no longer found in Indus sites. Indus materials like gold, carnelian and ivory objects, Indus seals, shell and bone inlay objects, cubical weights and ceramics are recovered from southern Mesopotamia and sites along the coast of Arabian peninsula only up to 1900 B.C. However, after that we find evidence of contact with coastal settlements in Oman at Ras-al-Jinz, Bahrain and Gujarat. This indicates continuity of trade, only the focus shifts from Sindh and Mesopotamia to Gujarat and Oman.

Further there was increasing interaction with the Bacteria Margiana Archaeological Complex (BMAC) cultures. BMAC materials are found in small quantities at Mohenjodaro, Harappan, several sites in Baluchistan and even at Rajasthan.

Maritime posts of Sutkagendor and Sotkakah were abandoned. At Shortughai, Afghanistan we find diminishing evidence for Indus materials around 2200 B.C. which are replaced by BMAC materials. Even at Nausharo, Indus materials are replaced by Kulli culture evidences suggesting extension

of its influence through small scale exchanges. Internal trade also declined due to climatic and environmental changes.

However, Possehl has raised a pertinent question with regard to the direction of cause: whether disruption of trade contributed to the transformation of the Harappan Civilization or vice versa. Further, he points that there is very little evidence for disruption of trade with Mesopotamia around 1900 B.C. as there are many references to Meluhha even during the second millennium B.C. in Mesopotamian texts.

Further we have no clue as to the scale of trade and its importance in the Harappan economic rubric. We do not have much archaeological evidence on the economic weightage of trade except some documentary evidences from Mesopotamia and stray finds providing insight into the scale of trade. Evidences indicate that Harappan materials are more visible in Mesopotamia and other neighbouring cultures than vice versa.

All these evidences do point out that trade was indeed vital to Harappan civilization and must have contributed to its demise in some way.

d) Social Instabilities:

Possehl opines that the collapse of the Indus Civilization was primarily a matter of ideology. This was induced by over extended socio-political networks and the rise of a new social order. There was "a definite transformation of Harappan life, with important changes in the socio-cultural system" (Possehl, 1997).

Continuity and Survival of the Indus Tradition:

In the aftermath of the Harappan Civilization we find continuity and survivals of the earlier tradition in the form of a large number of Regional/Local Post-Urban/Late Harappan cultures in the Harappan culture area and its margins.

The urban character of the Mature Harappan with its large, multifunctional cities, system of writing, weights and measures, long-distance trade, and contacts with the Gulf, Africa, Mesopotamia, and Central Asia was no longer found.

But rural villages or peasant societies with local arts and crafts continued to thrive, particularly towards the east of the Indus system. Average site size declines, but there was no net change in the total settled area. This indicates a redistribution of the population from cities to villages or increase in number of small communities owing to shifts in trade, economy and environmental parameters. Therefore, Possehl, Kenoyer and many others shy away from talk of 'collapse' or 'eclipse' of the civilization and instead talk in terms of 'continuity' and 'survivals'. These cultures have their own characteristic artifacts and varying chronological distribution.

Upper Indus (Cemetery H/ Late Harappan):

At Harappa, there is evidence for continuity from Urban/Mature Harappan to Post-Urban/Late Harappan. Evidence for the Post-Urban phase at Harappa is found from Cemetery H, Mound AB, E and F. Though the burial practices and pottery styles of Cemetery H differ from the R37 burial area dated to the urban period, continuities have been found at excavations on the north side of Mound AB where in-situ hearths, intact walls, pottery with

inscriptions and charred grains have been found dated to 1730 B.C. along with a cache of typical Harappan objects including 133 beads, and other objects of copper alloy, agate, carnelian and faience indicating a continuity in technological style. But changes were noted in the form of haphazard constructions encroaching onto streets. After the Post-Urban period Harappa was abandoned.

During the Post-Urban period the number of settlements on the Indus, Chenab and Ravi rivers reduced considerably to only 4 from 18 during Harappan period, also diminishing in size

Lower Indus (Sindh-Late Harappan and Jhukar Style):

Late Harappan settlements have been found at Amri, Chanhudaro, Lohumjodaro, Mohenjodaro, Jhukar and many other sites. The Post-Urban settlements in Lower Indus are distinguished by a distinctive pottery style, the Jhukar ware - a bichrome ware with a thick buff or cream slip and paintings in black or red. The shapes and motifs of the Jhukar pottery are different from Mature Harappan, with none of its artistic value and tidiness along with use of new pigments. The shapes included unusual straight sided shallow dish and carinated bowl on stands, and lota shaped vessels at Chanhudaro.

