

DEVELOPMENT POLICIES AND TROPICAL DEFORESTATION IN THE SOUTHERN YUCATÁN PENINSULA: CENTRALIZED AND DECENTRALIZED APPROACHES

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Received 30 July 2002; Revised 15 April 2003; Accepted 15 July 2003

ABSTRACT

It is well established that for multiple biophysical contexts there are legacies of past government policies in present land conditions. Despite this recognition, however, investigation of ongoing tropical deforestation dynamics often de-emphasizes the past. The case of the southern Yucatán peninsula demonstrates the need for historical analysis in identifying key drivers of deforestation. The most important land-use changes in the region over the past 100 years are connected to shifts in national development policies. These shifts represent tensions between centralized and decentralized approaches to land management—as represented by the policies of Presidents Díaz (1876–1910) and Cárdenas (1934–40)—that persisted throughout the 20th century. The legacies of these reoccurring development strategies include depleted hardwood reserves, large areas of permanently cleared forest, a complicated system of land allocation, and long-standing tensions between economic, social welfare, and environmental conservation goals. These findings suggest that while centralized and decentralized approaches to development *both* focus on natural resource exploitation, the rates of deforestation tend to be faster, the patterns of forest clearing more pronounced, and land-use decision making less democratic under systems of centralized control. These conclusions hold implications for land-use decision making today. Copyright © 2003 John Wiley & Sons, Ltd.

KEY WORDS: tropical deforestation; environmental policy; sustainable development; decentralization; land use; environmental history; Mexico

DEFORESTATION AND DEVELOPMENT

Understanding the dynamics of tropical deforestation is a key focal point in global change and development studies. As a biome, tropical forests are incurring rapid change at this time (FAO, 2001; Achard *et al.*, 2002), with deforestation linked to many potential adverse effects on both social and ecological systems (Brown, 1993; Brown and Pearce, 1994; Downing, 1996; IGBP-IHDP, 1999; Houghton *et al.*, 2000; Place, 2001; Wood and Porro, 2002). Deforestation in Mexico is indicative of this worldwide trend; between 1970 and 1990, four-fifths of its tropical and temperate forests were transformed (Sonnefeld, 1992), and the FAO (2001) reports a nationwide 1.08 per cent yr^{-1} deforestation rate for 1990–2000. Among those areas undergoing the most dramatic forest change are its southern tropical forests (World Bank, 1995; Challenger, 1998; O'Brien, 1998). For example, the southern Yucatán peninsula—the focus of the research presented here—is identified as a 'hot spot' of tropical deforestation in multiple studies (Achard *et al.*, 1998; Cortina Villar *et al.*, 1999; Cincotta and Enelman, 2000; Turner *et al.*, 2001).

Analysis of historical land-change dynamics in the southern Yucatán peninsula connects directly to three important themes in environment and development research: the identification of the web of driving forces surrounding tropical deforestation (Vandermeer and Perfecto, 1995; IGBP-IHDP, 1999; Geist and Lambin, 2002);

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Contract/grant sponsor: NASA; contract/grant number: NAG 56406.

Contract/grant sponsor: CIS-CMU; contract/grant number: NSF-SBR 95-21914.

the use of environmental history to understand modern environmental issues and land management (Batterbury and Bebbington, 1999; Klepeis and Turner, 2001; Foster, 2002); and the exploration of the impacts of centralized vs decentralized land-use decision making, and the implications for sustainability (Shiva, 1993; Bebbington, 1996; Rubin, 1997; Haenn, 2002; Ribot, 2002).¹ Much of the research on land-use decision making and tropical deforestation dynamics explores the dichotomy between societal structures and centralized control of natural resources vs the role of local agency and decentralized control (alternatively referred to as forces of globalization, on the one hand, and localized development, on the other) (e.g., see Rappaport, 1971; Hecht, 1985; Peluso, 1992; Schmink and Wood, 1992; Coomes and Barham, 1997; Geoghegan *et al.*, 2001; Wood and Porro, 2002). Issues of structure-agency and extra-local vs local control of land resources are central to the story of land change in the southern Yucatán peninsula—including the linkage of specific development policies to distinct land impacts.

It is well established that for multiple biophysical contexts there are legacies of past government policies in present land conditions. Despite this recognition, however, investigation of ongoing tropical deforestation often de-emphasizes the past. The case of the southern Yucatán peninsula demonstrates the need for historical analysis in identifying key drivers of deforestation. In particular, centralized and decentralized approaches to development—as represented by the policies of Presidents Díaz (1876–1910) and Cárdenas (1934–40)—begin in the late 19th century and continue to occur up to the present, with key policy shifts corresponding to the most important land-use changes in the region over the past 100 years. These shifts represent tensions between centralized and decentralized approaches to land management that persisted throughout the 20th century. The legacies of these reoccurring development strategies include depleted hardwood reserves, large areas of permanently cleared forest, a complicated system of land allocation, and long-standing tensions between economic, social welfare, and environmental conservation goals. These legacies influence land-use decision making today and hold implications for the sustainability of future land uses.

Towards exposing the imprints of federal development policies on human-environment conditions in the southern Yucatán peninsula the research presented here draws primarily on field work and archival research undertaken in southeastern Mexico and Mexico City in 1997 and 1998 as part of the SYPR project.² A number of excellent historical analyses of the transformation of Mexico's tropical forests underpin the analysis, as well (e.g., De Vos, 1988; Szekely and Restrepo, 1988; Ponce de Jiménez, 1990; Konrad, 1991; Challenger, 1998; O'Brien, 1998; Primack *et al.*, 1998; Turner *et al.*, nd).

First, the structure-agency debate in tropical deforestation studies is reviewed, which reflects the broader debate in sustainability science between a perceived need for balance between centralized and local control of natural resources (e.g., see Bebbington, 1996; Ribot, 2002). Second, a historical overview of land-use change in the study region is presented.³ A relatively detailed description of the historical periods in which the policies of Presidents Díaz and Cárdenas were implemented follows (covering the late-19th century to around 1940). Next, the key policy shifts in the 20th century are reviewed in rough chronological order. These changes are understood to be the manifestations of tensions between the Díaz and Cárdenas models of development: top-down or centralized (national) vs bottom-up or decentralized (local) control of natural resources, and commercial interests vs concerns for social welfare. Beginning in the Cárdenas period, but more prominent in recent years, a third tension pits a desire to bolster short-term economic growth based on systematic resource exploitation against efforts to engage in more 'sound' resource management over the long term.

The last two sections review the environmental and social legacies of the policy shifts and their implications for issues of sustainability. Two themes, in particular, stand out. First, while policies founded on both centralized and

¹As reviewed by Parris (2003: 13) the concept of sustainable development 'has broad appeal and little specificity, but some combination of development, equity, and environment is found in most attempts to describe it.' It generally connotes the idea that society may be able to use natural resources in a way that supports indefinitely high standards of living for people now and in the future; it assumes that the goals of economic growth, improving social welfare, and maintaining or improving environmental conditions may all be met simultaneously (WCED, 1987).

²The southern Yucatán peninsular region (SYPR) project is described in the acknowledgements.

³A detailed description of the policy changes affecting land use in the region over the past 100 years is found in Klepeis (nd), Klepeis (2000), and Klepeis and Roy Chowdhury (nd).

decentralized approaches to development *both* focus on natural resource exploitation, the rates of deforestation tend to be faster, the patterns of forest clearing more pronounced, and land-use decision making less democratic under systems of centralized control. Second, a lack of consistency in development rationales may be part of the reason why ongoing attempts to both stem rates of deforestation and foster sustainable development—that is, to promote agricultural intensification and tourism while conserving tropical forest—have had mixed results. Given the similarity between the rationales policy makers have towards development today with those held in the past, even in the face of new views of the environment that endorse conservation of nature, the degree to which forest cover will be maintained in the future is uncertain.

