

From Belize to Bagan: Framing a Comparative Analysis of Tropical Societies

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The ultimate goal of the Socio-ecological Entanglement in Tropical Societies project (SETS) is to promote the cross-cultural, transdisciplinary examination of the tropical experience, past and present, as a means to explore resilience and vulnerability to changing socio-ecological circumstances. This discussion presents the results of the initial phase of the research program, which focused on the comparative assessment of data quality and quantity across five principal foci (water management, agriculture, settlement, epicentral capitals, and integrative mechanisms), spanning nine geopolitical “divisions” (Belize, south India, Sri Lanka, Myanmar, Thailand, Cambodia, Java, and both northern and southern Vietnam). Our detailed literature reviews and comprehensive site visitations – which have so far concentrated on the Classical, or “Charter States” of the various sub-regions of interest – have also allowed us to generate some preliminary insights concerning the similarities and differences across the different case studies, with particular emphasis on how the Asian examples compare with the ancient Maya.

Keywords: Cross-Cultural, Comparative, Method and Theory, Tropical States



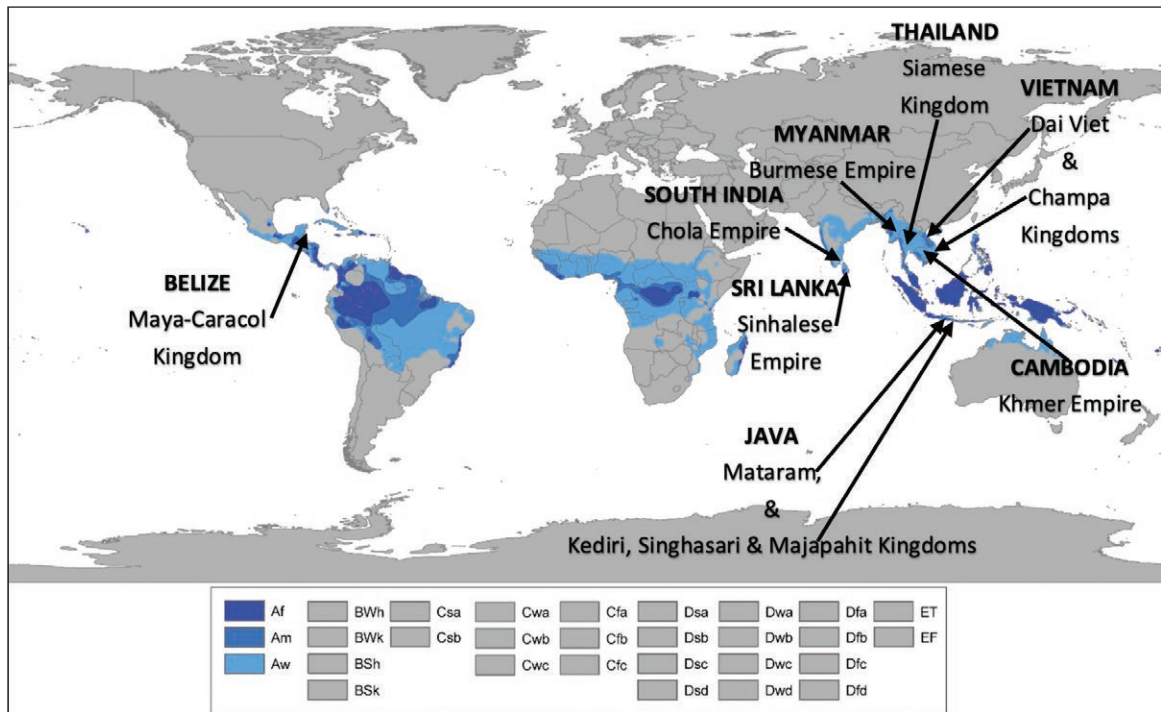


Figure 1. Köppen climate classification showing the world’s tropical zones and the locations of the SETS case studies (modified from wikipedia.org).

