A Preliminary Study on the Stability of Ecosystem and Landscaping for the Site of Moenjodaro and the Vicinity, Pakistan

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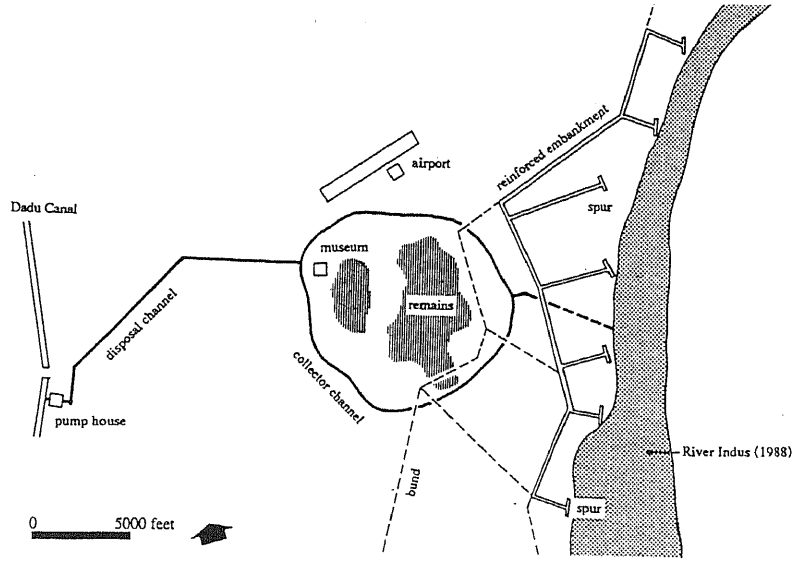
Abstract

The content of this paper is dedicated to a preliminary analysis and evaluation of fundamental conditions necessary to prepare a comprehensive landscape planning scheme for the site of Moenjodaro and the vicinity which require the most urgent and complete proposal because of its primary value as a cultural asset. It is discussed that a comprehensive landscape planning coordinated with the agricultural land use in the area should be prepared upon the completion of initial tasks to safeguard the remains against immediate threats of destruction. In particular, amount of the water resource generated by the ground water control program was estimated and several conditions of possible agricultural development and land reclamation in the area utilizing those byproducts were discussed. Also, a group of specific plant species suitable for landscaping and plantation of the site to protect the remains against wind erosion and prepare a appropriate environment for the tourism purposes was identified. However, it became clear at present that a set of technical information needed to prepare a realistic scheme has been in critical deficiency.



Location of the Remains and Other Related Features in the Area

Introduction

Even after the independence of the nation, the site of Moenjodaro, Harappa, and other historical remains of the ancient cities of Indus Civilization in Pakistan had not been given satisfactory treatments for preservation due mostly to political and economical reasons of developing countries. In response to the critical conditions of those remains, The United Nations Educational, Scientific and Cultural Organization (UNESCO) had took an initiative for promoting the preservation of the sites in the first quarter of 1960s. Those endeavors have shown a certain degree of success and several prominent sites are safeguarded from immediate threats of structural damage. For the next phase of the environmental development, it is required to extend the conservation task for larger scale of the site as well as promoting landscape planning and economical development to revitalize the local communities. The contents of this paper is dedicated to a preliminary analysis and evaluation of fundamental conditions necessary to establish a comprehensive landscape planning scheme for the site of Moenjodaro and the vicinity which require the most urgent and complete proposal because of its primary value as a cultural asset blessed by the entire world.

The study begins with overviewing the process of the preservation tasks in the past which is followed by setting up objectives of the landscape planning. A detailed analysis and evaluation will be provided for two important factors closely related to land use of the site and the vicinity : control of ground water level for desalinization of the structural remains; examination of the existing vegetation and plant species suitable for landscaping within the site and the surrounding area. The primary source of information is several reports prepared by Pakistan government and UNESCO, and the minutes of the proceedings at the International Consultive Committee for the Preservation of Moenjodaro. Also, hearing surveys were

conducted on the site of Moenjodaro and the local communities as well as at the Authority for the Preservation of Moenjodaro in Karachi.