THE STRUCTURE–AGENCY DEBATE IN DEFORESTATION STUDIES

Recognizing the array of explanations for environmental change in the literature, those relevant to tropical deforestation can be clustered minimally into two broad kinds, with recent attempts to merge them. In the first, tropical deforestation is embedded within political, economic, and social structures that differentially empower certain economic agents (e.g., corporations) ‘to mine’ tropical forests with little responsibility for the social and ecological consequences, and disempower others, usually those impoverished and non-western groups whose livelihoods depend on the forest (e.g., see Peluso, 1992). This first form of explanation tends to fail to devolve deforestation beyond the policy, institution, or power in question as if the mere presence of the same structure axiomatically translates into similar rates and magnitudes of deforestation; this despite the virtual absence of empirical evidence that common structures lead to common outcomes. The second form of explanation blames tropical deforestation and forest degradation largely on the immediate agents of change, usually local land managers (Myers and Simon, 1994). Commonly, it is concluded that local or regional population growth produces too much pressure on local human–environment conditions, promoting the path of least of resistance—to expand into the forest frontier and cut (e.g., Rudel and Roper, 1996). Alternatively, local users may be seen as ‘locked in’ to a conservative worldview that is resistant to change. As the human–environment conditions change, the management responses are too slow in adjusting or the extant management practice is intensified without the appropriate adjustments, resulting in deforestation and degradation (Laney, 1999).

To some degree, these different explanations reflect the various human–environment conditions triggering tropical deforestation around the world. But they also are related to scalar dynamics—the spatial, temporal, and hierarchical scale of the problem definition. Focusing on the local-scale, and not following the chain of linkages away from it, tends to reveal the role of local land managers and population change; focusing on global capital, in turn, identifies the role of international markets and government policy. In most instances, however, the many drivers of change, from the most distal to the most proximate, work together to create deforestation (see Coomes and Barham, 1997; Geist and Lambin, 2002), and teasing out which driver or cause is *the* triggering event—if one such driver stands out in importance at all—necessitates careful analysis that invariably requires a historical component (Hecht, 1985; Leach and Mearns, 1996; Batturbury and Bebbington, 1999; Klepeis and Turner, 2001).

Comprehensive analysis of all of the possible triggering events causing tropical deforestation is difficult and requires both multidisciplinary investigation and a mix of qualitative and quantitative methodologies (IGBP-IHDP, 1999; Place, 2001; Turner *et al.*, nd). An important subset of this vast literature investigates those events that manifest themselves as external shocks to the regional land-use system. Government settlement programs, shifts in demand for extractive commodities, and the rise in international conservationism, for example, are factors that influence how local land managers use the land but that originate outside of the region (Hecht, 1985; Browder, 1992; Peluso, 1992; Utting, 1993; Coomes, 1995; Klepeis, 2000; Brockett and Godfried, 2002). The analysis presented here identifies the trends and precipitating events of land-use change caused by such shocks, and shows how extra-regional structural forces manipulate regional land-use systems—research that attempts to link ‘structural’ and ‘local agency’ forms of explanation for tropical deforestation.

A fundamental premise underpins the analysis: while all external shocks, such as market shifts, are not necessarily in the control of government officials, the rationales of development—implemented via government policies—initiate, direct, or mediate the underlying causes of tropical deforestation. The case of the southern

Yucatán peninsula shows that over the past 100 years the key land changes are linked to outside influences, the most important of which are federal policies (Klepeis, nd). In other words, shifting development rationales and associated policies are the primary causes of the most dramatic periods of deforestation.

Identifying societal structures and development approaches as the most important factors leading to tropical deforestation, however, does not rule out intra-regional factors. Local land managers and biophysical conditions are also responsible for land change, apart from that fostered by external influences. Research on the decision-making processes of local land managers in the study region identifies numerous important factors, such as elevation, slope, plot size, distance to road and market, population pressures, off-farm income, and education levels (Geoghegan *et al.*, 2001). Access to credit and social capital, including past experience, also affects decisions (Cortina *et al.*, 1999; Klepeis and Vance, 2003; Keys, nd). For example, Vance (2000) suggests how these variables affect choice by demonstrating that the majority of the land managers in the region are quasi-subsistence/market producers, making decisions predicated on both commodity prices and household size.

Microeconomic and local biophysical factors are therefore key variables affecting deforestation over the short term, but the overarching trends in past and ongoing forest management—as analyzed over a broader time scale—reflect the role of federal development initiatives. In the case of southeastern Mexico these policy trends reflect tensions between the development rationales established by President Porfirio Díaz in the late-19th century and President Lázaro Cárdenas in the 1930s. Policies embedded in these same rationales, based on similar approaches, occur and reoccur throughout the 20th century. They continue to manifest themselves today in hybrid policy strategies that seem to ignore lessons gleaned from the failure of past initiatives. In short, the development initiatives of today represent a recycling of earlier development strategies and ideas about how to best manage nature that emphasize outside control and influence on the one hand (Díaz) and local-actor ingenuity on the other (Cárdenas).

LAND-USE CHANGE IN THE SOUTHERN YUCATÁN PENINSULAR REGION

Located in the southern portions of the Mexican states of Campeche and Quintana Roo and spanning approximately 22 000 km², the southern Yucatán peninsular region—defined by the SYPR project—is dominated by a semideciduous or seasonal (wet-dry) tropical forest that connects with that of the Petén (Guatemala) and Chiapas (Mexico) to form the largest remaining expanse of tropical forest left in Central America (Figure 1). But it is not pristine and in most cases is not even ‘old’, extractive industries having exploited significantly select species. Indeed, the region has undergone one and one half ‘long waves’ of boom-bust occupational and use history (Whitmore *et al.*, 1990; Whitmore and Turner, 2001; Turner *et al.*, nd). The first full wave took place long before the Columbian encounter; the second ‘boom’ period began slowly, some 120 years ago.

The ancient Maya peoples entered the region as early as 3000 BC. They evolved into one of the world’s most important civilizations, and the southern Yucatán peninsula formed a portion of their Classic Period heartland (Thompson, 1966; Thomas, 1981; Ford, 1982; Lowe, 1985; Pohl, 1985; Fletcher and Gann, 1992). The landscape was largely denuded of trees to support the lowland civilization, including such city-states as Becan, Calakmul, and Río Bec, and regional population densities exceeded 100 people km⁻² (Turner, 1990). The density of Maya occupation is apparent to the casual observer even today in the huge number of ruins, house mounds, temples, and water control features, such as *aguadas* (shallow depressions, largely human-made, collecting rainfall and runoff), that are scattered densely across the region. The enormous size of the Maya occupation required varied and large areas of cultivation, including terracing, alterations of wetlands for cultivation, orchard-gardens, and rotational/fallow systems such as *swidden* (slash-and-burn) (Turner, 1993). The relics of these systems are replete throughout the region today, especially stone walls and terraces attesting to the scale of past deforestation.

Sometime between AD 800–1000, however, the Classic Maya civilization collapsed for reasons in debate, but likely including human-induced, environmental stress and, perhaps, climate change (Haug *et al.*, 2003; Turner *et al.*, nd). Regardless, the southern Yucatán peninsula was abandoned and remained sparsely occupied for the next 900 to 1000 years. During the early colonial period, the region was used primarily as refuge for the northern and coastal Maya fleeing the reach of both the Spaniards and, later, the Mexicans during the Caste War in the 19th century (Jones, 1989; Turner, 1990). The forests regenerated, but with telltale signs of anthropogenic disturbance.



Figure 1. Location of the southern Yucatán peninsular region.

Maya agroforestry and orchard-garden practices built up an unusual abundance of economically useful species that are found today (Lundell, 1934) and abundant monumental architecture (ruins) were taken over by species with affinities for exposed limestone (Lambert and Arnason, 1978; Lambert and Arnason, 1983), especially ramón (*Brosimum alicastrum* Sw).

The first cycle of human occupation and land use shaped the structure of the forests subsequently encountered by the Spaniards. A second boom of use (or mini-boom compared to Maya impacts) began slowly in the late-19th century and marks the recent land history that sets much of the options for current and future uses of the region.