The *Socio-ecological Entanglement in Tropical Societies* (SETS) project has been specifically developed to promote the cross-cultural, transdisciplinary examination of the tropical experience, past and present, as a means to explore resilience and vulnerability to changing socio-ecological circumstances. An outgrowth of 23 field seasons of excavation-based research into the rise and fall of Classic Maya polities (e.g., Iannone and Connell 2003; Iannone 2014c; Iannone et al. 2016), Phase I of the SETS research program has employed an *Insight Development Grant* (2013-2015) from the Social Sciences and Humanities Research Council of Canada (SSHRC) to initiate a broader, comparative study of the development and denouement of complex societies in tropical South and Southeast Asia. This initial foray into cross-cultural research has been specifically aimed at evaluating the quality of various datasets relevant to the elucidation of the reasons for the “collapse” of a number of “classical” state formations in the latter part of what Victor Lieberman (2003, 2009, 2011) refers to as the “Charter Era” (CE 800-1400; see Figure 1 and Table 1).

The Focus of the Research Program

When contemplating the relevance of such a study, it is important to acknowledge that the world’s tropical zones were once regularly characterized as ecologically homogenous, energy-challenged, limited in terms of resources and agricultural potential – other than small-scale slash-and-burn farming – and thus unlikely places for state formation to occur (Boserup 1965, 1981; Coe

POLITICAL DIVISION	CHARTER STATE CAPITALS (ORIGINAL NAME & KINGDOM/EMPIRE)	DATES	COMPLETED SETS PHASE I VISITATIONS	SELF-FUNDED VISITATIONS
Thailand	<i>Sukhothai</i> (Thai Kingdom)	1238-1378 CE	2013	2011
	<i>Lopburi</i> (<i>Lavo</i> ; Thai Kingdom)	468-1351 CE		2011
Myanmar	<i>Bagan</i> (<i>Arimaddana Pura</i> ; Burmese Empire)	849-1287 CE	2013	2012
Cambodia	<i>Angkor</i> (<i>Yaśodharapura</i> ; Khmer Empire)	893-1431 CE		2010, 2011, 2012, 2013, 2015, 2016
	<i>Koh Ker</i> (<i>Lingapura</i> ; Khmer Empire)	928-944 CE	2013	2012
	<i>Rolous</i> (<i>Hariharalaya</i> ; Khmer Empire)	802-893 CE	2013	2010, 2011, 2012, 2013, 2015, 2016
North Vietnam	<i>Thang Long</i> (Dai Viet Kingdom)	1009-1400 CE	2014	2010
Central Vietnam	<i>Cha Ban</i> (<i>Vijaya</i> ; Cham Kingdom)	986-1471 CE	2014	
	<i>Duong Dong/My Son</i> (<i>Indrapura</i> ; Cham Kingdom)	758-986 CE	2014	2010
Java	<i>Singhasari</i> (<i>Tumapel/Singhasari</i> ; Singhasari Kingdom)	1222-1292 CE	2014	
	<i>Kediri</i> (<i>Daha/Kediri</i> ; Kediri Kingdom)	1045-1222 CE	2014	
	<i>Prambanan/Ratu Boko</i> (Sanjaya Dynasty/Mataram Kingdom)	760-1000 CE	2014	
	<i>Borobudur</i> (Sailendra Dynasty/Mataram Kingdom)	750-860 CE	2014	
South India	<i>Gangaikondacholapuram</i> (Chola Empire)	1025-1297 CE	2015	
	<i>Thanjavur</i> (Chola Empire)	848-1025 CE	2015	
	<i>Madurai</i> (Pandya Empire)	590-1333 CE		2014
Sri Lanka	<i>Polonnaruwa</i> (Sinhalese Kingdom)	933-1310 CE	2015	2011
	<i>Anuradhapura</i> (Sinhalese Kingdom)	377 BCE-933 CE	2015	2011

Table 1. Major charter state capitals visited as part of the SETS Phase I research, and via self-funded visitations.

1961; Meggers 1954; Sanders and Price 1968; Winzeler 1976:624-626). We now know that such assertions are false. Tropical environments are relatively heterogeneous (Scarborough and Burnside 2010:178), and they were often the settings for high populations, intensive agricultural regimes,

sophisticated water management systems, far-flung trade networks, and powerful state-level societies.

The SETS investigations are specifically focused on the impressive pre-industrial state formations that developed in the monsoonal, wet-dry outer tropics that occur between approximately 5° and 20° North/South (Ewel and Bigelow 1996:195; Fletcher 2009, 2012; Kricher 2011:19; Weischet and Caviedes 1993:11-12, 167), within the “sub-humid” Am and Aw climates in the Köppen-Geiger system (Köppen 1884; see Figure 1). Not only do these climate zones exhibit distinct wet and dry seasons, they also display considerable variability in terms of soil productivity, hydrological processes, and overall biodiversity (Kricher 2011; Marcus 2009; Scarborough and Burnside 2010:178; Weischet and Caviedes 1993:275-279). These environmental factors would have enabled or

constrained specific behaviors and conditioned the unique cultural developments that characterized the classical states under consideration.