Process of the Conservation Tasks in the Past

During the colonial period between the discovery of the site in 1922 and the end of World War II, excavation of the site was conducted mostly by British archaeologists such as J. Marshall and E. Mackey. Upon the independence of the nation in 1947, the jurisdiction of the site was transferred to the Department of Archaeology, Government of Pakistan. It was reported that some structural damages by salinization was found at that time and minor repairs and washing by fresh water were repeated several times.

Sukkur Barrage, the largest irrigation dam in the Indus valley, was constructed 120 km upstream from the site of Moenjodaro in 1933. It enabled the middle basin of the Indus valley be irrigated for agricultural development and rice cultivation prevailed in the surrounding agricultural communities. It activated the rise of ground water table which deteriorated the structural damage of the remnant through salinization. Also, the full operation of Sukkur Barrage influenced the stream pattern of the River Indus and its main course shifted further west to the right bank near the site which made the flooding of the river one of the major threat of physical damage.

In 1960, recognizing the urgency of the safeguarding of the remains against damage, the government of Pakistan asked UNESCO for technical and financial assistance. UNESCO responded immediately with dispatching groups of specialists in archaeology and conservation technology for next several years and, in 1972, established the first version of a masterplan for the preservation of Moenjodaro as a joint effort with Pakistan Government. In the following

year, "International Symposium on the purpose of discussing the contents of the master plan as well as promoting the UNESCO's preservation fund which aimed at US$5,000,000. Also, an international conciliative committee of the specialist was organized to support the activities of the preservation project to be executed following the master plan and a part of the actual project was initiated in 1981. After several times of revision, the master plan was officially approved by UNESCO in 1978. The following is the major tasks for the preservation and actual proposals to be executed.

(1) Ground water control

The level of ground water reached immediately under the structural remains when the project was initiated. The part of the brick foundation decomposed in a submerged condition and it made further excavation practically impossible. Also, salinized water rises through capillary action in a sedimentary layer of the soils underneath and it enhances decomposition of the bricks in the lower part of the remains by salinization effects. For a countermeasure, it was proposed to lower the ground water level by excavating a number of tube well in the form that encircles the remains and pumping up the ground water. The extracted water will be utilized for irrigation of agricultural land in the area immediately downstream of the site. The details in the agricultural development will be discussed later.

(2) Preservation of structural remains

Since most of the remains had been abandoned for a long period of time, its substantial part became structurally unstable through weathering. In order to prevent physical collapse of the remains, it was required to reinforce the structure and prepare a proper surface drainage system on the site. Decomposition of the bricks through salinization would be prevented by salinized ground water, coating the entire remains with saline resistant materials, and removing salinized soils from the site.

(3) Flood control of the River Indus

The site of Moenjodaro is located 1 km west of the right bank of the River Indus. It seemed necessary to reinforce the existing bunds as well as changing the course of main stream further east from the right bank, so that the immediate threat of flooding would be minimized. Among other technical proposals are reinforcing the embankment with heaps of rocks along the site and constructing 7 T-shape spurs which run out to the main stream at right angle.

(4) Revegetation and landscaping of the site and the surroundings

It is considered that some portion of weathering of the remains would be cause by air bone saline carried with sand particles coming from outside of the site. As a countermeasure development of green belts encircling the site would be effective for protecting the remains against strong wind and sand. Also, it is proposed to restore an imaginary landscape of the Indus Civilization for tourism purpose and to alleviate visual impact of ground structures and facilities by revegetation and its planting design.

In order that those major proposals of the masterplan are executed effectively on the schedule, four subcommittees were organized within the International Consultive Committee and technical assistance has been provided.

Among four major proposal, the priority has been given to the ground water control on the site and the flood control of the River Indus which have ultimate urgency. Installation of the tube wells and construction of disposal channels which executed in two stages were completed in 1985. On the other hand, reinforcement of the bunds along the river bank and construction of

the spurs started in 1985 and two spurs and embankment are left to be completed as of November,1990. Also, repairs and partial restoration of the remains have been executed continuously since 1981 and temporary treatments were completed for the most of excavated remains.

