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Vernon L. Scarborough

Arlen F. Chase

University of Nevada, Las Vegas, arlen.chase@unlv.edu

Diane Z. Chase

University of Nevada, Las Vegas, diane.chase@unlv.edu

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Ruins of the ancient Mayan city of Palenque, in the jungles of Chiapas, Mexico

Low-Density Urbanism, Sustainability, and IHOPE-Maya: Can the Past Provide More than History?

Vernon L. Scarborough, Arlen F. Chase and Diane Z. Chase

The Dahlem forum on “Sustainability or Collapse” in 2005¹ spawned a variety of regional research groups that now operate under the IHOPE (Integrated History and Future of People on Earth) umbrella. The developing syntheses from these groups are designed to investigate the effectiveness of geographically meaningful units for subsequent cross-temporal and cross-cultural global comparisons. Our group, known as IHOPE-Maya, is composed of approximately twenty researchers working across the Yucatan Peninsula and the Maya Lowlands of Central America (Figure 1) and focuses on the role of coupled human/nature dynamism in the context of an evolving tropical forested civilization (Costanza et al., 2012). The initial charge of IHOPE-Maya was to break down disciplinary divisions and integrate sometimes disparate data sets in a manner compatible with region-wide computational modeling and cultural comparison.

Progress has been made not only in linking specific cultural adaptations to climate forcings and the effects of population growth, but also in understanding the immediate and complex relationships – both short- and long-term – between the greater natural environment and society. We are especially sensitive to the renewed role of culture change and how our knowledge of past ecological systems has now evolved into a subset of our global cultural systems. With respect to the ancient Maya, determining the degree to which they successfully altered their environs

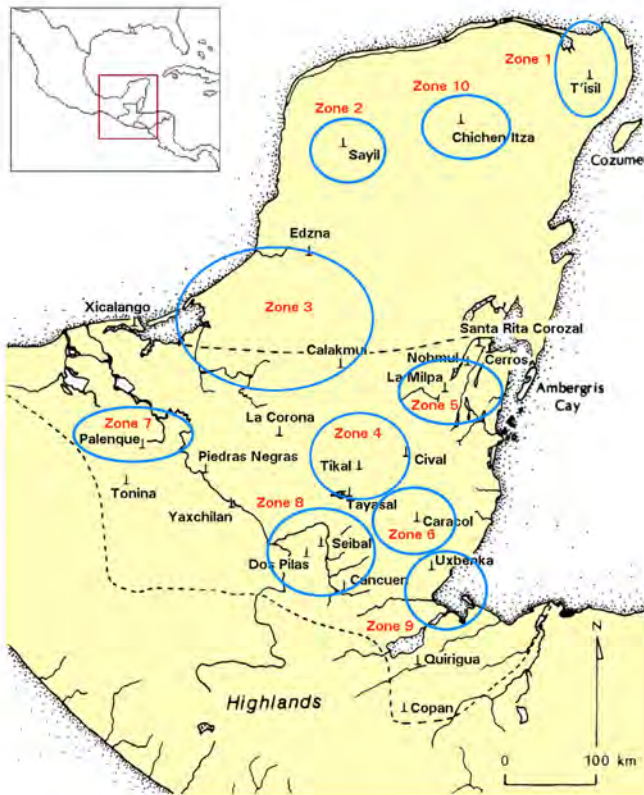
– or regionally damaged it – within the constraints of their technologies and innovations has great potential for assessing present-day societal adaptations.

Maya urbanism

Although there are several facets to our IHOPE-Maya work, an intriguing aspect evolving from recent field studies at Tikal, Guatemala (Scarborough et al., 2012) and at Caracol, Belize (A. F. Chase et al., 2011) – two of the preeminent “cities” in the Maya area at AD 700 – is the kind and degree of urbanism now identified.

