



Three stories under the same hut: Market preferences and forest governance drive the evolution of tourism construction materials



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ABSTRACT

Forest resource extraction evolves with commodification and shifts in product use and demand. Tourism is a major economic sector that represents approximately 10% of the global GDP and has the potential to drive major changes in forest activities. In the last three decades the boom of coastal tourism created new markets for the emergent community forestry sector in Quintana Roo (SE Mexico). Employing ethnobotanical and archival research methods we analyzed the evolution of management and use of three distinct forest products used in tourism architecture: polewood, thatching materials and chicozapote tree (*Manilkara zapota*) posts. Current models explain processes of forest product substitution and management intensification either in terms of economic efficiency and resource depletion, or power differences. Our results suggest the need to expand our understanding of extractive cycles to explicitly incorporate multi-scale governance, shifting values, and external shocks (i.e., hurricanes) as major drivers of change of forest products.

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1. Introduction

Forest resource commodification modifies both plant populations and the livelihoods of those who manage them (Ruiz-Pérez et al., 2004; Zenteno et al., 2014). Variation in demand, often induced by commodification, can change specific management practices and resource management systems, and transform landscapes (Forero and Redclift, 2006; Koh and Wilcove, 2008; Rico García-Amado et al., 2013). Homma (1992) proposed an influential model of forest resource extraction dynamics which predicts that increased demand leads to either resource depletion or management intensification, usually through cultivation (e.g. Arnold and Pérez, 2001; Belcher et al., 2005; Shanley et al., 2015). Subsequent research highlighted alternative pathways of resource extraction, including expansion of harvest into new areas, sustained harvests of abundant and resilient resources, and shifts towards less valuable species (Belcher and Schreckenberg, 2007; Homma, 2012; Shackleton et al., 2015). While much research has addressed market growth, collapse and contraction of markets also cause

dramatic changes in forest resource management. Demand collapse is often associated with product substitution or changes in supply. While for luxury products, harvests often decline when fashionable trends fade and markets vanish (Belcher and Schreckenberg, 2007). Studies in political ecology and environmental history focus on power and conflict as drivers of resource management change (Dove, 1995). Advances in common pool resource research coupled with large scale devolution of forest rights placed governance in the spotlight of forest sustainability, adding new dimensions to forest management change analyses (e.g. Poteete and Ostrom, 2004). Comprehensive longitudinal studies, such as ours, that scrutinize the drivers and impacts of change of forest resource use and management at regional scales are scarce (but see Lemenih et al., 2014; Rico García-Amado et al., 2013) and highly needed (Shanley et al., 2015) to both inform resource management and policy and provide empirical evidence to develop more robust social-environmental theory.

Travel and tourism make up approximately 10% of global GDP, and for some nations this figure can be higher than 50% (WTTC, 2016). Nonetheless, tourism linkages with forests remain mostly unstudied (Agrawal et al., 2013). The state of Quintana Roo contains the largest area of managed tropical forests in Mexico and boasts the most important tourism destination in Latin America—The Maya Riviera. In this paper we examine the evolution of forest products used as construction materials in coastal tourism architecture in this Caribbean coastal state. We focus on three forest products – polewood, thatching materials, and

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large diameter zapote (*Manilkara zapota*) posts – which are harvested extensively to build huts that create a sense of tropical paradise in the region's booming vacation hubs.

Here, thatched huts are pervasive elements of the tourism experience where nature and Mayan culture are “aesthetized” and appropriated for tourism consumption (Córdoba-Azcárate et al., 2014), and increasingly also used for crafting new urban identities (Manuel-Navarrete et al., 2011; Quiroz-Rothe, 2006). Our focus on construction materials utilized in tourism architecture allows us to compare the evolution of biologically contrasting forest products that are utilized as an ensemble in the same structure (“under the same hut”) by developers for tourist consumption. We highlight this group of products to actively explore changes and feedbacks related to markets, governance, and community-based forest management. We also discuss the implications of these processes for forest management sustainability and our understanding of extractive cycles. Our analysis spans approximately 40 years, focusing on five guiding questions: 1) What is the role of tourism in the emergence and evolution of tropical forest products? 2) What factors influence demand increases? 3) How have local and national institutions evolved to govern the management of forest products demanded by the tourism industry? 4) How has use of rustic construction materials influenced landscape management? And, 5) What factors of change and innovation can be identified?

1.1. Study site and resource use

Quintana Roo encompasses 42,361 km² of the eastern portion of the Yucatan Peninsula of Mexico (INEGI, 2011). This region stands out for its extensive tropical forests, Mayan heritage, and white sand Caribbean coastline. Quintana Roo is the top Mexican state in tropical timber harvested from natural forests and its coasts are the largest tourist destination in Latin America, receiving > 10 million visitors annually (Ellis et al., 2014; STEQR, 2015).

