

Environmental and Civilizational Processes in India: Their Global Relevance

Dharma Pal AGRAWAL

Continental Palaeoclimate Studies Area, Physical Research Laboratory, Ahmedabad, India

I personally feel that this International Symposium on “Nature and Humankind in the Age of Environmental Crises” is of great historic significance. It is so gratifying to note that Japan has taken the initiative in initiating discussions on these crucial and fundamental environmental issues facing humankind. In this age of environmental confrontation between the North and the South, Japan has a unique role to play, though geographically located in the South, as it is perhaps more developed than the North.

Let us take the example of the Green House effect. At present CO₂ levels in the atmosphere have reached 340 ppm (from the pre-industrial levels of 290 ppm) and they are rising at an alarming rate. At this rate the earth will heat up on a frightening scale (a doubling of CO₂ is expected to raise average surface temperature by about 1.5° to 2.5°C) resulting in sea level rise, melting of glaciers and so fourth, which will have multiple consequences. One result could be to wipe off a host of coastal cities and towns. The scenario is grim indeed, with frightening consequences for humankind. *Ad hoc* solutions will not do. In fact, the environmental crises faced by humankind today urgently require solutions which are global in their scope and holistic in their approach. When the global crises are viewed in this light, archaeology seems to provide lessons with its hindsight.

I am of the view that archaeology as a holistic discipline has a vital role to play in understanding the civilizational processes of the past and the future of humankind. In this essay are discussed the environmental changes in India during the last several millennia and their global significance and relevance to humankind.

HARAPPAN CIVILIZATION

In my holistic approach to the human past I prefer to deal with the whole coupled system of technology—environment—society. Isolating individual components of this complex system may not be correct.

In the fourth to fifth millennia B.C. Neolithic cultures were flourishing in the Baluch Hills, wherever there were perennial springs and streams. Increases in produc-

tivity and population forced them to look out for expansion towards more open valleys. The nearest to them was the vast Indus valley on the eastern flank. But harnessing the resources of perennial springs and small hilly basins was a much simpler task, to which they were used to, than tackling the problems of the plains drained by the mighty Indus which brought vast amounts of water and silt with each flood. A technology which incorporated knowledge of the calendar, flood control, dam building and irrigation on a large scale alone could be adequate for colonizing the vast Indus plains. In the process of developing a new technology to face the challenging problems of exploiting the Indus plains lies the origin of the Indus (Harappan) Civilization. A semi-arid ecology with its vast alluvial plains, pliable fertile silt, mineral rich areas, avenues for export and import were essential to the genesis and growth of the Harappan civilization (Agrawal, 1982, and 1992).

For a civilization flourishing in the third millennium B.C. over a vast area spread from Suktagendor in Baluchistan to the fringes of the Gangetic *doab* (land between two rivers), and from Harappa in the north to the southern end of Gujarat is a vast territory of half a million square kilometers. Even over this vast area, it did maintain a uniformity in the shapes and motifs of artifacts and standardization of weights and measures. The major cities of this civilization seem to be planned about 330 km apart



Fig. 1. An impression of a Harappan seal showing a tri-faced horned deity identified with the latter-day god Shiva.

from each other, a distance which is a multiple of their linear measure of a large foot (33 cm). If we draw circles around each major city, using a diameter of 330 km, they all make intersecting circles. Thus there are overlapping zones between the different provincial nuclear centres. Each major town commanded control of some economically important resource and perhaps also represented protohistoric linguistic boundaries. Harappa, in the Punjabi speaking north, controlled the import of minerals and timber from the hills and trade through the western passes. Mohenjo-daro, in the



Fig. 2. A Harappan clay jar with typical *pipal*, peacock and intersecting circle motifs.

south, in the present Sindhi speaking area, controlled the sea trade. Rakhigarhi, in the east, perhaps oversaw the copper and lead mines of Rajasthan, and is today in an Hindi speaking area. Ganveriwalla seems to form the epicenter of the Harappan "Empire." Dholavira in the Kutch, in the Gujarati speaking area, probably controlled the trade in beads, copper, and timber. If this reconstruction is correct, the planning of the Harappan cities over such a large area was indeed unparalleled in the third millennium B.C.