Extraction industries in search of logwood (*Haematoxylon campechianum* L.), chicle (a resin extracted from the chicozapote tree—*Manilkara zapota* L. Van Royen, formally *Achras zapota* L.—and used as a base for chewing gum), and tropical hardwoods began in earnest in the region in the late-1800s. As forestry declined gradually in importance, the devastating hurricane Janet hit the region in 1955, revealing the isolation of the region as well as that of Chetumal, the territorial capital of Quintana Roo, lying to the east (Figure 1). Coinciding with federal aims to populate Quintana Roo sufficiently to make it a state, the first paved road between Escárcega (on the main highway from Mexico City to Mérida) and Chetumal was completed by 1974 and cut across the base of the peninsula west to east. The highway opened the southern Yucatán peninsular region directly to the rest of Mexico and rapid development.

Migrants seeking land grants followed quickly. The population of the region climbed dramatically from 2174 persons in 1960 to some 40 000 persons by 2000. Fueled by the Mexican oil boom, various cattle and rice schemes were undertaken during the 1970s and early-1980s, triggering large-scale deforestation. These schemes collapsed with the subsequent international oil glut, to be followed by a new scheme, one that portends to have important forest impacts. It began in 1989 with the creation of the Calakmul Biosphere Reserve, encompassing over 7000 km² in the center of the region. It has been sustained since 1993 by El Mundo Maya (The Maya World), a program that seeks to make the study region part of one of the largest ecological/archeological-tourism schemes in the world. El Mundo Maya, however, requires roads and other investment in infrastructure and services that potentially may pull more land users into the region.

The southern Yucatán peninsular region is therefore a microcosm of tropical deforestation problems worldwide. Various forces seek to protect the region's forests, while others seek to enhance its economic utility. Combined, these forces, many of which originated or were manipulated by development policies, lead to certain pathways and patterns of deforestation.

THE DÍAZ AND CÁRDENAS DEVELOPMENT MODELS (LATE-1800s–1940)

The modern land history of the southern Yucatán peninsular region begins in the late-19th century, despite little human impact on the landscape until the 1930s (Klepeis, nd). To uncover the driving forces that led to the exploitation of the region's forests, however, analysis of the policies and processes linked to forest conversion that occurred under Porfirio Díaz (the president of Mexico between 1876 and 1910) are vital.⁴

The export of primary products, dominated by metals but including forest resources, drove economic growth in the Díaz era. Díaz held that Mexico was rich in natural resources and that they were to be exploited to the utmost to foster industrialization and development.⁵ To this end, the development process depended on capital-intensive technology and international managerial expertise, given the lack of domestic sources for both (Garner, 2001: 184). In addition, *terrenos baldíos* (unoccupied or vacant lands) were quickly surveyed, land grants awarded, and colonization schemes enacted, all towards serving national economic development goals and opening up these 'unexploited' areas to productive use (Garner, 2001: 187).

The forests of southeastern Mexico, replete with hardwoods and chicle, were one of many targeted areas (Konrad, 1991). In addition to fostering industrialization, Díaz wished to establish a firm border with British Honduras (now Belize) and to set up entrepreneurial relationships with the English, who had a long presence in the area and who had been logging Mexican forests illegally for decades (Chenaut, 1989; Galletti, 1994; Macías Zapata, 1996). And he sought to pacify rebel Maya, groups of which had been causing political instability in the region since the Caste War of the mid-19th century, and thereby stabilize the frontier region for settlement (Macías Zapata, 1996; Reed, 2001).

⁴The impact of humans on biophysical conditions of the southern Yucatán peninsula during the 20th century is described in detail in Turner, Geoghegan, and Foster (nd).

⁵As discussed in great depth in Sachs (1992), the concept of development is a complicated one, with many different meanings and definitions. As used here, development refers to the degree to which people's material conditions and access to social services and other resources improve. In the context of the southern Yucatán peninsular region, for example, development refers to improved transportation systems, access to healthcare, electricity, and markets, and the development of a healthy and diversified regional economy.

Díaz moved quickly to establish the legal right for companies to operate in the isolated, southeastern corner of Mexico. In 1894, he enacted legislation, *Las Leyes de Deslinde y Colonización* (The Laws of Delimitation and Colonization), opening the *bosques* (forests), *terrenos baldíos*, and *terrenos nacionales* (national lands) to exploitation. This law encouraged surveyors to enter and explore the forests of the southern Yucatán peninsular region. In one case, a surveyor was awarded a large land grant in partial reward for his work. Subsequently, the surveyor sold his land to a US businessman who founded the Pennsylvania Land and Lumber Company.

Forest concessionaires had usufruct rights to exploit the forests. While the first forest concessions on the Quintana Roo side of the study region were given to the elite of the state of Yucatán—who became rich off of the henequen (*Agave sisalana* Perrine) boom, lasting from the mid-1800s to 1910, after which a bust occurred precipitously—and Mexico City, the logging operations in the Yucatán peninsula proved to be extremely capital intensive. This required the Mexican financiers to underwrite the forestry operations with profits from their henequen operations in northern Yucatán or to seek foreign investment (Konrad, 1991).

The 1894 law opened the floodgates of national and international investment in the forests of the southern Yucatán peninsula. Willing to try almost anything to attract the capital necessary to colonize and develop Quintana Roo, at that point one of the most isolated places in Mexico, Díaz created a free trade zone in 1901, which lasted until 1912 (Villalobos Gonzalez, 1993).⁶ The result of Díaz's policies was that the sparsely occupied frontier forests of southeastern Mexico were opened to systematic exploitation by mostly foreign run extractive industries. In essence, Díaz created forest *latifundios* (a term traditionally used to refer to *haciendas*, or plantations, with large land holdings and that focus on agriculture or ranching) by awarding huge concessions to Mexican and foreign elite (Klooster, 2003). Between 1902 and 1905, for example, 11 concessions covered 3 456 857 ha in Quintana Roo with English companies financing those that were most active (Ponce Jiménez, 1990). And around 10 men controlled concessions in Quintana Roo between 1915 and 1930, almost all with either direct or indirect ties to US companies (Ponce Jiménez, 1990).

A presidential decree in 1909 established that forests were Mexico's national reserves and would not be sold. To avoid financial ruin, many of the Mexican concessionaires rented their concessions to foreign interests. By 1912, Díaz canceled the concessions to those companies that were not working the forests directly and, instead, transferred them to US and English companies. The rent from the foreign companies was then collected on behalf of the federal government. Disruption in the lucrative henequen trade led to many concessions passing into the hands of foreign companies (Villalobos González, 1993). For example, in 1911 the following transfers of Mexican concessions to foreign companies were made in Quintana Roo alone (Villalobos González, 1993): Benjamin Barrios to Quintana Roo Development Company; Faustino Martínez to Banco de Londrés y México; Rafael Peon to J.E. Plummer; Olegario Molina to J.E. Plummer; Romulo Fernández to the Mexican Exploitation Company; Alberto Terrazas to the Mexican Chicle Mahogany Company. Even the extremely well-organized and well-financed *Compañía del Cuyo y Anexas* failed because it could not maintain capital investment for the long term and was transferred to the English backed *El Banco de Londrés y México* in 1910 (Konrad, 1991).

Simonian (1995: 61) concludes that the Díaz period witnessed accelerated exploitation of the land, which drew on the 'biblical injunction to subdue the earth', although the regime did take some limited steps to protect natural resources if industrial development was jeopardized (e.g., reducing the consumption of wood by railroads). Concessions—whether to foreign or national interests—were awarded with the idea that they were to play a pivotal role in developing the region in exchange for access to forest resources. In agreements that were typical of the day, the concessionaires were supposed to introduce modern forestry methods, encourage colonization of the region (mostly to offset the indigenous population), and install railroads, telephones, and telegraphs (Macías Zapata, 1996). The concessionaires did not meet these goals, however, and environmental conditions were largely ignored (Simonian, 1995); no forestry management plans were included in the contracts (Galletti, 1994). In the majority of cases, colonization was not fostered, seasonal workers came from Cuba, British Honduras, Puerto Rico, and other parts of Mexico, and improvement to infrastructure was for forest extraction only (Konrad, 1991).