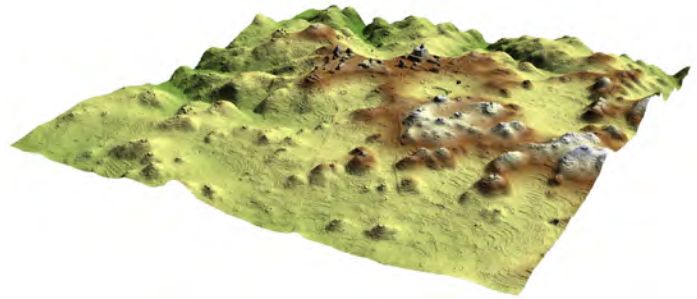
¹ The June 2005 IHOPE-Dahlem conference in Berlin, Germany assembled an interdisciplinary group of 40 top researchers from a range of natural and social science disciplines, with the goals of identifying how humans have responded to and impacted their environments over millennial, centennial and decadal scales as well as providing a glimpse of the future of the global human-environment system. Results from IHOPE-Dahlem are now published in the book, *Sustainability or Collapse? An Integrated History and Future of People on Earth*, from MIT Press (Costanza et al., 2007).

Figure 1 | Map of Maya area showing locations of zones under investigation by IHOPE-Maya; Tikal centers Zone 4 and Caracol centers Zone 6 (courtesy of IHOPE-Maya)



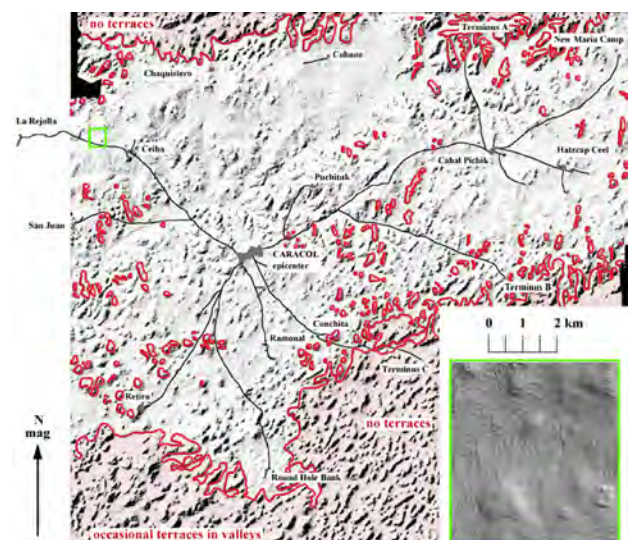
Given Paul Sinclair's commitment to the "Urban Mind" project (http://www.arkeologi.uu.se/Forskning/Projekt/Urban_Mind/Introduction/) within the IHOPE mission, a focus on this topic seems appropriate. Drawing from the work of Roland Fletcher and his colleagues at Angkor, Cambodia (Fletcher, 2009), it has become clear that the Maya practiced a form of "low-density urbanism." Scarborough has argued that ecological rules drove this settlement pattern at the outset – that is, the diversity of plants and animals in the tropics remains the greatest on the planet, but the incidence or richness of any one species in any one patch or microenvironment is highly limited. Unlike the potential for centralized urbanism in semiarid settings based in part on the concentration of several domesticates – vast wild and "natural" wheat or barley stands or gregarious herd animals like wild cattle, sheep, or horse (all identified with the first Old World experiments in domestication) – the Maya adapted to a wet-dry tropical forest that encouraged population dispersion for harvesting and exploiting local resources to make a living. Although Maya rapidly gravitated toward centers of control for greater societal order, their definition of "city" was always constrained by their environmental reality.

Figure 2 | 2.5D LiDAR image of central Caracol looking northwest (courtesy of Caracol Archaeological Project)



Digital aerial imagery from Caracol, specifically Light Detection And Ranging (LiDAR), has accentuated a vast landscape covered with dispersed, but continuous, residential groups, civic architecture, and agricultural terracing (Figure 2) – all within a single Maya city (A. F. Chase et al., 2011; 2012). The data confirm what was implied by years of settlement survey and excavation – that Caracol was a huge ancient city spread over almost 200 square kilometers of landscape. The imagery also shows the intense landscape manipulation that was necessary for sustaining the city's inhabitants as well as the integration of the city through a series of radial roadways (Figure 3). Only the scale of area covered by the LiDAR survey provides partial edges to an otherwise "boundary-less" settlement.