The landscape planning of the site and the vicinity, the main topic of this paper, is categorized into the task of plantation and landscaping of the site. In comparison with other three categories of the preservation tasks, it has been given a low priority and suspended until 1988 because it was not a matter of urgency and the investigation of unexcavated remains has not yet been completed. In the meanwhile, discussions on plant species suitable for the plantation and landscaping were repeated, but not concluded in a list of selected species. However, at this moment of time when the preservation tasks directly related to the protection of the remains, although uncompleted, have been initiated and proved certain degree of success, it is considered that the tasks of plantation and landscaping would be activated and specific proposals would be put forward.

It has been argued repeatedly in the consultive committee that the tasks of plantation and landscaping should be extended into a regional scale including a proposal of land use in the surrounding local communities. The masterplan advocates the agricultural development of the area through irrigation of ground water disposed from the tube wells and changing of cropping patterns. Also, multi-purpose plantation and afforestation for desalinization of the land have widely been practiced in the region. Therefore, coordination with agricultural land use in regional scale must be retained to create productive conditions and it is an ultimate objective of the landscape planning which propose a land use masterplan in the surrounding region of the site. The following discussions are focused on the ground water control, vegetation and

suitable plant species which form substantial part of conditions related to the landscape planning.

References

1) Pakistan Department of Archaeology & Museum (1989) : Conservation of Structural remains at Moenjodaro, Progress Report for 1989.

2) Pakistan Department of Archaeology & Museum (1972) : Masterplan for the Preservation of Moenjodaro.

3) Pakistan Authority for the Preservation of Moenjodaro (1976) : The minutes of the 1st meeting of the International Consultive Committee for the Preservation of Moenjodaro.

4) United Nations Educational, Scientific, and Cultural Organization (1981) : Moenjodaro, a 5.000-year-old legacy.

5) Pakistan Authority for the Preservation of Moenjodaro (1989) : The minutes of the 12the meeting of the International Consultive Committee for the Preservation of Moenjodaro.

6) Pakistan Authority for the Preservation of Moenjodaro (1985) : The minutes of the 8the meeting of the International Consultive Committee for the Preservation of Moenjodaro.

7) Pakistan Department of Archaeology & Museum (1972) : Masterplan for the Preservation of Moenjodaro.

8) Pakistan Water and Power Development Authority (1971) : Sukkur Right Bank Fresh Ground Water Project Planning.

9) Pakistan Department of Archaeology & Museum (1978) : Symposium of Plant Community and Landscaping of Moenjodaro.

10) FOSBERG, F.R. (1980) : The Plant Eco-system for Moenjodaro, UNESCO.

Chronological Record of the Events Related to the Preservation of Moenjodaro

Year	Excavation and Preservation Task	UNESCO and Others
1922	Discovery of remains by R.D.Banerji	
	Excavation by J. Marshall continued through 1936	
1931	Publication of "Moenjodaro and the Indus Civilization"	
1933		Competion of Sukkur Barrage
1938	Publication of "Further Excavation of Moenjodaro"	
1940 - 48	Desalinization tasks of remains	
1947		Independence of Pakistan
1960	Requesting UNESCO's assistance	
1961		Site visit by E. Warner of the British Museum
1964	Excavation by University of Pennsilvania	1st research group headed by H.D.Plenderleith
		Open of Moenjodaro International Airport
1966		2nd research group headed by S.J.Van Kregten
1967	Renovation of Moenjodaro Museum	
1968		3rd research group headed by M.Wheeler
1972	"Masterplan for the Preservation of Moenjodaro"	4th research group headed by Z.Iskander
1973	International Symposium for the Preservation of Moenjodaro	Flood of River Indus
1974	Establishing Authority of the Preservation of Moenjodaro	Foundation of UNESCO fund
	Installing experimental tube wells	
	Establishing research laboratory on the site	
1976	Founding International Consultive Committee	Flood of River Indus
1978	Symposium on Plant Community and Landscaping	Approval of preservation masterplan
1980		Approval of preservation taskforce
1981	Initiating preservation task	
1982	Completing disposal channel	
1983	Installing tube wells (1st stage)	
1984		"Tokyo Appeal " by Prince Mikasa of Japan
1985	Installing tube wells (2nd stage)	
	Initiating flood control project	
1986	Completing spurs and embankment (1st stage)	
1987	Completing spurs and embankment (2nd stage)	
1988	Completing spurs and embankment (3rd stage)	
	Revising masterplan	
1989	Completing spurs and embankment (4th stage)	
1990	Completing spurs and embankment (5th stage)	