⁶The years in which Quintana Roo was a free trade zone (and Chetumal a free port) were 1901–12 and 1935–74. From 1974–93, the free trade zone was expanded. Any benefits from free trade status ended with the North American Free Trade Agreement (NAFTA) in 1994.

The case of the Stanford Company provides an example. While it installed a small-gauge railroad for extracting timber, it was only 22 km in length and by 1912 was in poor condition (e.g., many of the rails were made of wood and deteriorated). This and most other railroads were not powered by motors but by horses and mules (Edwards, 1957). Furthermore, the vast majority of workers employed by the Stanford Company were either *mestizos* (people of mixed indigenous and European ancestry) from other regions of Mexico or workers from British Honduras (Macías Zapata, 1996). These workers tended not to settle in the region. Between 1909 and 1912, rebel Maya renewed systematic attacks on commercial infrastructure and military targets. The Maya domination of the interior disrupted development efforts and forest extraction intensified inland only after the Mexican Revolution (a peasant rebellion against land monopolies, 1910–17) (Konrad, 1991). All in all, development goals—the establishment of permanent settlements, improved and lasting infrastructure, and industrialization, for example—were not achieved.

With respect to environmental change, forest concessions granted by Díaz did not lead directly to significant land change within the southern Yucatán peninsular region in the short term (except in the southeasternmost corner, close to the Río Hondo where logging was intensive, see Figure 1), but they focused international capital there in a way that affected dramatically the region's environmental and social history. It is foreign capital that drove forestry operations in the zone for the first half of the 20th century. In most cases, the foreign companies maintained direct power until President Lázaro Cárdenas cancelled all international forest concessions in 1934, although, despite such attempts to curtail their influence, foreign interests dictated on-the-ground forestry operations until the end of World War II. By solidifying the position of foreign and Mexican elite companies in the zone and encouraging the rapid exploitation of forest resources, the imprint of Díaz on the forest is evident today in depleted mahogany (*Swietenia macrophylla* King) and cedar (*Cedrela odorata* L.) stands (Klepeis, 2000).⁷ But beyond such direct impacts on the land Díaz's rationale for developing the southern Yucatán peninsular region, which was based on capital and control external to the region and systematic exploitation of natural resources, continues to shape land-use policy today.

The Mexican Revolution was, in part, a response to the policies of Díaz—the forest *latifundios* and the power over forest resources held by Mexican and foreign elites in the case of the southern Yucatan peninsular region. President Lázaro Cárdenas (1934–40), among others, framed an alternative rationale to development.

In 1930, President Pascual Ortíz Rubio declared chicle to be a public treasure and that its extraction should be undertaken by chicle cooperatives overseen by the federal government (Ponce Jiménez, 1990) and Cárdenas canceled foreign forestry concessions four years later. These were attempts to move forestry away from centralized control, and to empower peasant control over local resources. Cárdenas's main goals were to reform the elitist social and economic policies started under Díaz and, thereby, to empower *campesinos* (rural peasants) and improve their condition (Galletti, 1994). The results of these efforts were mixed, however, and *campesinos* pushed for more control over logging in the decades after Cárdenas. Across the study region they would fight to gain full access to land resources rights until the last of the forest companies was dissolved in 1983. In the 1980s and 1990s, Cárdenas's initiatives were revisited when social forestry and notions of sustainable development affected the study area.

Simonian (1995: 85–88) identifies elements of an early notion of sustainable development in Cárdenas's policies. Although his primary focus was to improve economic and social conditions in rural areas, Cárdenas made conservation of natural resources a high priority due to the perceived connection between sound resource management and sustained livelihood opportunities for the rural poor. For example, in response to deforestation and soil degradation, his administration created forest reserves, protected forest zones, and national parks. He also created the Department of Forestry, Fish, and Game, the first autonomous conservation agency in Mexico, which he directed to implement, among other things, reforestation programs, the administration of national parks, and scientific investigation, including newly created forestry schools (Simonian, 1995: 88, 92).

⁷Klepeis (2000) estimates conservatively that from 1900–90 approximately 420 400 m³ (some 156 000 trees) of mahogany was extracted from the region, leaving the stands severely depleted.

Cárdenas created moderate-sized national forest companies, and he expanded and accelerated land grants to *campesinos* (the land grants are called *ejidos*, which are communally based and under usufruct tenure). He encouraged the creation of worker cooperatives, and under his leadership, numerous small-scale concessions (of the order of 5000 to 100 000 ha per concession) took the place of the larger foreign and national concessions of the earlier period (usually well over 150 000 ha). In this way, Cárdenas broke the forest *latifundio* put in place by Díaz. By the 1940s, concessions were awarded for five years with the stipulation that the concessionaires must manage the forests for long-term extraction and not just for short-term gain. This interest by the government in more long-term management of the forests is the first example of government reaction to over-exploitation of forest resources. Genuine efforts at forest management, however, awaited the rise of para-statal forest companies in the 1950s.

One of the most critical changes in policy by Cárdenas was the dramatic increase in the creation of *ejidos*. Multiple 'forestry' *ejidos* were established with the official calculation of 430 ha per *ejidatario* (*ejido* inhabitant with land rights).⁸ The forestry *ejido* grants were large, although forest clearing was only allowed in a relatively small area surrounding the *ejido* center. The rest was to be managed as a forest reserve, a federally-dictated restriction on land-use practices that remains in place today. Part of the rationale underpinning the *ejidal* land grants was that workers for the old chicle companies would have rights to their own chicle reserves, control their own resources and their own well-being. During Cárdenas's term, 26 *ejidos* and 43 cooperatives were established in Quintana Roo. In Campeche, 60 *ejidos* were established, 79 extensions to current land holdings were awarded, and the important cooperative, Los Chenes, began (Ponce Jiménez, 1990).

Despite the distribution of land to peasants, the evolution of land tenure and forestry dynamics to this point combined to make for poor forest management by any standard, a state of affairs destined to continue to the present. The Cárdenas period is marked by multiple interest groups focused on the forest resources. Each group perceived these resources differently: the *ejidatarios*, who wanted access for themselves and the freedom to manage the land as they saw fit; the contractors to foreign companies, who focused on short-term resource exploitation and little else; and the politicians bent on developing Mexico's forestry sector. Cárdenas complicated matters by creating the forestry *ejido* and the formation of worker cooperatives, which embraced social forestry long before the notion of peasant control over their own resources became fashionable. While *ejidos* were able to extract chicle within their own territory concessionaires continued to have logging access to *ejidal* forests (Villaseñor, 1958). In short, multiple interests vied for access and control of forest resources.

Cárdenas and Díaz held similar utilitarian views of nature in their desire to exploit natural resources to foster development, however, they disagreed over the degree to which the state should direct and control land use, and there was a considerable shift towards environmental conservation goals under Cárdenas. As Simonian (1995: 94) describes the period, 'Cárdenas's conservation program was indeed a pioneering effort to design social and economic policies that would maintain an ecological equilibrium in the country for the benefit of both nature and people.' Despite these overall goals, however, while the reforms by Cárdenas improved somewhat the lot of workers and peasant landholders they did not slow the rate of extraction of forest products. Rather, by encouraging settlement via land grants, the reforms increased the extent of deforestation. Moreover, the indirect control of forestry practices via foreign contractors reduced the chicle producing capacity of the region on the one hand while encouraging hardwood logging on the other. It was the bust in the chicle market after World War II (due to the creation of a synthetic substitute) and not government policy that finally reduced foreign interest in the region. After the chicle bust and with no formal concessions in their control, foreign interests abandoned the region until the rise of international conservationism in the 1980s.

CONTRASTING DEVELOPMENT APPROACHES, POLICY SHIFTS, AND LAND CHANGE (1940–2000)

The Díaz and Cárdenas periods set the tone for subsequent development initiatives. The first half of the 20th century in the southern Yucatán peninsular region highlights the prominent role that the federal government played

⁸The 430 ha ceded per *ejidatario* was determined on the assumption that each hectare would produce on average 5.0 kg of chicle.

in staking out the basic strategy of regional development. The seeds of deforestation occurring over the last 50 years were sewn in the Porfiriato (1876–1910); the depletion of mahogany and cedar in the mid-20th century as well as clearing for agriculture and ranching projects in the 1970s (described below) was federally directed and tied to processes of globalization (i.e., local resources were exploited in an attempt to boost Mexico's comparative advantage in international markets). In contrast, emphasis on local control of natural resources and sustainable development since 1983 harks back to the 1930s when President Cárdenas promoted campesino land rights and nascent conservation initiatives.

