

TECHNOLOGIES OF CONSTRUCTION

DECOLONIZING BAMBOO

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UNEARTHING INDIGENOUS FUTURITY

SELINA MARTINEZ INTERVIEWED BY TONIA SING CHI



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ABSTRACT

In the Southeast Asian archipelago prior to European contact, a ubiquitous knowledge of bamboo construction fed, and was fed by, the ritual assembly of village structures. Each family unit renewed social contracts and reaffirmed power hierarchies according to the bamboo they grew, harvested, and fashioned into components of buildings. As the twin imperatives of colonial extraction and missionary conversion swept across Asia, Africa and the Americas, waves of campaigners preached the gospel of single-family houses and more "salubrious" buildings. Before the turn of the 20th century, these sermons were re-asserted as regulations and compulsory standards of morality and hygiene, virtually eliminating bamboo structures beyond bridges and animal pens. In the early decades of the 20th century, pro-independence architects in the colonial service sent to enforce prohibitions in bamboo construction across the Dutch East Indies encountered a series of joinery and treatment methods capable of preventing infestations. They presented their findings at the 1922 Social Housing Congress, proposing that the socio-cultural practices of bamboo, along with its

economy, were the key to solving multiple crises facing the colonial administration.

A century later, bamboo structures have emerged at the cutting edge of sustainable design, simultaneously providing architectural media with some of its most startling imagery. The present global state of bamboo design and construction provides a framework for a return to the same Balinese villages where Dutch colonial architects first encountered the building cultures of bamboo. The article interrogates the socio-cultural status of bamboo architecture at a moment when a luxurious seven-story bamboo mansion in Bali appears as the cover image of Apple TV's "Home" docu-series: What meanings are associated with bamboo structures? How have international building codes and engineering standards adapted to the "nonhomogeneous element behavior" of bamboo poles? What do the master builder/architect priests of the stronger-than-ever Hindu-Balinese religious practices see in the legalization of building methods that once played a central role in village life and social order? Well into the anthropocene, where do we stand in relation to questions posed in 1922 on the potential for bamboo architecture?

INTRODUCTION

In the 1970s, Green Revolution agricultural technologies were embraced by the Indonesian government and brought three successive years of record rice yields to Bali. When the trend line dipped in year four, the response was to apply more pesticides and fertilizers. What happened next was a shock to everyone. From 1982 to 1985, plant stress from water shortages and catastrophic losses to pest infestations resulted in unprecedented food scarcity. Farmers rebelled, rejected government interventions, and returned to their prior rice farming routines. But what accounts for the success of these routines, given that the rugged area of south central Bali feeds more people on less land than almost any other region in the world? While archeologists excavating the canal networks of Cambodia and Thailand had long speculated on the role of religion in water allocations, the collapse of the Balinese rice system suddenly brought its centuries-old Hindu-Balinese temple practices out of the shadows and made it the focus of intense scrutiny.¹ A decade of computer modeling by University of Southern California researchers revealed the remarkable sophistication of the Balinese *subak* temple system in its capacity to dynamically respond to shifting parameters large and small to restore balance.² In light of their catastrophic failures and the subsequent systems analysis, even the true believers at the Asian Development Bank took a step back from their constitutional zeal and admitted that no bank project had ever exhibited such a high performance and capacity for self-regulation comparable to that of the centuries-old terraced rice system of Bali.³ This short history of the momentary displacement, and urgent return, of a previously invisible yet inexplicably sophisticated set of socio-religious practices is prologue to a similar, albeit elongated, history of suppression and nascent revival.