The climate is hot and subhumid, with a mean annual temperature of 26.4 °C and mean annual precipitation of 1312 mm (INEGI, 2011). The forests lie between dry and moist life-zones (Ibarra-Manríquez et al., 2002), and support about 100 tree species ha⁻¹ (Snook et al., 2003). Timber harvest rights were granted to communities in the form of *ejidos* (we use both terms interchangeably in this manuscript) in the early 1980s after decades of logging by private and parastatal concessions. Historically, commercial forest management focused on harvesting high value timber (e.g. mahogany, *Swietenia macrophylla*) and *chicle* tapping to extract the resin of the sapodilla tree (*M. zapota*, locally known as zapote) for chewing gum (Ellis et al., 2014). From the 1950s to the mid-1990s, communities with limited volumes of precious timber harvested diverse hardwood species to supply a national demand for railroad ties (Shoch, 1999). Throughout, these same landscapes have been managed for subsistence use, consisting of shifting cultivation for maize production and harvests of medicinal plants, bush meat, honey, and construction materials. These commercial and subsistence uses resulted in mosaics of forests of different successional stages and management histories (Ellis et al., 2014). Communities with approved Forest Management Plans (FMP) are zoned into three major management areas: 1) urban areas where houses and urban infrastructure are concentrated; 2) agricultural areas where mostly swidden agriculture is practiced, although some permanent agriculture and cattle ranching also occur; and 3) permanent forest areas which are commonly divided into legally recognized production forests and often include conservation areas. Legally, all commercial forest products including timber, polewood, and non-timber forest products (NTFPs) are only harvested from production forests. As of 2013, in Quintana Roo, more than 50 communities had active FMPs (Ellis et al., 2015). Required by law, communities typically contract government-accredited forest technicians, but are responsible for applying the FMP with the advice of their technical service providers. Community members have variable participation in forest management planning and execution. For example, timber

extraction may be conducted either by local crews or by external contractors (usually timber buyers), while land zoning, forest inventories, reforestation, fire management and NTFP harvests are usually executed by community members with approval of the *ejido* assembly.

Mayan people have occupied the study region for at least the last 3000 years (Coe, 2011), and in spite of massive recent immigration from other regions of Mexico and abroad, 16.7% of Quintana Roo's population are native Mayan speakers (INEGI, 2011). A strong tradition of Mayan architecture still persists, particularly in rural Mayan communities where up to 90% of the houses are at least partially built with forest-based materials (Racelis, 2009). Vernacular Mayan architecture in the Yucatan has been extensively described (e.g. Baños Ramírez, 2009; Villers Ruiz et al., 1981; Wauchope, 1938), with polewood and thatching as the two most important forest-based materials used in construction. The core of this single-family house, is a multifunctional room about 9 m long, by 4.5 m wide and 4.5 m tall (Baños Ramírez, 2009; Villers Ruiz et al., 1981), and its layout is either apsidal or rectangular with flattened corners (Wauchope, 1938). Polewood (*palizada* in Spanish) is the generic name for small diameter stems used for structural purposes. While trunks of trees are most commonly used, stems of arborescent palms are used in some locales (e.g. Calvo-Irabién and Soberanis, 2008). In vernacular Mayan architecture, polewood is classified into approximately twenty structural categories, including all framing components from posts (ca. 17 cm in diameter) at ground level up to the thatching supports in the roof (Villers Ruiz et al., 1981). Traditional thatching is dominated by fan-like palm leaves, mostly from the genus *Sabal*, while in coastal communities, *Thrinax radiata* and *Coccothrinax readii* are common. In contrast, grasses are considered of low quality and traditionally only used where thatching palms are scarce (Bolles, 2008). Nonetheless, their use in commercial settings has risen steeply and merits examination (Caballero et al., 2004). For commercial timber management, roundwood is now legally subdivided in two categories that are regulated and accounted for separately (Racelis and Barsimantov, 2008). Polewood falls into the first category, which includes small diameter trees (<35 cm). A second category includes large diameter trees (≥35 cm) that are either processed as sawtimber or utilized as posts in large dimension structures. Recently *M. zapota*, locally known as zapote or chicozapote, has become one of the most important timber species in Quintana Roo (Ellis et al., 2015), but is also often used for large (≥35 cm in diameter) posts.

The massive scale of tourism in the state is largely a result of planned development. Cancun, now a city of > 700,000 inhabitants, was created from the ground up as a state-led tourism development in the early 1970s to be an elite “sea, sun and sand” destination. The “brand” Riviera Maya was launched in 1996 by a consortium of hotel owners as the official marketing name for beach areas south of Cancun, with Playa del Carmen as its hub (Manuel-Navarrete et al., 2011). While tourism was underway in the latter prior to 1996, the Riviera Maya campaign successfully attracted unprecedented investments and visitors. In this period, Playa del Carmen grew from 17,621 inhabitants to 149,923 by 2010 (INEGI, 2015). In contrast, tourism development in other regional destinations such as Tulum, has been characterized as “spontaneous”, meaning that tourist amenities arose in existing villages through smaller scale projects often labeled as ecological, natural or alternative (Manuel-Navarrete et al., 2011).

2. Methods

Collection of primary data and compilation of existing information was concentrated in a 14-month period from June to August 2012 and from November 2013 to October 2014. Our dataset is composed of six major sources from diverse parts of the state (Fig. 1): 1) Semi-structured interviews (108) with key informants, including building contractors from five urban areas (Playa del Carmen, Cancun, Tulum, Mahahual, and the state capital of Chetumal); intermediaries; forest technical service providers based in the municipalities of Felipe Carrillo Puerto,

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