Figure 3 | Caracol road system and area of continuous agricultural terracing overlaid on the LiDAR Digital Elevation Model of the site. The anthropogenic landscape can be clearly seen in the agricultural terracing evident in the inset. The Caracol low-density urban adaptation was successful for approximately 500 years (courtesy of A. F. and D. Z. Chase).



At Tikal, settlement work suggests similarly subtle density drop-off zones as one leaves the civic center (Puleston, 1983). However, based on the new work at Caracol, the boundaries between urban centers may prove yet more subtle. Given their scale and concentration of monumental architecture – from pyramids and palace-like structures (Figure 4) to the surface area of plaza space and reservoir volumes as well as their manifest of quality and quantities of other artifactual wealth, it would be imprudent to call Maya cities decentralized. Nevertheless, the scattered character of their populations and associated resources does identify the sprawl of low-density urbanism. As has been noted previously (D. Z. Chase et al., 2011), the population density of the ancient Maya is well within the range of contemporary urban and suburban populations.

What Tikal adds to the recent literature is the complex infrastructure that these “centers” required. To accommodate the many laborers, visitors, and residents occupying or at least frequenting the heart of a Maya city required “monumental” maintenance investments as well as functional ends put to a predictable water supply (Figure 5). The latter is now well-defined as a waterworks system at Tikal and was no doubt highly developed in other urban aggregates (Scarborough et al., 2012; Scarborough & Gallopin, 1991).

Today?

So what, then, can the ancient cities of the Maya realm introduce to our perceptions of a vibrant urban setting today? Given cultural and technological differences – to say nothing of the disadvantages

of living in a fragile tropical environment – how can the past be of any real aid in assessing our urban plans for the future?

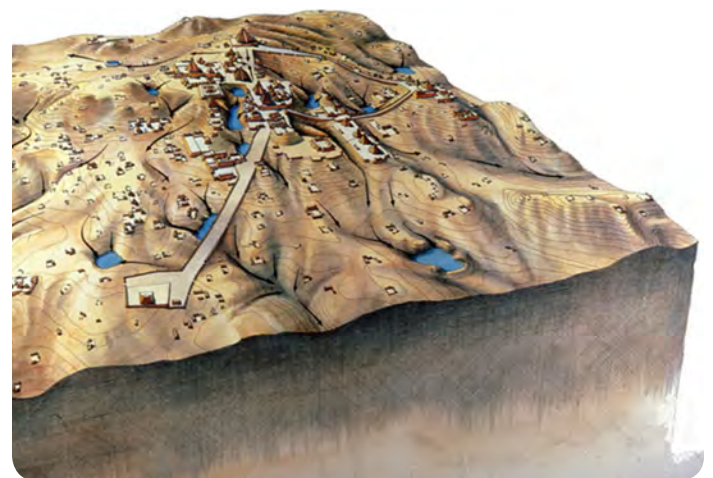
Perhaps our Western technologies are now finally poised to revisit a notion of urbanism reclaimed from the past. Maya centers and their hinterlands are revealing extensive roadways beyond the core zones of specific sites – apparent at cities like Caracol, Coba, and Chichen Itza. And, when contextualized by the amount of time and energy invested by the Maya in their ancient calendar system – surely a set of scheduling devices for economic purposes as much as for any political or ideological end – cities had a highly organized and rapid interconnectivity. This kind of integration was not limited to their cities, as the Maya hinterlands were inextricably joined by way of a “high-density ruralism,” allowing for rapid and efficient linkages between those small communities and the marketing advantages of both established and emerging “low-density urban centers.”