Throughout much of Southeast Asia prior to European contact, buildings, villages, and infrastructures were made of bamboo. Like the Balinese *subak*, the unique role of bamboo in the equatorial ecosystems and material properties placed it at the heart of a rich building culture and complex socio-economic order. Along with colonial extraction and missionary conversion, hygiene campaigns swept across Asia, Africa and the Americas

with the aim of imposing moral and physical health on colonial subjects. Thatch and bamboo buildings were declared to be dangerous breeding grounds of rot, rats, and malaria. Bamboo was discouraged and banned outright, beyond animal pens and bridges. Entire villages were removed to address the threat posed to European enclaves by bamboo structures and their inhabitants.⁴ It was a war pitting European modernism against indigenous tradition. Now, some seven decades after Southeast Asians brought an end to formal colonialism, the stigma of bamboo as a sign of poverty and backwardness remains. Even as bamboo structures have provided a global architectural media with some of its most stunning images since the 1990s, bamboo remains a material for the very rural and the very rich. Against the largely successful displacement of bamboo culture, this article interrogates the socio-cultural status of bamboo architecture at a moment when bamboo structures are found on the pages of *National Geographic* and as the ultra-luxury mansion on the cover image of Apple TV's "Home" docu-series, but nowhere in between.

SIMPLE MATERIALS, COMPLEX STRUCTURES

Irish designer Linda Garland pushed back hard against the cultural stigmatization of bamboo: "If you took the properties of bamboo and you called it 'techno-fiber' ...governments [would say] 'my god, of course we want it.'" By its common name, it is shunned as being just for the poor.⁵ As founder of the Environmental Bamboo Foundation, Garland traveled a path forged half a century earlier by two Dutch architects who, like Garland, disseminated techniques of bamboo preservation and promoted its use for inexpensive self-construction of housing. But unlike Garland, their troubled roles simultaneously as instruments of, and anti-colonial activists working against, the late colonial project of the Dutch East Indies (now Indonesia), compelled a more explicit socio-political critique.⁶ Thomas Karsten (1884-1945) and Henri Maclaine Pont (1884-1971) defined "the task" (*de taak*) of the age as the expression of "...the insoluble duality [that] lies in the essence of the colony: the contrast in tradition, degree of development and aims between dominating European and dominated indigenous life."⁷ They were explicit in their own roles as placeholders and catalysts of a transition to indigenous self-governance.