To date, there have been few concerted efforts to try to understand issues of resilience and vulnerability specific to socio-ecological systems in the tropics (e.g., Iannone 2016; Isendahl and Smith 2013; Scarborough and Burnside 2010). Nevertheless, it has become clear that these civilizations do represent a divergent path to urban life, and they appear to have shared a certain range of vulnerabilities that ultimately contributed to their “collapse” (Fletcher 2009, 2012; Iannone 2016). In order to explore shifting levels of resilience and vulnerability within the various classical states, the SETS project has adopted an explicit historical-political ecology approach to the assessment and analysis of various pre-existing datasets (Thompson 2014).

Our approach is also unabashedly cross-cultural in focus yet strives to be as rigorous as possible (see Trigger 2003:15). To begin, we adhere to Robert Ascher’s (1961:319) canon that we should “seek analogies in cultures which manipulate similar environments in similar ways”; hence our focus on the world’s tropical zones, where the different pre-industrial state formations had to contend with similar socio-ecological issues over the course of their integrated histories. We also strongly concur that “data proximity” is crucial to the comparative approach (Drennan and Peterson 2012).

It is also important to stress that by adopting a comparative approach one is not necessarily devaluing the significance of more particularist, agency or event-centered analysis. Roland Fletcher (2012:317) argues that: “Cross-cultural comparison is not about creating blanket generalizations that homogenize diverse cases. Rather, we need to construct operational models that can be tested against the varied scenarios of diverse human history across the planet.” In doing so, it is imperative that we craft comparative studies that are systematically “cross cultural and cross-temporal” (Bartolini 1993). Finally, with respect to the stated goals of the SETS research program, we also agree with Drennan et al. (2012:3), who underscore that: “Comparative methods are essential if archaeologists are to contribute to transdisciplinary research in the historical and social sciences and thereby broaden the scientific understanding of the past, the present, and the future of human societies” (see also Feinman 2012:22). In other words, it is through rigorous comparative analysis that we aim to generate a nuanced understanding of resilience and vulnerability in tropical state formations across both time and space.



On Resilience and Entanglements

Resilience

What then, is “resilience”? To begin, resilience can be defined as “the capacity of a system to absorb disturbance; to undergo change and still retain essentially the same function, structure, and feedbacks” (Walker and Salt 2006:32). Importantly, resilience is “not about not changing,” but rather the ability to manage change, sometimes because staying the same will diminish resilience, at other times in efforts to avoid a critical transition, or “collapse” (Walker and Salt 2012:24). Scholars have outlined a number of specific criteria that can be used to pinpoint areas of resilience or vulnerability in socio-ecological systems (see Iannone 2016). Four of the core concepts of resilience thinking are: 1) **niche construction**, wherein people do not simply adapt to their environments, but also adapt their environments to them, which alters pre-existing ecological relationships and introduces new anthropogenic landscapes that often require additional investments and innovations (Dearing et al. 2007:266; Fischer-Kowalski, Marina 2003; van der Leeuw 2007:215), thereby increasing the locale’s historical gravity (Mrozowski 2016); 2) **risk spirals**, where efforts to solve immediate problems have unintended consequences that spawn issues in the future that are more complex and difficult to contend with, requiring further responses, and leading to a constant innovation pressure (Müller-Herold and Sieferle 1997:201-202); 3) **path dependency**, which refers to a state where specific decisions and practices lock a community or individual into a particular developmental trajectory that becomes increasingly hard to diverge from because certain options are no longer available, and particular practices have become too firmly engrained to be easily abandoned (van der Leeuw 2007:215); and, 4) **sunk-costs**, where people or communities continue to invest in existing things and relationships, even when faced with changing circumstances, which results in a tendency to undermine innovation (Cumming 2011:94; Janssen and Scheffer 2004; Walker and Salt 2006:87). The challenge for those who wish to explore resilience and vulnerability in the past is that such concepts remain abstractions, at least from an archaeological perspective, unless we can determine the material correlates for resilience and vulnerability.