The history of the southern Yucatán peninsular region is, therefore, a backdrop for two competing rationales for development: the Díaz model, in which an economic elite controls the resource base and the government sets the development agenda (i.e., promoting forestry, agriculture, or tourism) while letting big business operate relatively unmolested; and the Cárdenas model, in which local people are empowered with control over natural resource use and the government seeks to facilitate rural development with numerous agrarian programs.⁹

Post-1940 land change is reviewed here briefly; the goal is not to produce a detailed account of recent human-environment conditions, which is presented elsewhere (e.g., Klepeis, nd; Klepeis and Roy Chowdhury, nd). Instead, I highlight key policy shifts that demonstrate three key tensions between the development rationales of Díaz and Cárdenas: (1) top-down vs bottom-up control and management of natural resources, (2) commercial vs social welfare policies, and (3) economic growth vs 'sound' resource management (i.e., environmental conservation). These tensions manifest themselves in complicated resource access and land tenure regimes,¹⁰ the entrenched role of foreign capital and expertise in regional land-use systems, intermittent and often inadequate rural aid and agrarian subsidies, and uncertainty on the part of government officials over how to improve simultaneously social welfare, promote environmental conservation, and foster economic growth. The tensions between the Díaz and Cárdenas models of development are embodied by frequent shifts from local to extra-local prominence in land management, each driven largely by the government's attempt to maintain control over boom-period resources.

International Forest Concessions (Early 20th Century)

As described above, the first main shift in policy affecting the southern Yucatán peninsula was when Díaz cancelled the large Mexican concessions and transferred them to large international concessions in the early 20th century. Management control was awarded to international actors who, in essence, 'mined' the forest of resources without consideration of long-term social and environmental impacts.

Mexican Forest Concessions (1940s and 1950s)

When Cárdenas came to power, a dualistic development rationale was adopted, one that embodies his difficulty—or unwillingness—to fully embrace local control. Demonstrating a desire to decentralize control of forest resources, President Cárdenas cancelled the large international concessions, which were transferred to small Mexican concessionaires in the 1950s, and awarded many ejido land grants. By awarding both local managers with concessions and land grants to those who wanted to settle in the region, Cárdenas tried to shift control away from foreign actors and to provide improved livelihood opportunities for campesinos. International actors continued to maintain control of forestry indirectly, however. This indirect control can be attributed to the capital-intensive nature of forestry, the technical expertise of international companies as well as their access to markets, and ties within the Mexican Government to forest industries. The tension between centralized and decentralized control of

⁹Note that the rationale underpinning the Cárdenas model mirrors the kinds of assumptions made by those researchers that embrace the structural form of explanation for deforestation; if societal structures were altered to give greater access and control of natural resources to local people then land management would improve.

¹⁰The region's land tenure regimes are complex. There are private lands, ejido lands—many of which are split between forest reserves and areas designated for agricultural use—national land in the biosphere reserve, ejido and private lands that are within the core and buffer zones of the biosphere reserve, and areas in which Maya ruins exist, which are the purview of the national government regardless of where they are located. In addition, there are plans to create a Mesoamerican Biological Corridor that connects forested areas to the north and northeast of the region with those of the Petén to the south. Taken as a whole, determining which actors are responsible for land management is not straightforward.

land resources is, perhaps, best exemplified by the system of split access to *ejido* resources. *Ejidatarios* had control over chicle and agriculture for subsistence, but Mexican forest concessionaires had rights to the timber. In short, social welfare policies encouraged *ejido* land grants to be used for exploitation of chicle resources. However, international actors controlled the marketing of chicle and *ejidatarios* were not allowed to log.

Para-Statal Forest Concessions (late 1940s–1983)

With chicle no longer profitable after World War II, logging of tropical hardwoods became the major extractive activity in the region. Despite over 50 years of attempts to promote the development of the Mexican forestry sector industrialization had not occurred. In response, President Miguel Alemán (1946–52) instituted a modified Díaz model for Mexican forestry. The modified model held that the state should aid directly in the industrialization of the forestry sector and that the forests and its occupants should serve to supply raw material and labor for the benefit of industry, a notion that directly contradicted the views of Cárdenas. President Alemán considered the forests to be a national resource to be controlled by the state on the behalf of national interests (Galletti, 1994). Centralized government control was strengthened, although with a national elite running forestry operations as opposed to foreign interests. Long-term, large-scale forest concessions were awarded to para-statal companies, within one of which, Caobas Mexicanas/Impulsora Forestal Peninsular (a concession in southeastern Campeche of upwards of 600 000 ha held between 1948–75), President Alemán was an investor and partner. *Ejid*os already in place were maintained, but permission to log was given only to the para-statal companies that, in effect, had a state-mandated monopoly. *Ejidatarios* were awarded a paltry stumpage fee. The transfer of Mexican national concessions and national lands to para-statal forest companies was a formal reestablishment of the forest *latifundios* of the Díaz period.

By the 1960s, however, forestry was in decline with the primary export commodities, mahogany and cedar, having been largely depleted (Klepeis, nd). The last of the para-statal forest concessions operating in the region ended in 1983, bringing to a close the operation of large forest companies in the southern Yucatán peninsular region.

Colonization, Big Projects, and Agriculture (1975–82)

In response to the decline in forestry, and in line with the Díaz mode of thinking, the Mexican government moved rapidly to target the region for agricultural development. There were visions of a primary agriculture center that would supply urban areas, such as Cancun (Figure 1), and help support tourism and industrialization. This was to be accomplished by awarding *ejido* land grants for agriculture, government-directed colonization schemes, economic incentives to clear the forest for agriculture, and in a number of cases—despite official control by the *ejidos* of their own land—the usurpation by the federal government of *ejido* land to implement large-scale rice and cattle projects.

In all, there were six factors that led to government-directed colonization of the southern Yucatán peninsular region in the 1970s and 1980s, each linked to regional and national dynamics. Regionally, (1) the southern Yucatán peninsula was physically isolated from the rest of Mexico, (2) the forest economy was declining rapidly, and (3) Quintana Roo needed more people to attain statehood. Nationally, the region was (4) proximate to international borders and the concomitant issue of national security, while Mexico (5) witnessed lower than expected production of basic foods and (6) required a political quick-fix for landlessness in the face of rapid national population growth and social pressure elsewhere in the country.

*Campe*sinos from densely populated regions in Mexico were moved into the study area and massive amounts of money supported ambitious agricultural programs in rice, cattle, and clearing of forest for maize production. Linked directly to government programs, between 1975 and 1982, over 10 000 ha of forest were cleared in Quintana Roo alone, and this does not taken into account the thousands of hectares cleared as result of the Programa Nacional de Desmonte (National Deforestation Program), which gave credit to smallholders who cleared upland forest (*selva mediana*) for pasture and cropland.

But by 1982 the government's experiment in intensive 'modern' agriculture was a failure. The majority of these agricultural projects collapsed within a few years due primarily to weed invasion, disease, and, perhaps most

importantly, inadequate water control (Klepeis, 2000).¹¹ And due to the Mexican debt crisis of the early-1980s, money to address these problems was unavailable. Yet, while the big projects were an economic disaster, they did attract significant numbers of settlers. One of lasting legacies of this 1970–82 boom–bust period of federal investment in settlement and agricultural projects, therefore, was to connect the region physically to the rest of the country and to open it to widespread and permanent human occupation. Many of these settlers were unable to find employment in forestry and, in the face of the failed large projects, sought other options, including diversification of land use. Social forestry and sustainable development initiatives as well as the introduction of the principal market crop in the area—jalapeño chili—are fundamental to this diversification trend.