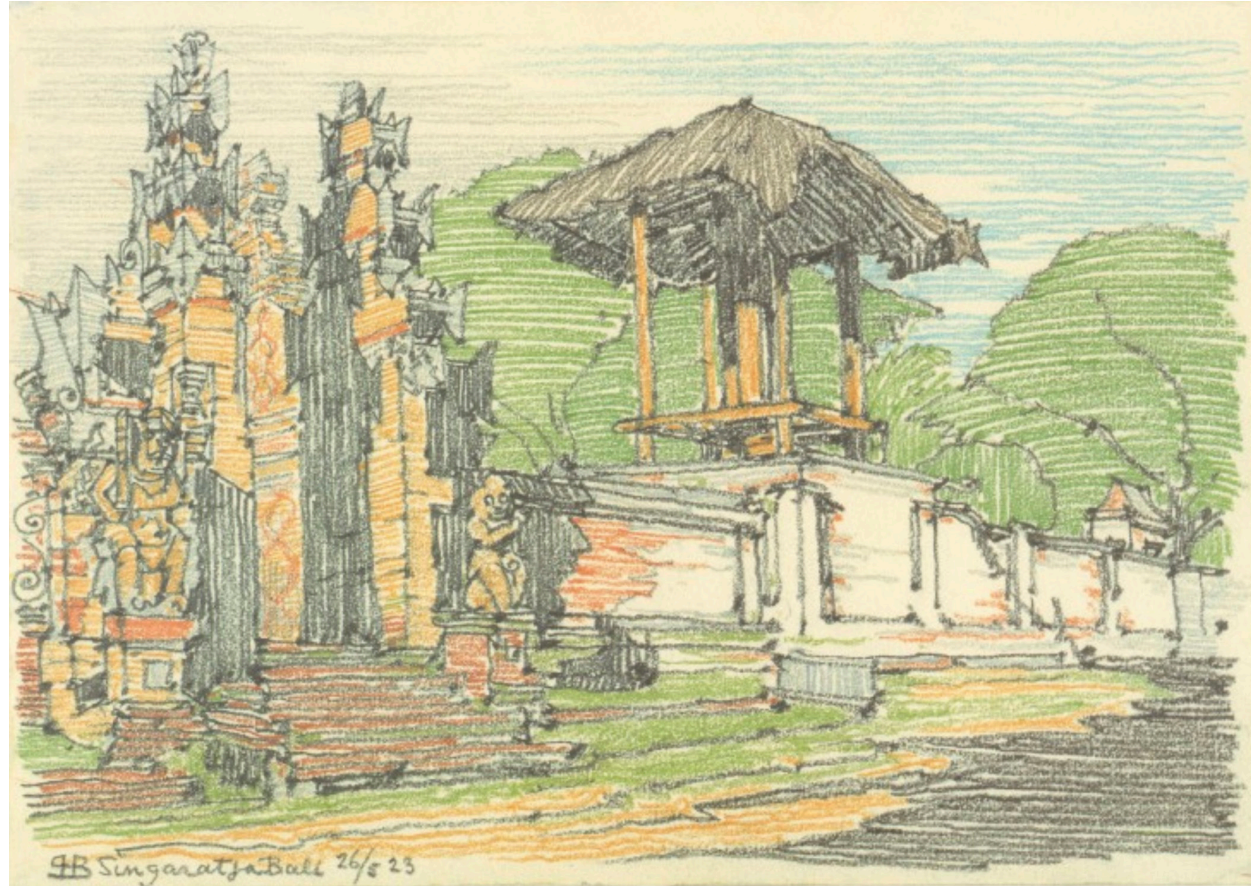


Figure 1: H.P. Berlage's 1923 sketch of a Balinese gateway and bamboo kul-kul bell during his tour of the Dutch East Indies (PD), from H. P. Berlage, *Mijn Indische Reis* (Rotterdam: W.L. & J. Brusse, 1931), 118.

When Hendrik Petrus Berlage (1856-1934) visited them in the Indies, he was drawn to the pre-European landscapes that were soon to be lost to progress. For Karsten, the loss was not a foregone conclusion. He expressed the conflict as manifesting in the very materiality of colonial constructions in which every masonry block exemplifies European domination in the extraction of wealth. Underlying outward expressions of deference to colonial power, the *tukang* (workers) withdraw to the *kampung* (rural and urban villages) to weave *tikar* (bamboo mats for walls, ceilings and floors) or thatch grasses into roofs.⁸ Within the walled and gated enclaves of rural and urban village *kampung*, these impermanent constructions are deployed as “spiritual weapons” renewing connections to a socio-religious-ecological order. After more than two centuries of colonial modernization and post-independence “development,” questions remain: What

now is included in the larger “cultural package” when a building is locally harvested, hand-wrought, and communally assembled?⁹

In his struggle to probe more deeply the “insoluble dualities” of the Dutch East Indies, Pont traveled the archipelago first from 1912 to 1915 and then more extensively as part of a Public Service Technical Inspection Tour from 1920 to 1923. Sent to enforce a ban on bamboo and thatch, Pont instead returned from his tour with a recipe for salt solutions capable of protecting bamboo from insects, and joinery techniques to reduce nesting. He pointed out that without bamboo, structures required the expertise of skilled carpenters.¹⁰ Previously, every child grew up learning to fashion buildings out of materials gathered from the surrounding forest. The first Europeans marveled at buildings being picked up and relocated,

houses built in “60 man-days,” and entire settlements of several hundred houses reestablished in three or four days after a disaster.¹¹ The larger impact of the bamboo ban was the need, for the first time, for cash to pay skilled carpenters and acquire scarce timber.