Entanglement

One avenue that holds some potential for the archaeological examination of resilience is the notion of “human-thing entanglements,” as outlined by Ian Hodder (2011a, 2011b, 2012). “Entanglement” theory is based on the idea that, as we live our daily lives, humans and “things” (natural occurring and/or human-made entities) develop recursive relationships grounded in a “dialectic” between dependence – which is productive and enabling – and dependency – which is constraining and limiting (Hodder 2011a:175, 2012:17–18, 88). From a resilience theory perspective, such material entanglements are of particular concern because “people and things get trapped in entanglements that themselves direct the way further change can occur,” principally because “the entrapment of entanglement limits and channels innovation” (Hodder 2011a:178). In other words, socio-ecological systems, through processes such as niche construction, cultivate many human-thing entanglements that foster relationships of dependence that are both productive and enabling. Such entanglements enhance, and even promote the ability to manage change in resilience terms. However, over time some of the more significant human-thing entanglements are



Figure 2. Kamara Pokuna, Polonnaruwa, Sri Lanka.

transformed into relationships of dependency – they exhibit the characteristics of risk spirals, path dependency, and sunk costs – and they therefore become more constraining and limiting in resilience terms. Such entanglements limit innovative potential and stifle the ability to manage change. Importantly for archaeologists, entanglements – relationships of dependence and/or dependency – have material correlates, and their formation and transformation can therefore be examined over time as proxies for shifting levels of resilience and vulnerability.

Exploring Resilience and Entanglements on the Ground

The question remains, what kinds of archaeological data can we work with that provide the best fit with resilience and entanglement theory? To begin, it is useful to follow the lead of Walker and Salt (2012), who stress that researchers should practice *requisite simplicity* when applying resilience theory to a specific case study. In other words, one should: “identify the minimum but sufficient information” required to explore the levels of resilience and vulnerability exhibited by a particular case study (Walker and Salt 2012:23). They posit that, in general, between three and five key variables will play the most significant roles in determining resilience in most situations. It also seems most profitable to explore human-thing entanglements using variables for which we are able to chart shifts from dependence to dependency over the long-term.

In terms of examining entanglement and resilience within early tropical state formations, the most fruitful variables to examine appear to be: 1) *Water Management*: many tropical societies relied on sophisticated water management systems that needed to be constructed and maintained (Figure 2); 2) *Agricultural Intensification*: the majority of tropical societies were agrarian based,

and highly reliant on agroecosystems and a specific staple crop (Fletcher 2012:298; Figure 3); 3) *Urban Epicentral Plan and Composition*: overtime, all of the early tropical state formations put great efforts into building, elaborating, and maintaining the ostentatious epicentral complexes at the very heart of their sacred and political capitals (Figure 4); 4) *Integrative Mechanisms*: all early tropical societies put considerable effort into building and maintaining integrative features such roads, bridges, temples, markets, administrative nodes, state controlled fields and water holding facilities, hospitals, rest houses, and a diverse range of sacred natural sites (Figure 5); and, 5) *Settlement Patterns*: the various pre-industrial tropical state formations all seem to have developed a somewhat unique low-density, or dispersed urban footprint (Fletcher 2009, 2012; Scarborough et al. 2012; Figure 6).

Specific Goals of SETS Phase I: Data Evaluation

The specific goal of the recently completed Phase I SETS research was to assess the quality of the various datasets associated with the aforementioned variables. This assessment was achieved using a three-stage approach. Initially, SETS team members immersed themselves in the general literature on the culture history of South and Southeast Asia. Subsequently, on-the-ground visitations across eight different political divisions of South and Southeast Asia were carried out, including South India, Sri Lanka, Myanmar, Thailand, Cambodia, North and Central Vietnam, and Java. Prior to each field trip more specific literature reviews for each particular Charter State case study were conducted, and detailed itineraries were formulated. A total of 18 separate epicentral capitals



Figure 3. Candi Selogriyo Area, Central Java.



Figure 4. Bagan, Myanmar.

were explored (see Table 1) as part of the study. Various contemporaneous cultural features were also visited on each sojourn. These represented the four remaining variables that were established as the foci of the SETS I study: water management infrastructure, settlement features, integrative mechanisms, and agricultural systems. In combination with a series of self-funded research trips conducted by the Principal Investigator (Iannone) across the study region, over 550 unique localities have been visited by SETS team members as part of our Phase I study.