Diversification of Land Use (1983–present)

In combination with decreasing emphasis on rural investment by the government, the end of the para-statal forest concessions and the failure of the large-scale rice and cattle initiatives, after 1983 smallholders in the region were given more control over land use than at any other time in the region's modern history. Land use diversified, moving away from reliance on just subsistence production, forestry, or cattle production. These uses continued but smallholders began to plant more cash crops, such as chili, oranges, sesame seeds, bananas, and tomatoes as well as engage in extractive industries, although at a much smaller scale of production than during the forestry boom period. The opportunity for wage labor increased, with intensive road construction, hotels, restaurants, stores, and the restoration of Maya ruins. Beekeeping, the collection of allspice, and the collection of grasses for the roofs of *palapas* (beachfront huts) in the tourist zone of Quintana Roo increased. Small-scale pasture creation increased, both for smallholders with cattle and for those wishing to either rent the pasture or obtain cattle in the future. Illegal activities, such as marijuana production, hunting and selling protected species, and the smuggling of timber were alternative activities not documented but known to exist.

Out of necessity the federal government had pulled back its rural investment for boom commodities, such as chicle, hardwoods, and rice. This respite in government-directed mega-projects, at least until the tourism schemes of the 1990s, provided an opening to NGOs and individual producers to explore alternative productive strategies. Some of the new land uses were the result of the interaction between the Mexican state, NGOs, and local social movements. In Quintana Roo, for example, Plan Piloto Forestal (Pilot Forestry Plan) established communally managed forest extractive reserves within *ejidos* lands and provided training to *ejidatarios* about the business of logging (Bray, unpublished manuscript, nd), and allowed them to log their own land. The program sought to maintain forest cover as well as provide for 'sustainable' livelihood opportunities in extractive industries for local people. Another example of cooperation between state, local, and NGO operators is the establishment in the late 1980s and operation of the Consejo Regional Agrosilvopecuario y de Servicios de Xpujil (CRASX), or the Regional Council of Solidarity and Agriculture, Livestock, and Forestry Services of Xpujil. Representing over half of southeastern Campeche's *ejido* communities by the late 1990s, CRASX served as the vehicle for many development and conservation initiatives in the region, such as water projects, marketing of cash crops, road improvement, and ecotourism projects, although the organization is now defunct.

Arguably the most important of the new land uses to arise after the bust in forestry and the big projects is the rise of jalapeño chili production. Keys (nd) documents how jalapeño chili was introduced by a handful of producers in the mid-1980s independent of any government or NGO initiative. By 2000, chili was the primary cash crop and was cultivated by some 90 per cent of smallholders in the region.

The Calakmul Biosphere Reserve and Tourism (1989–present)

While the agency of local smallholders was considerable in the 1980s and 1990s external forces of change still manipulated the people and landscape, and a shift back to centralized development reemerged quickly. Large-scale, capital-intensive agriculture, cattle ranching, and forestry were shown to be marginal economic activities in the decade leading up to the 1990s. But such failures did not dampen the imagination of developers, whether they

¹¹Detailed analysis of the root causes for the failure of the study region's big agricultural projects is found in Klepeis (2000).

were governmental or non-governmental, national or international, who continued to search for ways to extract from the land economic value greater than subsistence cultivation.

To suit prevailing international and national interests a large biosphere reserve (Calakmul) was created in 1989 (723 185 ha), with many *ejidatarios* displaced from their legal landholdings, or told to change land-use practices and to curtail forest clearing. Local people were not involved in the decision to locate a reserve in the study region, and most were surprised to learn of the reserve's existence after the fact (Haenn, 2002). Despite its establishment in 1989 the reserve did not officially function until 1995, it was poorly planned, and without significant backing of locals at any time, its effectiveness in fostering conservation is questionable. Enforcement of reserve boundaries is largely non-existent and there are reports of squatters in many parts of the reserve as well as pre-existing settlements, which continue unrestricted use of the forest.

Shortly after the reserve was established, tourism initiatives were initiated, which use the forest itself as a commodity—that is, the environment, including the Maya ruins beneath the forest. The government is now investing heavily in infrastructure and services associated with El Mundo Maya, an internationally funded ecological/archeological-tourism scheme that involves Mexico, Guatemala, Belize, Honduras, and El Salvador, to promote the attraction of the region's Maya heritage and biotic diversity. Investors in tourist-related initiatives (e.g., ruin restoration, road building, hotel construction) include governmental and private, national and international actors, however, they are dominated by extra-regional interests. The El Mundo Maya project is supposed to provide off-farm income opportunities for local people, but because the initiative is being designed and implemented largely by outside actors, it represents an attempt by the national government to initiate and control a new economic boom in the region. It has not produced the kind of economic return envisioned by developers and the ability to maintain the tourist sector in this part of Mexico is in question.

Two additional initiatives are ongoing that mirror both the professed conservation and development goals of the biosphere reserve and El Mundo Maya as well as the centralized decision-making approaches used in each case: (1) the Mesoamerican Biological Corridor (MBC), which was formalized in 1997 and (2) Plan Puebla Panama (PPP), which was announced in 2000 by Mexican President Vicente Fox. The MBC is an international project that seeks to limit habitat fragmentation and to improve the connectivity of regional ecosystems in southern Mexico and Central America (Kaiser, 2001; Miller *et al.*, 2001). Regardless of its merits for attempts to conserve forest cover and biodiversity, the proposed corridor largely represents extra-local interests. Similarly, PPP is an international effort that is designed to draw investment to Mexico's southeast and the seven Central American countries for the construction or improvement of infrastructure (Pickard, 2003). Its critics point out how local people largely oppose the development projects associated with PPP, which are funded primarily by large corporations, the US Government, and multilateral banks (Pickard, 2003). While the PPP has not affected the southern Yucatán peninsular region to date, it does represent the Mexican government's continued embrace of a centralized approach to balancing environment and development.

Neoliberal Reforms and Land Use (1992–present)

The centralized development approach to conservation and tourism coincides with the government's continuing efforts to foster an intensification of agricultural production. Recent decades show a mix of strong top-down initiatives (Calakmul Biosphere Reserve, El Mundo Maya, MBC, and PPP) as well as attempts to decentralize decision making, some of which fall under the framework of neoliberal reforms (e.g., land privatization, deregulation, and promotion of international free markets). Land reform in 1992, for example, gave *ejidatarios* the option to obtain private title to their land. This seems to fit the Díaz development model in that the land reform is designed to lead to a reduction in government spending in the rural sector, although potentially marginalizing *campesinos*. *Ejido* lands that are designated forest reserves (452 570 ha or about 25 per cent of the study region's land area) cannot be privatized, limiting by federal edict *ejidatario* control over resources in a significant percentage of the region's area.¹² By allowing *ejidatarios* to own their own land, sell it, and use it as collateral,

¹²The calculation of the percentage of the region occupied by *ejido* forest reserves is made by dividing the area of the reserves 4525.7 km² by 18 073 km², the area of a slightly smaller 'analysis' region (the region proper is 22 000 km²).

however, *campesinos* may be empowered to control their own destiny in a way consistent with Cárdenas's philosophy. Yet, to date, no *ejido* has voted to privatize its land and few *ejidatarios* are engaging in business ventures with off-farm investors. One of the possible explanations for the lack of privatization is that banks seem unwilling to invest in an area where profitable production is so uncertain; problems with pests and managing the water regime, among other factors, produce considerable year-to-year fluctuation in yields.

Another component in a suite of neoliberal reforms is linked to the North American Free Trade Agreement (NAFTA), which went into effect in 1994 and requires Mexico to liberalize fully its agriculture within 15 years of that date. PROCAMPO (Programa de Apoyo Directo al Campo/Direct Rural Support Program) is an agrarian subsidy linked directly to NAFTA. It first awarded payments in 1994. The program extends a per hectare direct payment for the production of a wide range of crops, including maize, beans, wheat, soybeans, sorghum, rice, and cotton, and was designed to help smallholders get away from reliance on subsidies and extensive swidden cultivation and towards greater market production. Analysis of the impact of PROCAMPO on land use suggests that the program has had the unintended effect of fostering deforestation while encouraging only a modest increase in market production. One of its impacts appears to be to encourage smallholders to plant pasture (Klepeis and Vance, 2003).