Just as the archeologists excavating the temples and canals of Cambodia and Thailand were eager to study Bali's still-living culture of the *subak*, Pont was fascinated by the ongoing practices of communitarian *sambatan* construction that was threatened by the prohibition on bamboo buildings. In the absence of dependably recorded histories prior to European contact, this kind of “ethno-archeological research” may help us draw historical connections that would otherwise escape notice.¹² The term *sambat* means to donate. *Sambatan* practices, where they can still be found, are not just a pragmatic strategy for housing affordability, like the English building societies, but lay at the heart of a vibrant gift economy.¹³ Each family unit renews social contracts and reaffirms power hierarchies according to the size, quantity, and elaborateness of building components they harvest,

fashion and install. Historian Anthony Reid draws on contemporaneous accounts to place the material properties of bamboo and thatch at the heart of a 15th to 19th century Southeast Asian social order in which every person was a builder.¹⁴ Prior to the displacements of the gift economy within villages by commodity trade, the ability to mobilize labor through tribute arrangements was the necessary precondition for accumulating and defending power and wealth.¹⁵ Far from being merely symbolic “spiritual weapons” against domination, Pont identified the practices of *gotong royong* (mutual self-help) found throughout his travels to be a powerful alternative political-economy embodied in the materials themselves. The impact of a ban on bamboo and thatch was a great acceleration of modernity driven by the dual imperatives of extractive capitalism and a missionary Enlightenment project.¹⁶ What if rather than having been driven to extinction, the socio-religious system of bamboo and thatch had, like the Hindu-Balinese *subak* water temple system, simply escaped notice beneath the tropes of colonial “modernisation,” and post-colonial “development”?



Figure 2: Wentworth Architecture and Bamboo U student Jonah He proudly displays a traditional “fish mouth” joint made with simple hand tools, Sibangkaja, Bali (Robert Cowherd CC BY-SA).



Figure 3: Temple of No, Cartagena, Colombia by Simón Vélez [Namagool7 CC BY-SA]

BAMBOO REVOLUTION?

In the 1970s, when Irish designer Linda Garland found herself on a small boat shuttling between islands, she demanded to see where its enormous bamboo pontoon had come from. Thus began her life-long obsession with bamboo's untapped potential. While the use of naturally occurring salts to protect bamboo probably predates the arrival of Europeans in the tropics, Garland's foundation worked with Dutch and German scientists who claimed to have "discovered" boric salt preservation methods.¹⁷ Ironically, Garland's team likely found itself promoting bamboo preservation to some of the same villages where the techniques were first shared with the Dutch technocrats some 60 years earlier.¹⁸ So thoroughly had the colonial campaigns against bamboo succeeded, that there was no one around to point out this connection. In the Balinese villages where Garland and her team worked, bamboo was for poor people in the far-flung "outer islands," not Bali. Despite Garland's foundational work of disseminating bamboo preservation and construction methods, the spark of "revolution"

did not catch. Instead, her bamboo housing work is overshadowed by celebratory displays in *Architectural Digest* and the celebrity of her client list, including David Bowie and Sir Richard Branson.

The socio-political implications of the bamboo revolution have been much closer to the surface in Latin America. In the 1980s, Colombian architect Simón Vélez pioneered a technique of injecting concrete into bamboo joints to quickly create lightweight, long-span structures in Colombia's coffee-growing region of Caldas, south of Medellín. Vélez has promoted the native guadua bamboo, the world's largest bamboo, as an alternative to colonial building cultures and materials of concrete and steel. Guadua bamboo, which grows up to a meter per day, can quickly reclaim lands ravaged by eucalyptus and other species brought from Europe in what he calls "botanical colonialism." After decades of development locally, his remarkable Zero Emissions Research and Initiatives (ZERI) Pavilion at Expo 2000 in Hannover, Germany brought the extraordinary aesthetic and technical potential of

bamboo structures to a global audience. When the pavilion was reconstructed back in Colombia, it was part of a larger demonstration showing how bamboo housing could outperform conventional approaches to rural housing.¹⁹ Like Garland, Vélez operated at both the cutting edge of flamboyant architecture in the increasingly global public eye, and in educating rural communities. His 2000 book, *Grow Your Own House*, was aimed to help the vast majority of rural Colombians house themselves better without crippling cash outlays.²⁰ Vélez came to a critical juncture when, as he flew to the Netherlands to accept the 2009 Principal Prince Claus Award for contributions to Culture and Development, Guadua was declared "endangered" in

