Perspective

Nucleation of Population and Water Storage Among the Ancient Maya

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THE PREHISTORIC DEVELOPMENT OF CITIES IN THE MAYA Lowlands has been a traditional point of controversy. In recent years, it has been accepted that at least certain Maya centers undoubtedly achieved urban status. Tikal is the best documented example, with an estimated population of 60,000 to 80,000 around A.D. 750 (*1*), but there are a number of other well-documented cases. It must be remembered that preindustrial cities were several orders of magnitude smaller than present urban centers. Early 16th-century England, for example, possessed only one city of 50,000 people, London, and most English cities of the time had about 3,500 inhabitants (*2*).

A major element in urban development in the Maya Lowlands was the capacity to sustain large populations through a long dry season. The tropical lowlands of the Maya area occupy some 250,000 km^2 of which about half lack significant sources of ground water because of karst topography. The climatic regime is one in which pronounced dry and wet seasons alternate. The dry season is approximately 4 months long. Therefore, for much of the area, and in order to sustain human population during the dry season, the ancient Maya built water impoundments as integral parts of their urban fabrics.

The hydrology of several ancient sites have been studied in a preliminary manner, usually incidental to systematic mapping. Tikal possessed sufficient storage capacity for 40×10^6 gallons of water, according to one of these studies (*3*). However, Scarborough *et al.* report that such water storage facilities may have been seriously underestimated (*4*). This would increase the supply side. On the demand side, because it seems likely that ancient major building projects were mainly carried out during the dry season, even more water would have been required for mortar and other construction materials.

Experience at Becan and Tikal in large-scale restoration projects has demonstrated that major outdoors construction work is best carried on during the dry season (January to April), although some work is also possible during the early rainy season (May to July). Further, there is a lull in the agricultural cycle, of whatever intensity, during the dry season, thus releasing labor for the brute tasks of large-scale stone quarrying, amassing construction fill, and preparing large quantities of mortar.

During the Preclassic, between about 1000 B.C. and A.D. 250, dispersing forces acting on ancient Maya populations included the practice of shifting agriculture. As population grew during these periods, it also tended to expand through space. Any nucleated settlement demanded as a prior condition a permanent source of water such as a river or springs. Lacking such natural sources in many regions, the Maya had to create artificial storage zones in order to support clustered populations.

Carneiro has suggested that the circumstance of "resource circumscription" might explain the origins of many of the first ancient states (*5*). He argued that growth of population within regions that were circumscribed by ecological, political, or other cultural factors would eventually eventually cause the growth of internal complexity in cultural institutions. Included in the cultural institutions were political units that would eventually become hierarchically organized administrative structures. In the case of the Maya, artificial water impoundments might have been attractions for high density populations and eventually cities. Further, an emergent elite class might well use the resource of water as an instrument of social control. This sequence of causation seems to have been one of the factors in the emergence of Maya civilization (*6*). Increasingly, it appears that the ancient Maya were intensely involved with water management of many kinds (7). Moreover, the largest cities in the Maya Lowlands correlate well with the largest swamps. On the basis of radar surveys, ground surveys, and a few careful excavations, the swamps and shallow lakes appear to have been drained or modified to create wetland gardens (*8*). An estimated maximum of 1250 km^2 may have been so modified for purposes of intensive food production (*9*), although the extent to which this occurred is still controversial (*10, 11*).

Periodicity of cultural floresence in the Maya Lowlands is a striking characteristic of culture history, between A.D. 250 and 900, the Classic period. The abandonment of centers and cities with large-scale monumental architecture and other public structures and the subsequent reoccupation of such communities suggests that natural climate cycles may have played a role (*12*). Water availability would influence and be a part of such intermittent occupation. The abandonment of the capital investment represented by huge architectural monuments at early lowland centers such as Mirador (*13*) and Nakbé (*14*) may have been attributable more to excessive drainage of water than to the political and military events that caused the temporary abandonment of Rio Azul and perhaps Seibal.

Clearly, there is much to be learned about the cultural trajectories of the Maya Lowland regions. Paradoxically, it appears that purely cultural insights often may be gained from the study of ecological context and especially of ancient water management.

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