The major urban centre, Mohenjodaro was virtually abandoned. However, the beginning of the end of Mohenjodaro has been placed at ca. 2200 B.C. when the Great Bath and Granary were abandoned.

Jhukar culture was characterised apart from characteristic ceramics by huts constructed of brickbats and matting, fireplace outside huts or indoors in wall recesses formerly occupied by doorways, unplanned or haphazard layout of settlements, profusion of bone awls used for making mats, round or occasionally rectangular seals with basic geometric motifs, short barrel shaped or biconical beads of faience, and bronze tools and pins with spiral or other sorts of ornamental heads. Terracotta female figurines, cubical weights and Indus script (except on pottery incisions), which are hallmark of Mature Harappan culture became rare. This suggests the collapse of a centralised administrative system.

We also find some distinctive metal objects at Jhukar, including a shaft-hole, axes and copper pins with looped or decorated heads with parallels in Iranian sites indicating trade links or migrations. Besides, circular stamp seals of stone or faience which replace typical square stamp seals of Indus and a bronze cosmetic jar also indicate culture contacts with the west.

At Jhukar, Mature Harappan ceramics occur together with 'Jhukar Ware' in three successive strata along with terracotta cart wheels, bangles, animal figurines, chert blades and unicorn seal. Similar observations were made at Amri and Kot Diji.

There is good evidence for continuity and no break in sequence can be seen. Jhukar is not an intrusive, Post-Harappan separate culture, but only a name for new ceramic style emerging within the Harappan culture area (Mughal 1992).

There is a drop in the number of sites from 86 to 6. After this period there is a clear break with no sites recorded in Sindh.

Post-Urban/ Late Harappan (Ghaggar-Hakra):

This region has been surveyed by Mughal, Stein and Archaeological Survey of India. Mughal found 50 Post-Urban/Late Harappan sites in Cholistan. These are followed by PGW sites which are located more to the north of Late Harappan settlements and even the number of sites reduces to 14 with a total settled area of 36 hectares (from 255 hectares).

During the Late Harappan, the geographical focus of settlements shifts to the east towards northwest India (Punjab, Haryana and northern Rajasthan) where 563 Late Harappan ((Siswal C-D) sites have been recorded which actually denotes an increase in the number of settlements in many parts of this region. The major sites of this time period include Mitathal, Bara, Ropar, and Siswal. At many of these sites OCP ware is also found, which is a typical ware at many early historic sites in ancient India. However, the exact nature of the linkages needs to be established.

Post-Urban/ Late Harappan (Kutch, Gujarat and Sorath):

This region provides evidence for both decline and abandonment in certain areas and continuity of settlement in other areas. However, even when continuity is indicated, the defining features of the Harappan Civilization, like its seals, weights and script, are nearly absent.

In Kutch, we find evidence for the decline and eventual abandonment at Dholavira, Lothal and Kuntasi, the major urban centres of the mature phase. At Dholavira, the excavators noted erosion and cracks in the walls resulting from an earthquake which were hastily repaired. At this time, circular houses make their appearance and planned layout of the city and its architectural features are gone. Jhukar ceramics have also been found in this phase along with typical Harappan ceramics, terracotta cakes, and weights in somewhat transformed form.

Around 1900 B.C. the industrial center of Kuntasi developed during the Late Mature phase was also abandoned and houses made of stone rubble appeared, and by 1700 B.C. it was reduced to a small village. At Lothal also there is evidence for disappearance of manufacturing and trade around 1900 B.C. Possehl opines that since Lothal, Kuntasi and Dholavira were dependencies or trading posts of the Sindhi Harappans, they succumbed to 'Domino Effect' and collapsed with the Sindh Harappan.

On the other hand there was also a phenomenal rise in the number of villages in Gujarat. In fact at sites like Rangpur, there is evidence of greater prosperity during the Late Harappan. This phase in the area is marked by Lustrous Red Ware. Even during the Mature Harappan, local ceramic tradition co-existed with Harappan pottery. However, the use of Indus script, seals, weights, etched carnelian beads and imported material declined and stone tools of locally available stone were made.