On-site visitations were a crucial component of the SETS Phase I research program. Although extensive literature reviews were also conducted, these were no substitute for the “data proximity” provided by on-the-ground examinations. It was determined, time and time again, that many points of interest – such as sacred groves, minor temples and shrines, smaller water management features, architectural embellishments, and less significant locales in general – were often not discussed in the literature at all, or if they were, they were only mentioned in passing, with no visual accompaniment. While visiting the different locales – both small and large, well-known and obscure – we were also able to informally engage with knowledgeable local guides and community members who were able to provide interesting details relevant to our study. We were also able to peruse informative signage and display texts at the various sites and museums we visited and acquire monographs and shorter guidebooks that are not readily available outside the country of origin.

Data proximity was especially crucial to carrying out the agriculture, sacred natural sites

(integrative mechanisms), and settlement sub-projects, as evidence for these important components of the ancient tropical lifeway are not as well preserved, primarily due to their palimpsestic nature. In addition, there is both limited literature and a paucity of archaeological research associated with these areas of investigation. It was often by travelling from one study location to the next that we were able to observe, from the vantage of the van or train window, vestiges of the ancient settlement pattern, pockets of intensive agricultural production, and examples of previously unknown sacred groves.

It was also much easier to gauge the actual extent and overall quality of temple complexes and monasteries, urban epicenters, water management systems, and even agroecosystems by roaming around, through, and between different components of these. Our extensive on-the-ground wanderings also made it much easier to ascertain the associations between different material elements of the overall settlement pattern, thus providing us with a more holistic understanding of the broader settlement footprint and its various entanglements. In South India and Myanmar there was the added benefit of being able to visit many of the “living temples,” and in doing so phenomenologically engage with the sights, sounds, smells, and actions that, although part of the contemporary world, are still reminiscent of those that framed the social and spiritual life of the early state societies we study. With respect to these living temples, the on-site-visitations were vital because photographs were sometimes not allowed within the inner sanctums of the more popular



Figure 5. Spean Praptos Bridge, Cambodia.



Figure 6. Situs Pemukiman, Trowulan, East Java.

temple complexes, and our first-hand encounters with these spaces therefore proved invaluable.

Through these efforts we determined that the five variables that were selected for analysis can be used to effectively examine the broader socio-ecological issues surrounding resilience and vulnerability in the various pre-industrial, tropical state formations under examination. However, we also noted a certain unevenness in terms of the quality of specific datasets across both time and space. For example, settlement patterning has witnessed decades of study in the Maya world, but is virtually absent from the research programs of South and Southeast Asian archaeologists. These limitations establish some parameters with respect to the degree to which shifting levels of resilience may be recognized within the various integrated histories we are attempting to craft as part of the broader SETS research program.

Preliminary Observations Generated During the SETS I Comparative Research Program

Some interesting similarities and differences emerged as a result of our examination of the various case studies. These observations can be considered as a whole, to help inform our general understanding of tropical lifeways, or individually, to stimulate follow-up research of a more focused variety.

To begin, it is noteworthy that water management was of a much higher magnitude in South Asia, and particularly Southeast Asia, when compared to that of the ancient Maya. The sheer number of moats, canals, and small reservoirs found in association with the South and Southeast Asian case studies is truly astounding. Most impressive are the expansive reservoirs – often referred to as “lakes” – that were constructed by the Khmer of Cambodia and the Sinhalese of Sri Lanka. The need for such widespread and high capacity water management systems was not simply due to

the occurrence of marked wet and dry seasons – the Maya also had to contend with this issue – but rather reflects two other fundamental differences: 1) the less porous sandstone geology found across much of South and Southeast Asia resulted in the need to manage runoff to avoid flooding during the rainy season; and, 2) the requirements of the Asian wet-rice economy, which demanded extensive and comparatively high volume irrigation systems.

Like maize for the Maya, rice was the staple food for South and Southeast Asian societies, as it continues to be today. That said, we also know that across the tropics agricultural practices were quite diverse, and fundamentally resilient in character, with polycultural cultivation practices being the norm. There is, however, still much that we need to learn about the agrarian economies of the ancient tropics, both in the Maya world and in the realms of the Asian case studies.