Several factors like increasing aridity, a rising water table, increased salinity, and probably invaders from the west generated a relentless pressure on the Harappans to move eastwards. From the Indus, the Harappan settlements seem to be shifting towards the Saraswati (present day Ghaggar) valley, which was a perennial river at that time. Around 1700 B.C. one notices a pronounced shift towards aridity, from the

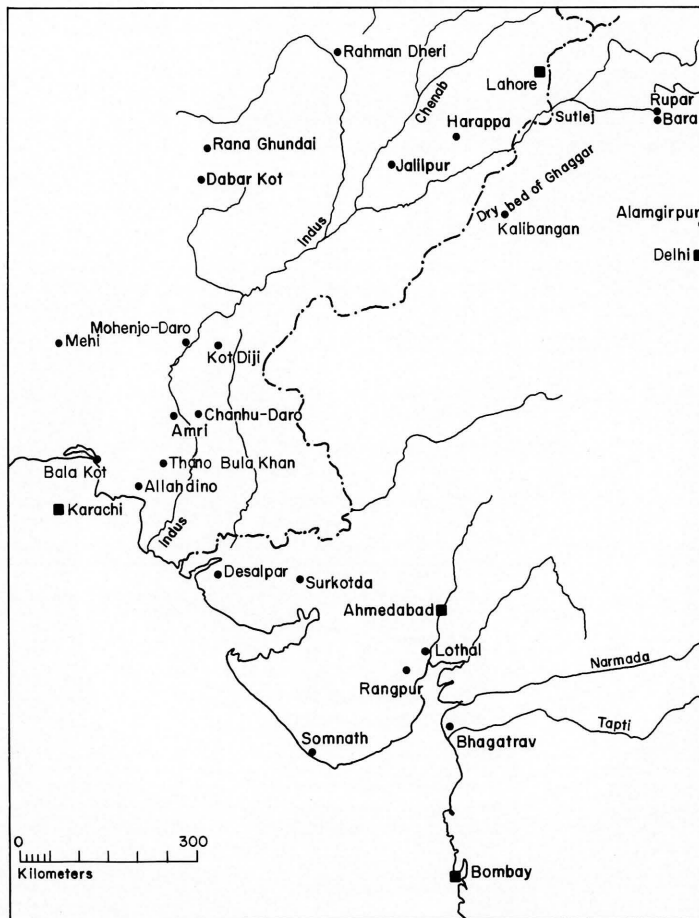


Fig. 3. The extent of the Indus Civilization (also called Harappa Culture). Circles represent Harappan sites and the squares, modern towns.

previous periods of higher global rainfall. It seems that the drying of the Saraswati was caused not only by increasing aridity but also because its two main tributaries were pirated by the two major rivers: the palaeo-Satluj joined the Indus system and the palaeo-Yamuna, the Ganga. In this semi-arid ecology, it appears that large sedentary populations could not thrive for long. The Harappans withered away around

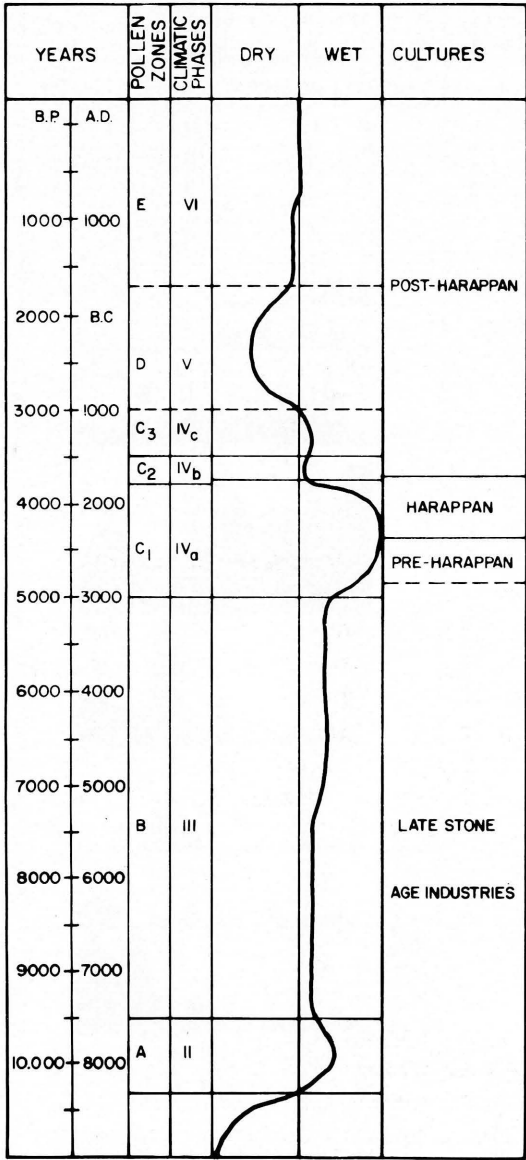


Fig. 4. Pollen diagram translated into wet and dry phases of Rajasthan and the correlation of climatic changes with cultures. The Indus Civilization (Harappa Culture) thrived during a wet phase in Rajasthan (after Singh *et al.*).