Rajdi, a small settlement in central Saurashtra also continued to be occupied during the Late Harappan. In fact, the site size increases by two hectares during Rajdi C (2000-1700 B.C.), an outer wall was built and many parts of the main mound were rebuilt at this time.

Though the number of sites decreases by one-third in Saurashtra yet we find

a number of settlements which continued to thrive at the same time that other settlements were being abandoned (Table 5). This suggests considerable settlement mobility and influx of new populations.

On the basis of the finds of local pottery style and other local features along with typical Indus characters like its weights and seals, Possehl believes that this region had considerable independence even during the Mature Harappan phase and therefore gives it the name of Sorath Harappan, after the name of the region.

Evidence from Kanewal and Ratanpura indicate nomadic hunting-gathering based subsistence at this time. Late Harappan sites have also been found at Maharashtra where they merged with the emerging agricultural communities.

Borderland Areas - Afghanistan and Baluchistan (Nausharo, Sibri and Pirak)

At Rana Ghundai in Loralai uplands of north Baluchistan, the level III C is overlain by ash lenses indicating fire and in the above level pottery also changes. Dabarkot also preserves four layers of ash indicating repeated conflicts.

Sutkagendor and Sotkakah in southern Baluchistan which served as trading posts were abandoned during this period.

Only evidence of a Post-Urban occupation in Baluchistan comes from Mehi, Kulli, Quetta and other places in the form of stray artifacts and signs of cremation in a highly disturbed context. These have been assigned to the 'Bactria-Margiana Archaeological Complex' (BMAC). It can be noted from the scanty archaeological evidence that BMAC people were nomads who came from Bactria and Margiana in the north (Table 5).

In the Kacchai plains west of the Lower Indus, Nausharo on the Bolan Pass has preserved evidence in Period IV (2200-2000 B.C.) for pottery (round jars and painted goat friezes) and female terracotta figurines associated with the Kulli culture from southern Baluchistan which was contemporary to the Harappan. Archaeological remains at Nausharo show more links with eastern Iran and Turkmenistan than with Sindh during the Late Harappan period.

At Sibri, we find coarse, hand-made pottery, some wheel turned ceramics in a wide variety of shapes; a number of flaked stone and bone tools, grinding stones and a large number of terracotta figurines similar to Hissar and BMAC sites. Besides, many items with parallels in the west include a small stone column, bronze and stone compartmented seals, a bronze shaft-hole axe-adze and pins. Notably, a very large number of high quality bronze artifacts have been recovered from this site.

At Mehrgarh where we find the earliest evidences for a settlement dating up to 2600 B.C. After this there is a break and we find evidence for a new culture, the only evidence for which are in the form of tombs with grave offerings but without skeletal remains. This culture is widely known as the BMAC. BMAC is also evidenced at Nausharo and Sibri.

At Pirak with evidence of occupation from 1700-700 B.C. the assemblage recovered is foreign to the Indus system. Here we find a characteristic light or white coloured pottery with applique bands of finger indentations and a number of animal figurines in clay, including those of cattle, camel and horse.

The architecture is also different from Harappan - brick houses with reed matting on the floor and walls with symmetric rows of rectangular niches, fire places were actually single-brick square platforms full of cracked pebbles in the central hollows. Hundreds of stone tools with very little metal have been found here. Few Pirak type sites are found in the Kachhai plains, and may be some existed in the Quetta-Pishin uplands, but very little is known about their cultural distribution.

In Afghanistan also during the end of the Mature Harappan/Urban period, evidence from Shortughai indicates replacement by BMAC.

Pattern of Shift:

A geographic pattern of abandonment of the Indus valley with declining occupation in the west in favor of a phenomenal rise in the number of settlements in northwestern India including east Punjab, Haryana, northern Rajasthan, the westernmost Yamuna -Ganges rivers region, and Gujarat in the southwest has been noted.

This shows that though the theory of 'eclipse' might hold true for Sindh and Baluchistan, there is strong evidence for continuity in the east and in Gujarat. However, the dark chapter in the history of Baluchistan needs to be verified with more research in that area. In the dry farming areas of Punjab, Haryana, northern Rajasthan and western Uttar Pradesh which were dependent on rainfall, there is a dramatic increase in habitation during the early second millennium B.C. During the same period, climatic reconstruction models, largely based on pollen data from Rajasthan lakes, show an increase in aridity. In Gujarat, there is evidence from Rojdi, Rangpur and other areas for expansion and rebuilding at the same time that Mohenjo-daro was being abandoned.