If Colombia has begun to see bamboo structures built at both extremes of the very rich and the very poor, the brilliant design innovations of Linda Garland and those following in her footsteps continue to capture the imaginations of a global elite beyond the notice of the villages still participating in *sambatan* bamboo building cultures.²⁴ While Vietnam's Vo Trong Nghia Architects has produced some of the most revolutionary bamboo architecture of the "bamboo revolution," his concrete-and-steel-framed, low-cost house prototypes use little bamboo and spark no revolution.²⁵

Among those swept up in the ripples emanating from Garland's vision is her neighbor in Bali, world-

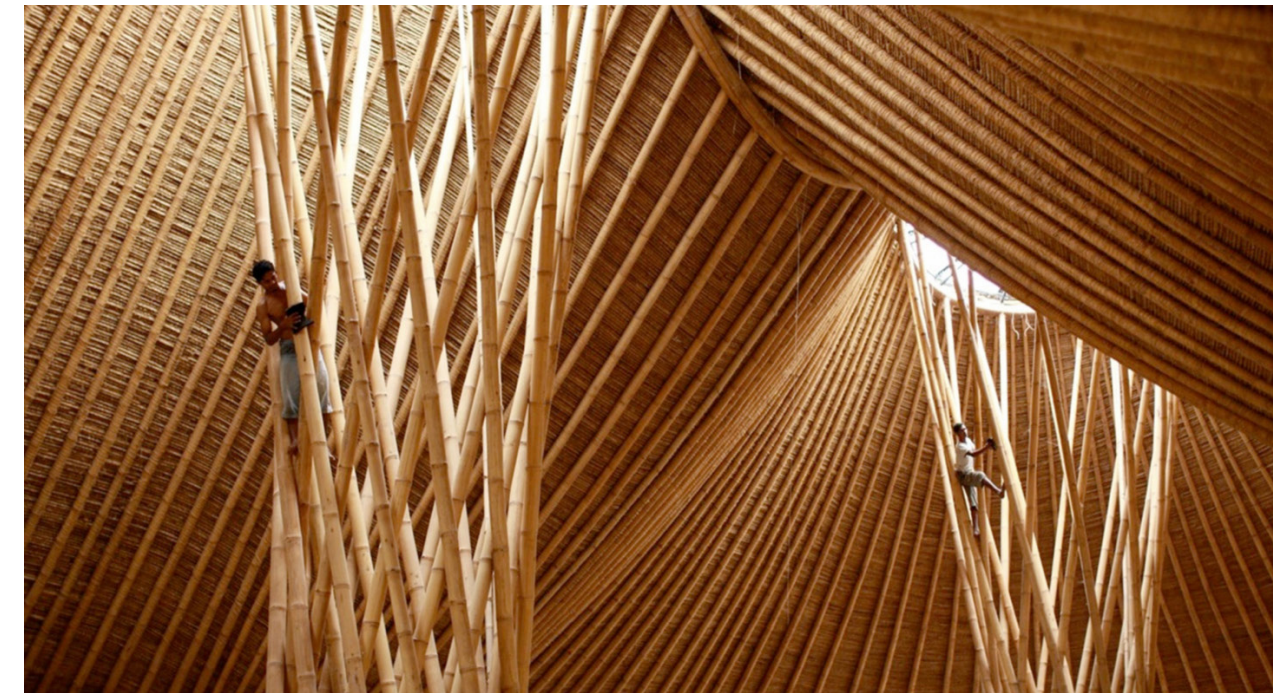


Figure 4: 2006 Three Mountains Hall, Bali by Jörg Stamm [©Ibuku] courtesy of Elora Hardy / Ibuku.