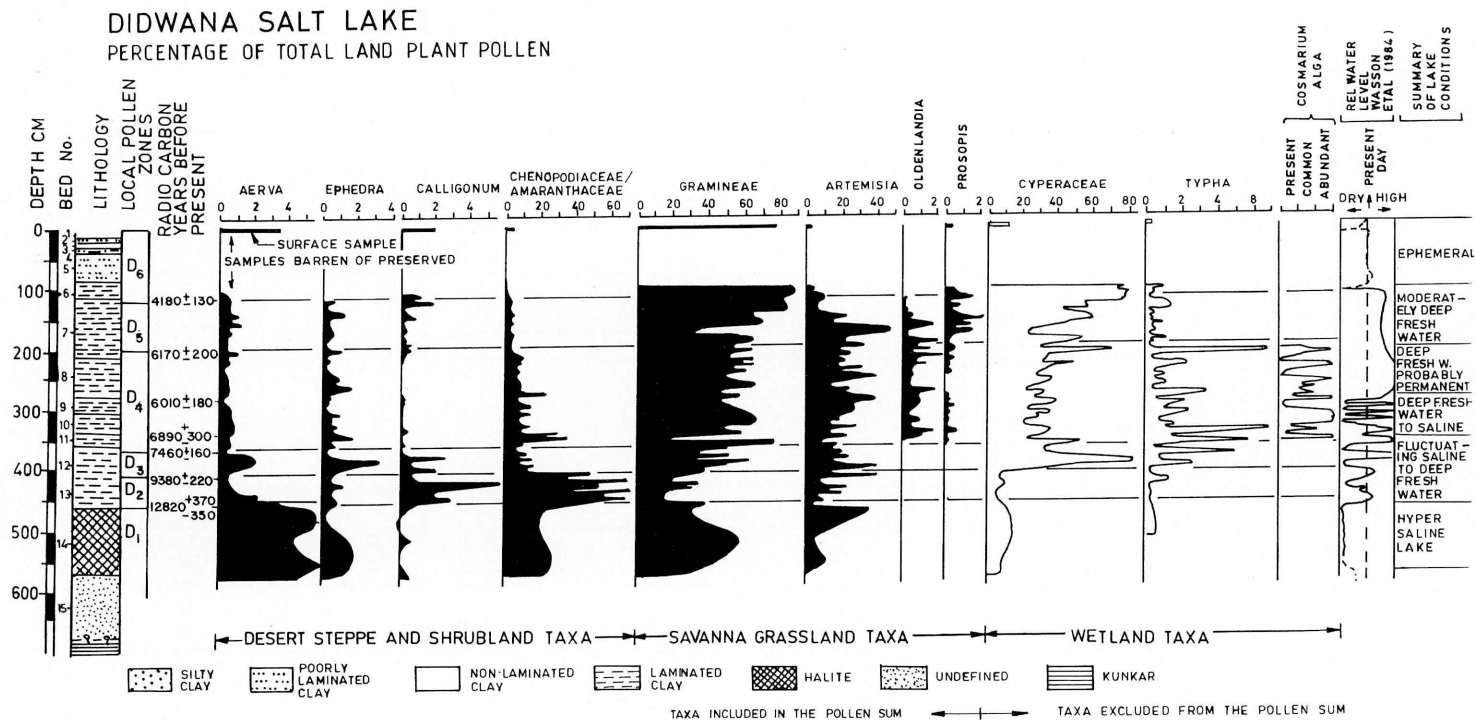


Fig. 5. Pollen diagram and salinity curves correlated for the Didwana lake cores. There is a fair correlation between Fig. 4 and the salinity curves. In this diagram only the precipitation sensitive species are depicted (after Singh *et al.*).

1700 B.C. and were followed by the Painted Grey Ware Culture, which appeared c. 700 B.C. and also disappeared c. 300 B.C. Finally the Rangmahal culture appears in the second to third centuries of the Christian era.

Thus it appears that aside from the human invasions from the west, a combination of adverse envgironmental factors was responsible for the demise of the Harappans. The neotectonics left the mighty Saraswati River high and dry; the high rainfall of the mid-Holocene degenerated into drought years; the pressure to sustain a sedentary population on a semi-arid ecology probably crossed the survival threshold and the cultures disappeared until the ecology regenerated. Such semi-arid ecologies could better sustain semi-nomadic cultures than large urban populations.