Summary of Policy Shifts in the 20th Century

The tension between models of development in the southern Yucatán peninsular region are manifested in international and para-statal forest concessions, big agricultural projects, the creation of the Calakmul Biosphere Reserve, and the fostering of El Mundo Maya under the Díaz model, and the establishment of numerous *ejido* land grants, paternalistic government subsidies, social forestry programs, and local sustainable development initiatives under the Cárdenas model. While I have emphasized that the principal tension is between centralized and decentralized approaches, regardless of the model of development, the role of the state—with decisions made in Mexico City—has determined the general conditions in which land managers in the region must operate. The shorthand of 'centralized' and 'decentralized' therefore hides additional tensions within the Díaz and Cárdenas models. Certainly, both presidents wanted to foster industrialization and economic productivity, however, there was a willingness to sacrifice commercial interests in favor of social welfare policies to a greater degree under the Cárdenas model. And while there is evidence that Cárdenas was more concerned about the environment than Díaz, conservationism was not evident until much later. Interestingly, conservationism has been used to justify both reduced access by locals to land resources (e.g., the creation of the biosphere reserve) as well as the empowerment of locals through social forestry and diversified use systems. The degree to which economic growth can be balanced with sound resource management is, of course, the fundamental goal of sustainable development initiatives. For the southern Yucatán peninsular region, the 1990s and recent years are witness to the often competing and contradictory forces of conservation, capitalism, and development, which converge to create the most eclectic pattern of land use and land cover in the region's modern history.

LEGACIES OF COMPETING DEVELOPMENT RATIONALES

The back-and-forth shifting policy initiatives have produced important environmental and social legacies in the study region. Most notably, depleted hardwood reserves and large areas of permanently cleared forest are linked to centralized development projects and the tension between the shifting policies has created a complicated system of land allocation and contestation over access to resources, the entrenched role of foreign capital in regional development, long-standing tensions between economic, social welfare, and environmental conservation goals, and the maintenance of widespread poverty of local smallholders. The research presented here is concerned primarily with the effect of these policies on deforestation. Findings suggest that impact on the forest tends to be more pronounced under systems of centralized control.

Centralized Development Policies

The embryo of many of the land-use strategies implemented in the region originated both far in the past as well as outside the region. Thus, the federal decision to cater to international timber markets can be traced to Díaz's

policies of Mexican development. The reliance on the export of raw materials and the influx of foreign investment fit into Díaz's rationale for economic development. He wanted tax dollars from international forest concessionaires and, at the same time, to strengthen his political ties and power with important allies, Britain and the United States (Galletti, 1994). He envisioned foreign capital opening up frontier locations by providing necessary infrastructure, thereby encouraging colonization, Mexican control of the area challenged by British Honduras, Guatemala, and rebel Maya, and national business opportunities. Even in the face of national efforts to curtail international influence after the Porfiriato, control stayed with external interests. Foreign companies took advantage of their monopoly on the chicle trade and the void in Mexican capital after the henequen bust to exploit the cheap labor and rich forest reserves in the study region (Medina Ramírez, 1948). Forest product extraction, export, purchase, and processing were all in control of a few select international companies until World War II and the chicle bust. Mexico's relationship to the foreign interests was, in effect, a neocolonial one where raw material was 'mined' from a former European colony in order to feed the industrial machine of the First World.

Ironically, counter to Díaz's professed objective, reliance on foreign capital and the export of raw material—key legacies of the Porfiriato—inhibited rather than encouraged the development of Mexican industry (Villaseñor, 1958). In order to attract foreign investment, Díaz offered concessionaires risk-free access to land resources and cheap Mexican labor but the concessions were not for the long term. The forest industry responded accordingly by mining the forest and there was little investment in sawmills or other capital associated with industrialization. Wholesale exportation of raw material was the best way to make money in the short term. This orientation discouraged forest management and promoted depletion of marketable species, especially mahogany. Furthermore, significant population centers and permanent infrastructure, secondary goals of Díaz's policies, were not established until the 1970s.

Despite the failure of the Díaz strategy to establish a dynamic and lasting economic base for the southern Yucatán peninsular region, his basic approach was employed again and again. Local control over valuable forest resources were kept to a minimum until the resource in question had either lost its market value or had become depleted: chicle, mahogany, rice, and tourism were managed by the government and an economic elite until it was no longer economically viable to do so (save for tourism, which is still in its boom period). Demand for chicle dropped after World War II and the involvement of international forest companies stopped. Yet, para-statal companies were established soon thereafter and only after mahogany was severely depleted did the *ejidatarios* gain the right to exploit their own timber in 1983. A national agenda towards import substitution and basic food production stimulated big rice projects in the study region. While forces in the government that followed the Cárdenas model endeavored to empower local smallholders to learn market production during this period, the end result was that the government took control of the projects entirely. Centralized control was maintained over rice projects even though they were on *ejido* lands, for example, only until it was clear that the project would fail. Only when agriculture and forestry were deemed poor investments did the government enthusiastically endorse empowering local people with sustainable development projects, and large investment was curtailed.

The impacts of centralized policies on the forest are pronounced. (1) Forest extraction in the first 60 years of the 20th century severely mined the region of its mahogany and Spanish cedar in the upland forests. This past forest extraction has largely eliminated this economic activity as an option as a primary livelihood strategy today. (2) Government-directed settlement and development activities, which began in the late-1960s and included paving the main road through the study region (Route 186), triggered the region's first significant deforestation since ancient Maya times, the pace of which was accelerated by large rice and cattle projects. Certainly, smallholder activity separate from top-down development projects account for land change, as well. Annual deforestation rates were 0.2 per cent in the late-1980s (Cortina Villar *et al.*, 1999: 46) and between 0.32 and 0.39 per cent from 1969–97 (Turner *et al.*, 2001: 364). Deforestation rates were much higher during the big projects period, however. Cortina Villar and colleagues (1999: 46) calculated an annual deforestation rate of 2.0 per cent between 1975 and 1985, for example. (3) The biosphere reserve and creation of forest extractive reserves seem to have slowed deforestation rates within designated areas, however, neoliberal policies (e.g., PROCAMPO) and El Mundo Maya—both top-down initiatives—seem to be linked to significant areas of forest being cleared. The fluctuating rates of deforestation underscore the structure-agency debate in deforestation studies: social structures, such as

government policy and markets shifts in the price of chicle and oil, explain much of the deforestation. However, decisions made by smallholders to open their lands in the absence of government incentives shows the role of individual agency in forest change. Interestingly, the involvement of both local and extra-local factors in driving deforestation provides an opening for both smallholders and government officials alike to claim a lack of responsibility for the deforestation problem.

Decentralized Development Policies

Since the 1930s, strategies of development under the Cárdenas model were also operating. The most dramatic of his legacies is the award of land grants to new *ejidos*. Local control by *ejidatarios* of the land for agriculture was stimulated by a rationale that *campesinos* should have access to land for subsistence purposes. In other words, federal officials wished to exploit resources for macroeconomic development, but also to provide for rural *campesinos* in at least a minimal way. The rising number of land grants to *ejidos* since the 1970s caused increasing areas of land to be converted to cropland via swidden agriculture. In addition to land grants, *campesinos* were plied with various government subsidies and assistance programs. These programs became muddled with the national and international agenda to conserve biodiversity and natural habitats in the 1990s when *campesinos* were the focus of numerous NGO and government-sponsored sustainable development initiatives, including Plan Piloto Forestal and agroforestry projects. Yet, the goal of preserving the forest seems to have more to do with national economic agendas than with conserving forest for local people to control. Certainly, this is the case with regard to Maya ruins and El Mundo Maya. The ruins are considered a national resource and, except for a few examples, *ejidatarios* do not benefit from having tourists visit ruins surrounded by *ejido* land.

The most important land change linked to the Cárdenas model of development is the gradual increase in land pressure and area under swidden agriculture due to government land grants and colonization programs. Furthermore, the setting aside of forest extraction reserves may be thought of as a way to conserve resources for the benefit of the *campesinos*, in the spirit of Cárdenas, or for the benefit of national and international conservationists and those promoting ecotourism.