Colombia, ushering in a moratorium on the cutting of Guadua for construction or any other purpose.²¹ After the ceremony, upon hearing this news the Dutch President called to urge the Colombian Minister of Forestry to lift the moratorium and write bamboo into the Colombian building code.²² Since the 2010 passage of the first-ever structural code for bamboo, Colombia has led the world in bamboo construction. Ecuador, Peru, India and Bangladesh have recently passed their own codes.²³

renowned jewelry designer John Hardy. In 2006, as their daughters approached school age, Hardy and his wife Cynthia saw Al Gore's "An Inconvenient Truth." They sold their jewelry business and turned to the task of building their Green School. The first trained architect on site presented a model of rectangular boxes sitting predictably on leveled terraces cut out of the jungle. John responded by plucking the largest block labelled "Administration" from the center, rolling and twisting the plasticine into a coil, and suggested



Figure 5: Wentworth Architecture/Bamboo U course in the Heart of School, Sibangkaja, Bali by Jörg Stamm & John Hardy for the Green School (Vrajesh Patel CC BY-NC-SA).

that students, not administrators, belong at the “heart of the school.”²⁶ The tale has ever since been deployed as a symbolic architect’s-head-on-a-pike-warning to the overly credentialed, lest they bring industrial-era norms and conventions too close to the Green School gate—right-angles, flush toilets, enclosure. In their place, the Hardys assembled a team of master bamboo builders of Belaga and Bona villages, and a polyglot cast of creative souls like sculptor Aldo Landwehr and Simón Vélez’s master carpenter, Jörg Stamm. Inspired by the volcanic peaks of Bali visible only on cool mornings, Stamm picked up John Hardy’s clay coil—the challenge thrown at the feet of architecture—and adding a second spiral, he twisted them together into a model for a triple-vortex bamboo cathedral of learning without walls. Around this “Heart of School” the Hardys have since built more than 100 bamboo structures,

each more audacious than the last, challenging all who enter to map out new possibilities for education, architecture, and the planet. Although limited in reach by the costs associated with a selective international school, close to 20 percent of the students are on full scholarship, some 270 Balinese students are enrolled in the after-school program, and the model is being replicated in three other countries. The voluptuous curvilinear forms of the Green School rendered in bamboo and thatch provoke a serious rethinking of how to respond to the global climate emergency, sequestering both carbon and lingering toxins of the “Bilbao effect.”

Expanding out from the bamboo epicenter of the Green School, John’s daughter Elora Hardy left Donna Karan’s Manhattan fashion design studios to lead the design-build firm Ibuku. Her team has since handcrafted some 100 bamboo buildings across Bali and the world. Their artistic approach retraces the steps of William Morris and the English Arts and Crafts movement, at least in creating every stair tread, light switch, and shelving unit as a made-to-fit, one-of-a-kind work of art. Like Morris, any trace of latent communitarianism associated with human hands shaping the once humble bamboo pole is swept away by Ibuku’s business model targeting a luxury, “bespoke,” market. Ibuku’s target market is decidedly upscale, seeming to inherit her celebrity client list directly from Linda Garland. Each creation seems to be more breathtaking than the last. Her 2012 seven-story bamboo mansion and Ms. Hardy’s remarkable artistic journey have deservedly landed her as the focus of Episode 3, and the cover image of Apple TV+’s 2020 “Home” series. With a television in every *kampung*, and a smartphone in every pocket, what cultural resonances might vibrate through the bamboo groves of the archipelago?