It is interesting to note that the Harappans thrived for about 500 years in a semi-arid ecology with the help of their well developed copper technology. But they withered away on the western fringes of the monsoonal doab. They were not geared to cope with a high rainfall ecology of dense forests and large swamps. Even today, tropical rainfall forests have not been colonized by modern man. The earliest civilizations of the Nile, the Euphrates, and the Indus were all based on copper technology, a semi-arid ecology and large rivers bringing annually fertile alluvium which could be tackled with the help of copper technology. The urbanization of the Gangetic doab had to await the advent of iron technology. One should, however, note that the main strength of iron was not in its hardness but in its mass abundance.

THE DOAB

The Gangetic *doab* witnessed the growth of the first iron using settlements at the beginning of the first millennnium B.C. But in its true meaning, with all the implied agricultural surplus production and the required changes in social polity, the *doab* took a few hundred years to usher in a full fledged urbanization. *Doab* urbanization reaches its peak in the Mauryan Empire. Today, the monsoon environment of the *doab* has been cleared of forests and drained of swamps for large scale agriculture to such an extent that not even patches of the primaeval forests are left, though some of them were there as late as the Mughal Empire in the seventeenth century. Major technological break-throughs, both in metallic and ceramic fields, were accompanied by the rise of new classes representing agriculture and trade, with their new leaders like Buddha and Mahavira who propounded Buddhist and Jain philosophies. For the first time, even the purely materialistic philosophies of the *Charvaka* and *Lokayata* schools held their sway. Obviously the *doab* urbanization was a complex interplay of technological, environmental and socio-economic changes.

In contrast, in south India, there was a sudden jump from the stone using Neolithic to the iron using Megalithic cultures. Unfortunately, so far, we know more about their burials (i.e., the megaliths) than about their settlement sites.

KASHMIR

In the Indian sub-continent we find that the marginal areas are affected more if there is a climatic-cum-environmental change. For example, in Kashmir even small temperature changes could induce drastic environmental changes forcing man to leave the valley. The ice of the last winter would not melt in the summer and this would keep on accumulating year after year. The lakes would be frozen for most of the year. As a result, we find that there is a direct correlation in Kashmir between palaeodemographic increases and climatic amelioration at c. 18,000, 5000, 1800, and 1000 B.P. We have multiple evidence that these periods witnessed climatic amelioration leading to a warm temperate type of climate. Around 18,000 B.P. there is evidence of an Upper Palaeolithic culture; during mid-Holocene there was a widely distributed Neolithic culture; during the early centuries of the Christian era, the Kushana culture flourished in the valley; around 1000 B.P. the historical dynasty of Avantivarman and others built monumental buildings and settlements all over the valley. In between, there were cold and arid periods during which little human activity is evidenced in the Kashmir valley. The environment, thus seems to be playing almost a deterministic role there (Agrawal, 1987; Agrawal *et al.*, 1985, 1988, 1989; Dodia *et al.*, 1984; and Sahni and Gaur, 1989).

RAJASTHAN

In Rajasthan, another marginal area, precipitation is more crucial. Periods of higher precipitation are marked by low salinity deep lakes, soil development, and dune stabilization. These were the periods when population also increased. The famous pre-Harappan and Harappan cultures also flourished during the mid-Holocene wet phase when both annual and summer precipitations were much higher than even today (Misra *et al.*, 1988; and Singh *et al.*, 1990). Environment therefore played a deterministic role in Rajasthan also. As discussed above, the situation, however, was more complicated because of neotectonics which changed the loyalties of the tributaries (like the palaeo-Satluj and palaeo-Yamuna) which left the mighty Saraswati River high and dry.

DISCUSSION

But if we look at much larger—regional and global—scales in prehistory we find that people did face environmental crises, often aggravated by anthropogenic factors. For example, in Rajasthan, large Harappan settlements were not sustainable for any appreciable length of time in the semi-arid ecology. We therefore find that in this region populations flourished, vanished, then reappeared again to wither away after a few centuries. The Harappans flourished between 2300–1700 B.C. then disappeared. The next major settlements were of the Painted Grey Ware in c. 700 B.C. They also

withered away by the third century B.C. The Rangmahal culture appears around second to third centuries A.D. This shows some sort of periodicity during which the ecology regenerates after each desertion allowing fresh settlements to appear (Agrawal, 1992).