The ancient Maya notion of settlement and hinterland interdependency evolves from an economic organizational foundation based on “resource-specialized communities” or the concept that many rural villages or hamlets tended to specialize in at least one economic resource and then circulate that resource through marketplaces; in Maya low-density cities, urban residential households mimicked the diverse specialization found in the hinterlands. Solar markets that were embedded in different venues and communities throughout the Maya landscape ensured predictable access to specific economic items for any household (Scarborough & Valdez Jr., 2003; 2009). Some communities might well accommodate certain fundamental political or ideological institutions pervasive in Maya culture, like the ballgame and the ballcourt or types of low-cost astronomical observation

Figure 4 | Photo of Tikal looking north across the palaces of the central acropolis to Temple 1 (courtesy of IHOPE-Maya; date unknown)



Figure 5 | Graphic showing central Tikal and its reservoir system (courtesy of V. Scarborough)



architecture; such small community investments likely resulted in periodic visitations and associated market activity by neighboring villagers. The resource(s) in which a community might specialize was broadly defined and tied to the needs of the greater district of interdependent communities (Scarborough & Valdez Jr., 2009).

A high-density ruralism connected to a world economy could well redefine our highly nucleating idea of city, providing an ancient analog to the contemporary notion of a “blue-green city.”



Because of the difficulties in concentrating or storing organic remains in a tropical environment, highly centralized urban supply chains were likely less effective, although this did not preclude long-distance trade or production in foodstuff by the Maya. When coupled with waterborne disease frequently spiking with dense urban aggregates, the low-density urbanism of the greatest “cities” was complemented by the “high-density ruralism” of the hinterlands. For some time, the health benefits derived from the dispersed settlement pattern practiced by the ancient Maya have been known (Chase et al., 1990; Drennan, 1988).

Could a model for our mega-cities be drawn from the Maya example of urbanism? Recently, Seto et al. (2012) lament the notion of a rural-urban polarity in our present-day assessments of cities, especially as resources are frequently located in a geographical mosaic of localities. Perhaps this reality and its prospects for future land-use harvesting and expansion might draw on a version of the outlined Maya model. In this scenario, the internet and the cultivation of market-driven co-operatives based in rural settings are the loose equivalent of the roads and calendars (the internet) and resource-specialized communities (the cooperatives) of the Maya, allowing the rapid pricing and subsequent movement of goods and services from otherwise isolated locations away from today’s urban hubs.

While the virtues of mega-cities continue to be extolled (Glaeser, 2011; Kennedy, 2011), clearly contemporary cities do provide the concentrated labor and services driving the world economy – but at what price? Urban poverty is frequently more severe and pervasive than subsistence living in rural settings, and notions of well-being in a favela or ghetto can surely be questioned. We are not advocating a Rousseau-like return to a hinterland nature, but we are suggesting that a high-density ruralism connected to a world economy could well redefine our highly nucleating idea of city, providing an ancient analog to the contemporary notion of a “blue-green city.” This will require cities to “open up” and work to improve inter-city transport of people, things, and ideas. Perhaps the European landscape is positioned to logically accommodate several of the Maya principles. Rail traffic and the internet are the roads and scheduling conduits pre-adapted for this kind of expansion and cultivation of resource specialized communities.

Nothing in this approach is new and in the Maya case it is a mere 2000 years old. However, a closer review of what has transpired in the deep past is as appropriate as fixating on the present order of our world and limiting our options to what has been identified as “urbanism” over the last century. The world is changing and we need to interrupt our sometimes romantically

constructed path dependency associated with a restricted view of urbanism before the current myth of the sublime nucleated megacity is covered by waves of a sea level advance or the congestion of disease vectors. This is not an indictment of all present-day cities, but instead just another dimension to assess our future.

Acknowledgements

Our discussion here has very much benefited from a series of seven multi-day meetings of the IHOPE-Maya group beginning with our first assembly in January 2009 at the School of Advanced Research in Santa Fe, New Mexico. The work of IHOPE-Maya members will be showcased in a 2013 volume titled *The Resilience and Vulnerability of Ancient Landscapes: Transforming Maya Archaeology through IHOPE* (edited by A. F. Chase and V. Scarborough) that is being published by the Archaeology Section (AP3A) of the American Anthropological Association.

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