Meanwhile, back in the village, Linda Garland’s son Arief Rabik has picked up the mantle of the Environmental Bamboo Foundation to design and implement an ambitious vision for “1000 Bamboo Villages.” He leads his audiences through a “bamboo yoga” routine as a mnemonic device to internalize the principles and numbers of the plan. Stretch up inhaling, visualize sequestering one of the 40 billion tons of human-produced carbon dioxide each year. Bend forward exhaling, visualize each clump of



Figure 6: The design process moves from hand sketch to bamboo model to construction (©Ibuku) courtesy of Elora Hardy / Ibuku.

bamboo holding 5,000 liters of water to sustain the surrounding forest over the increasingly unpredictable periods of drought.²⁷ The kinesthetic stimulation is Rabik’s admission that, conditioned by constant meetings with governors and their technocrats, his numbers tend to, well, numb. To increase the carbon sequestration of bamboo to more than two percent of global annual output, these numbers are all big. Once again, the “techno-fiber” outperforms all competition: softer, stronger, more odor-resistant than any cotton or silk; less land, pesticide and water-intensive than wood for pulp and paper; and the biggest potential, Laminated Bamboo Lumber (LBL) that outperforms wood equivalents on structural consistency, cost, and environmental justice. As a bonus, the byproducts of each process convert well to liquid or gaseous bio-energy.²⁸ The ambitious scale of Rabik’s vision would seem to be a requirement to break the chicken-egg

impasse where investors in each of these sectors are reluctant to commit until a dependable supply can be demonstrated.

What is to prevent this huge mobilization of bamboo out of the villages and into markets from replicating the human and ecological carnage of the plantation system? Rabik points to three factors. First, bamboo thrives in mixed forests interspersed with medium-depth and deep rooted species, not mono-cropped plantations. Second, bamboo is labor intensive and makes sense only with value-added processing optimized at the scale of around 2000 hectares, a small cluster of *dusun* or *banjar* village units. Third, the Bamboo Village app brings Forest Stewardship Council accountability from clump to consumer.²⁹



Figure 7: The construction is executed by scaling directly from the 1:50 model in the field (©Ibuku) courtesy of Elora Hardy / Ibuku.

Beyond Rabik's pitch in the idiom of the technocrat/investor class, the actual engagements on the ground in 30 or so established bamboo villages and the hundred more in progress suggest a refreshingly humble approach. In place of the two-week-in-a-hotel-crash-course, the eight-month "Field School" immerses Rabik's team in one village at a time. It takes several months of listening, social mapping, and inevitably failing repeatedly before earning the trust of the community.³⁰ It is an approach informed by the ruins of history, which in Indonesia is littered with the remains of well-intended efforts like the 1900s hygiene campaign against bamboo, the 1980s rice famine triggered by the Green Revolution's engineered rice, and the 2000s deforestation driven by palm oil subsidies. Rabik's experiences in reclaiming these deforested lands suggest that the longer ethno-archeological perspective reveals the continuation of a

centuries-old struggle. Even before direct contact with European colonialism and its continuation as extractive capitalism, the wealth of Southeast Asian forests inextricably entangled these communities with the luxury markets of the Mediterranean world.³¹ Rather than playing into modernity's trope of rupture, empathy and humility appear to be prerequisite attitudes in the Anthropocene. What had been rendered invisible by the attitudes of history are suddenly made plain in an ongoing dance between rupture and continuity played out village-by-village, one generation after another, between collectivized practices and its displacement by individual commercial ventures.

Asked if the economy and performance of bamboo for building might finally overcome its deeply embedded stigmas, Rabik plants his feet firmly back in the numbers:



Figure 8: 2012 Sharma Springs, Green Village, Abiansemal, Bali by Elora Hardy / Ibuku (Thomas Darr CC BY-SA)

With 430,000 poles per year coming out of each village, they can certainly spare 250 poles for a six by nine meter house. They don't want to live in what they have seen, but if they see a model house they can see a new possibility.³²

With so much visibility in recent years, bamboo would appear to at last be ready for its close-up. If it is indeed to be a bamboo revolution, what kind? Much depends on whether designers are able to excavate the deeper roots of what might otherwise be merely symbolic, or superficially aesthetic, to resurface otherwise forgotten practices tying our fates together with that of the planet. ■

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