For the prehistoric environmental crises he faced, early man tried to find their solutions by either migrating to newer and more congenial ecologies or developing new technologies. When western India became very dry, unable to sustain the Harappans, the latter tried to spread towards the monsoonal *doab*, but found their copper technology unable to cope with these new conditions. The high rainfall monsoon forests and the swamps of the Gangetic *doab* could only be meaningfully colonized with the new technology of iron metallurgy.

Earlier, even Middle Palaeolithic man faced with the environmental crises of mass animal extinctions (caused by large herds of animals stampeding across cliffs and precipices) found a technological solution: he invented the first missiles. *Homo erectus* developed the technologies of making stone spears and arrow heads with which he could pick and choose even fast moving animals which had probably become scarce by then. This was a more economic and environment friendly way of hunting.

We thus see that humankind has faced environmental crises in the past too. So long as it had newer and more congenial environments to colonize, it could migrate there. Or, in course of time, it developed new technologies to cope with different and difficult environments. Today man has colonized most of the surface of the earth. He can still colonize some new environments like the tropical rain forests, polar regions, Siberia and so forth. But now we realize that any such steps could jeopardize the very existence of humankind on this planet, because any major changes made by man in these ecologies may snowball into major disasters. The Amazonian forests are being removed at the rate of 30 acres per minute, and very soon we will face the environmental consequences of such short sighted steps, if we are not already facing them!

Of course, new technologies may enable man to live under the sea, in the sky or on other nearby planets, but the costs and hazards of such colonization will be mind boggling. Then what is the answer? From the hindsight of archaeology can we learn some lessons for the future?

THE FUTURE

Mankind has been making technological changes at an ever accelerating pace. Some of the consequences of these rapid changes have been vividly portrayed in *Future Shock* by Alvin Toffler. The multiple effects (social, psychological, personal, institutional, etc.) of such fast changes are too vast even to contemplate. Nor is it possible for the other countries of the world to compete with the USA or Japan in exploiting the mineral wealth of the globe. American prosperity today is based on the exploitation of 45% of the total mineral wealth of the world. If the whole world follows this example where are the new mineral rich worlds to sustain such development? The rich North continues to maintain its prosperity and consumption which is a hundred

times greater than the South. The answer perhaps lies in drastically reducing the consumption levels of the North and the population rates of the South. At this stage Gandhi has become suddenly very relevant when he says that we have to reduce our wants and live in a symbiotic manner with nature. The answers for the environmental crises do not lie in either conquering new lands on this planet or developing new technologies to colonize other planets. Nor will the poor South allow their development projects to be stifled on the pretext of pollution increase, so long as the North does not drastically reduce its consumption levels. Viewed in this manner, I think the human past thus provides some foresight into the future and is relevant to the problems faced today.

The world has many lessons to learn from Japan and India—both with a hoary past.

Despite tremendous pressure on land, due to density of population and industrialization, Japan has been able to preserve its forests. Even today, two thirds of Japan is covered with forests. The belief of the Japanese in nature and the capability to use and pay for fuel has no doubt helped in the preservation of their forests.

But more important in this context is the belief in Buddha's teaching over most of Asia. Buddhism was a code of conduct and not really a religious cult. Buddha always preached simple living and was against violence and hoarding of wealth. In recent times, Gandhi preached the same things: to live simply, in harmony with nature, and to cut down our wants. The path of consumerism is the path of disaster for the world. It is said that an average American consumes his weight of basic materials daily! At this rate, how can we leave anything for the poor of the world and for posterity, so long as our consumerism goes unchecked and unabated.

Perhaps we cannot stop technological progress, but we certainly can tame it. Let us concentrate our high-tech efforts only for space research and informatics and mass communication. The latter will bring the world closer and the former will bring the universe closer. If the Asians decide to provide adequate food, shelter and culture to all the people of Asia and the world, and cut down on the luxuries of the rich nations, we will be nearer to Buddha's and Gandhi's teachings. We have only one world to live in, let us preserve it for humanity and also for posterity.

As pointed out by Professor Umehara, the Mesopotamian civilization started by killing off the god of the forests, Gilgamesh. Perhaps it is symptomatic of all civilizations. If civilization can thrive only by killing nature, let us go back to the Neolithic polity, a self-sufficient economy based on a symbiotic relationship with nature. The Neolithic societies of archaeology, the Third Wave society of Toffler, the self-sufficient economies of Gandhi, perhaps all point to the same direction—reduce our wants and live in harmony with nature.

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