Recent studies (Gangal et. al. 2010) have integrated GIS information on topography, hydrology, radiocarbon dates and archaeological data of 1874 sites, to analyse the spatio-temporal growth and decline of urbanism in the Indus valley. The spatio-temporal analysis indicates that the pace of de-urbanisation is non-uniform with a strong geographical variation. The decline starts in the Ghaggar-Hakra region, followed by a large-scale collapse in the lower Indus plain, but settlements continue to flourish in Gujarat, which has a fairly delayed decline.

The pattern clearly indicates a redistribution of population. There was a shift from integrated state to regional resources and local trade networks, in other words de-urbanisation is noticed. We see a societal transformation from city-centred economies to vibrant agricultural village communities.

This shows the complexity and heterogeneity in the socio-cultural processes of change that were at work.

The center of settlements shifts from Cholistan during the Mature Harappan to east Punjab, Haryana, northern Rajasthan and western Uttar Pradesh during Late Harappan/Post-Urban period. The Early Harappan centre was farther to the west and tracing back to the earliest settled village farming communities in the Baluch hills and piedmont, they were even farther west. There is a clear eastward shift of settlements with time, though it is not clear

what it means. Further, there was a shift from concentrated residence in cities to dispersed residence in villages along with a population move from west to east.

Conclusion:

"Collapse means the end of an integrated and complex social, economic and political system, carrying with it a decline in social stratification, erosion of economic specialization, the eclipse of regulatory institutions and the flow of information, the city life that embodies the sophistication of the civilization and ultimately the magnificent monuments and art production" (Ratnagar 2000).

Though some cultural elements relating to rural technologies or peasant knowledge that was passed down generations did indeed survive, but the Harappan civilization in the form of "a political economy with its institutions of dominance, its economic networks, its interrelationships and dependencies, and intellectual norms - in other words, a state system and the cultural circumstances in which it had flowered" (Ratnagar 2000) did indeed come to an end.

There seems to have been no single cause of the decline and abandonment of cities, and reorganization and transformation of the Indus Civilization but that it is 'a complex, multifaceted process of change' (Possehl 1997). Allchin and Allchin argued for the interconnection of causes in regional and interregional terms. It may be said that both internal and external factors together contributed to the decline and collapse of the Bronze Age civilization in the Indus valley and its surroundings.

Ratnagar (2000) succinctly sums the causes for the transformation at the end of the Mature Harappan, "Triggers or immediate causes could have been raids, migrations in the west, or internal dissensions that affected the centres of control and residential stability. In contrast, background conditions or enabling factors could be the shamanistic nature of the religion, the absence of institutionalised temples, tensions in the little communities, an undeveloped division of labour within the villages, absence of village self-sufficiency in a Bronze Age political economy, as also the inroads by metal, faience and brick industries into the vegetation cover of the surrounding localities. Ultimate and deep-rooted causes would mainly be the stresses and contradictions of a system which could sustain itself only in its geographic expansion, and in which the polity, trade and craft production, all centred on the elite. And elite dominance depended on a paradoxical combination of coercion and the forging of personal ties (this being too early a form of state to have developed a full-fledged bureaucracy).

Perhaps the structural strains became too great to override when they were juxtaposed with other independent variable, coincidental occurrences in adjoining regions: the expanding pastoralist mobility in the Eurasian steppe, the emergence of Elam as a dominant power and its possible appropriation of tin supplies after 2000 B.C. which in turn could have been connected with group movements and migration along the western margins of the Harappan world, and the possible extension of regional cults."

For a better understanding we need a firmer chronology and better

understanding of the regional cultures and environment.

The process of transformation was perhaps slow and gradual that began two to three centuries before the actual decline as evidenced from the abandonment of the Great Bath and Granary at Mohenjo-daro. By 1300 to 1000 B.C. a new social order characterised by a distinctive ideology and language began to emerge in the northern Indus Valley and the Ganges river region to the east though some aspects of Indus urbanism and the important craft technologies survived. A second urban revolution was brought through the emergence of new technology of iron metallurgy and glass production.