We do know much more about the monumental epicenters of the Maya and their Asian counterparts. Here I am referring to the main agglomeration of monumental architecture that demarcates the socio-spiritual *axis mundi* of an urban center. Across the various case studies these epicenters are dominated by towering temples and sprawling palace complexes. Whereas the temples are generally constructed of durable stone or brick, there are significant differences in palace architecture. Maya palaces – specifically royal residences – are largely constructed of stone, whereas their Asian equivalents are made of wood, and they are thus rarely preserved. We must, therefore, infer their presence based on other datasets, such as inscriptions and historical narratives. In contrast to the Maya case study, Asian epicenters are often surrounded by walls and moats. Another difference is that Maya epicenters demonstrate a historical stratigraphy – with rulers building new temples and courtyards overtop those of their predecessors – whereas the Asian epicenters were often added to in a lateral fashion, with new rulers constructing their own seat of power in the vicinity of, or sometimes distant from, those of their predecessors (Michael D. Coe, M@P2010 keynote address). As such, Maya epicenters can be said to be more vertically oriented (like Russian Stacking Dolls), whereas the Asian epicenters are more horizontally dispersed (like pieces on a chess board).

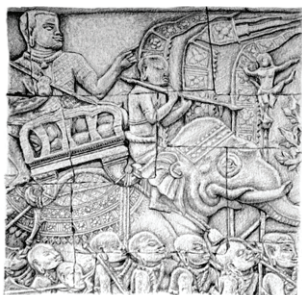
Regardless of the aforementioned differences, one fundamental similarity is that the monumental epicenters in all of the tropical case studies are embedded within a dispersed peri-urban landscape exhibiting a mixed urban-rural character. We know much more about these peri-urban zones in the case of the Maya, due to the many decades of settlement archaeology that have been carried out in Mesoamerica. In South and Southeast Asia our understanding of peri-urban zones and support populations continues to be limited by the long-standing emphasis on elite-focused inscriptions, historical narratives, art, and architecture. A significant period of comprehensive settlement archaeology will need to be completed before we can begin to draw some empirical conclusions as to the demographic and socioeconomic characteristics of the agrarian societies of Classical South and Southeast Asia.

Finally, in considering how all of the tropical societies under consideration were integrated at the community and societal levels, our comparative study made it clear that ritual and religion were fundamental to social cohesion, with temples and temple complexes figuring prominently both within and outside the monumental epicenters. One thing that may, at first blush, appear to differ from the Maya case study is that in South and Southeast Asia religious institutions were crucial not only for unifying people of varying socio-spiritual, economic, and political status, but also in terms of basic economic expansion and amalgamation. That said, other than Marc Zender's (2004)

detailed analysis, there have been few considerations of whether the ancient Maya had well-organized religious institutions akin to the powerful *Sangha* of South and Southeast Asia, with its temples, monasteries, priests, nuns, and expansive landholdings. Until such research is carried out in the Maya world, we should be cautious about overstating this apparent organizational difference.

Conclusions

In conclusion, the SETS investigations are envisioned as a long-term research program that will bridge the gap between the past and the present in order to examine socio-ecological relationships, and issues concerning resilience and vulnerability, in the world's tropical zones. SETS Phase I constitutes the first stepping-stone in this endeavour, and these preliminary investigations have already resulted in two open access edited volumes (Iannone 2014b; Iannone et al. 2015), one book chapter (Iannone 2016a), nine conference papers (Hills 2016; Iannone 2013, 2014a, 2015a, 2015b, 2016b, 2016c; Macrae 2016; Marajh 2016a), five Master's theses (Baron 2019; Goldberg 2018; Marajh 2016b; Mody 2018; Shirkey 2015), and an electronic image library containing over 68,000 photos.



So, “what’s next” for the SETS team? Beginning in May 2017, we began leveraging the general results of our initial SETS data evaluation exercise as part of a more focussed, and traditional research project, in collaboration with Yangon University, Mandalay University, and Yadanabon University.

Our primary goal is to generate an integrated socio-ecological history for residential patterning, agricultural practices, and water management at the Classical Burmese (Bama) capital of Bagan (mid-11th to early-14th century CE), Myanmar. The *IRAW@Bagan* project gains its importance from the fact that our current understanding of Bagan society is biased towards its upper echelons, being based almost entirely on elite-focused texts, art, and architecture. A settlement archaeology study within the peri-urban (mixed urban-rural) zone immediately surrounding Bagan’s walled and moated, regal-ritual epicenter will: 1) provide much needed balance to our conception of Bagan as a dynamic capital city; 2) generate insights useful for elucidating the unique aspects of urban development in the tropics; and, 3) help inform considerations of resilience and vulnerability in tropical metropolises, both past and present.

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