Two other legacies have their root in aspects of both Díaz's and Cárdenas's policies. First, the government-directed settlement schemes that were initiated in the 1970s were linked to problems with development in other regions of Mexico. Land scarcity and political instability caused the federal government to use the southern Yucatán peninsular region as a safety valve. Land was distributed to *campesinos* (Cárdenas) but with the intent to foster big agriculture (Díaz). The effect of natural population growth in the study region is minor compared with the dramatic population increase linked to colonization. Even though much of the colonization was spontaneous, the government largely initiated the process.

Second, in between the large investment in agriculture, colonization schemes, and investment associated with El Mundo Maya, the federal government reformed *ejido* land tenure, providing opportunities for *ejidos* to privatize land holdings, which fit into the country's emphasis on neoliberal reforms. International and national capitalists identified neoliberalism as the road to economic success for Mexico. In theory, the reform empowered local people by giving them access to more credit. Yet, credit for intensive agriculture is not flowing into the region owing to its poor comparative advantage to other regions of Mexico (primarily due to its physical isolation from markets and water scarcity), although chili development and tourism may offer exceptions.

CONCLUSION

Development policies in tropical Latin America often shift the target interest group back and forth, from commercial to populist (*campesino* or social welfare) interests (e.g., see Simmons, 2002), as is the case in the southern Yucatán peninsular region. Review of the key policy events affecting the study region in the 20th century, however, shows that in most cases, external agents (e.g., government officials or heads of corporations) control regional resources either directly or indirectly. While local land managers have agency, the production portfolios

and perceptions of smallholders—given what they have the potential to perceive—have been strongly shaped by outside influences, ranging from the rules of land access, to road improvements, to federal rules about land use and policy initiatives. This is, perhaps, not surprising given the somewhat similar trajectories of change and the relationship between external shocks to regional land-use systems and deforestation that were witnessed in the forest histories of eastern Chiapas and central Quintana, two other frontier forest regions in southeastern Mexico (Bray, unpublished manuscript, nd; O'Brien, 1998).

Yet, what caused the policy shifts and associated land impacts? The periodicity of forest impacts over the last 100 years exposes the way that shifts in government policy affecting land use in the southern Yucatán peninsular region were triggered by key thresholds. These thresholds have multiple manifestations: the decreased demand for a forest product (chicle), an event beyond the government's control; the depletion of mahogany despite continuing demand for it, a scenario that might have been avoided had the government been less shortsighted in its land management policies; the failure of large-scale agriculture and cattle ranching projects, which exemplify the government's skewed vision of reality (i.e., that biophysical conditions and the region's geographic location provided a comparative advantage over other agrarian centers in Mexico when they did not); and a begrudging embrace by the government of the rise in both national and international demand for conservationism and archeological–ecological tourism when there was no other apparent option for significant revenue generating land use. With each historic episode of land change, the number of options available to the government for obtaining economic benefit from the land became fewer.

The finding that development policies initiated well over 60 years ago are partly responsible for recent deforestation is important for researchers of tropical deforestation dynamics—ongoing processes of environmental change are linked to the past and should be incorporated into global change science (Klepeis and Turner, 2001). Yet, what do the results suggest for the region's future?

Government officials are now attempting to capitalize on the rise in demand for natural resource conservation and the need for a new economic base for the region. For many environmentalists and developers alike tourism provides a possible solution. The goals of ecotourism are seen to represent the key components of sustainable development (Honey, 1999). They provide local people with well paying, off-farm income, which presumably decreases pressure on land resources, they conserve natural resources due to their economic value as tourists pay to see Maya ruins and the rich flora and fauna of the region, and they improve infrastructure, and provide electricity and water—essential services for the tourist industry—which, potentially, will also raise standards of living for local people. To Mexican Government officials and many NGOs operating in the region, therefore, El Mundo Maya, the Calakmul Biosphere Reserve, and the establishment of the Municipality of Calakmul in 1997 (often referred to as the 'ecological' municipality, belying the intent of the government to have ecotourism and sustainable development serve as the economic base of the area) are indicative of a 'new environment view' for the region, one that is linked to notions of sustainable development.

According to its developers, El Mundo Maya is supposed to conserve forest in line with an edict to conserve biodiversity while providing locals with off-farm labor opportunities, thereby, decreasing pressure on the forest. An eye towards conservation and sustainable development certainly counters the emphasis on forest clearing under Díaz and Cárdenas. However, El Mundo Maya may have more to do with a pragmatic assessment of economic conditions than a radically new view of how to manage nature. With other productive options limited—in the face of the bust of extractive industries and big agricultural—policy makers have chosen to new way to exploit nature. The forest itself, and the Maya ruins within it, are the latest commodities to be exploited in the zone, and if more hotels, roads, and airports are built, and more ruins are restored, then this latest episode of land change may provide the economic productivity that government officials have long sought.

Analysis of past large government initiatives provides a cautionary tale, however. Despite some efforts to involve locals in the crafting and operation of initiatives in forestry, agriculture, and in fostering tourism today—to integrate or create a hybrid Díaz-Cardenas model of development, in other words—campesinos in the region are still largely subsistence producers (Vance, 2000), there is increasing human impact on the forest (Turner *et al.*, 2001), and there have been minimal improvements in the living conditions of local people (Ericson *et al.*, 1999; Vance *et al.*, nd). For example, in the face of huge federal investment in tourism there is little investment in

agriculture despite many constraints faced by local people; in particular, water scarcity, physical isolation, and lack of credit (Klepeis and Vance, 2003; Turner *et al.*, nd). And yet, for tourism to be successful, the growing pressure on the forest needs to be lifted to maintain the forest cover that tourists want to see, which presumably requires intensified production and investment in *landesque* capital. That said, there are examples of development in the region, such as the paving and improving of roads, electrification projects, and increased access to schools and healthcare clinics.

While there may, indeed, be a new view of nature embedded in recent development initiatives, the findings presented here suggest that views on development have not changed dramatically in the last 100 years. Sustainable development is a phrase often used by development experts operating in the region, but the basic rationale for how to develop, which is to rely on outside control and influence, has not changed significantly even in the face of growing conservation-minded views of the environment. It is the combined effect of (1) continued reliance on top-down development strategies, which do not involve local decision makers in any serious way, and (2) ineffective empowerment of local people in solving problems of environment and development that throws into question whether or not balancing the three branches of sustainable development—economic growth, improving social welfare, and improving environmental conditions—is possible.

Literature on sustainable development is diverse, but there is broad consensus that the degree to which land-use decision making is democratic and balances centralized elements is vital in creating more sustainable use systems (e.g., Shiva, 1993; Bebbington, 1996; Kasperson *et al.*, 1999; Renn and Klinke, 2001; Logan and Mosely, 2002; Raskin *et al.*, 2002; Ribot, 2002; Sachs, 2002). Bebbington (1996), for example, argues that indigenous technical knowledge alone will not solve environment and development problems. Local actors need to call for and incorporate key ideas, methods, and skills that fit best with local needs. Local smallholders might require accounting or marketing skills as well as agricultural extension services in their efforts to raise agricultural production. Ribot (2002) argues that local people must be empowered by gaining access and control over local resources, but only in the context of strong environmental laws that balance local needs with national priorities. Kasperson *et al.* (1999) review how democratic decision making helps to build broader consensus and more effective societal response to environmental problems. In reference to these ideas about how to make better land-use decisions—the degree to which they are democratic, and with balance between local and centralized input—land-use decision making in the southern Yucatán peninsular region falls short. The federal government seems to give control over natural resources to the region's inhabitants only when the boom has passed for the commodity in question. Certainly, in the midst of the key economic booms in the area (chicle, hardwoods, rice, cattle, tourism, and conservation) locals were not key players in land management decisions; outside control or extra-local factors drive the most dramatic regional land changes in the 20th century.

The current models of development repeat the patterns of the past. Given the similarity of views on development to those that left lasting imprints on society and the environment the degree to which land use in the southern Yucatán peninsula will be sustainable in the future is uncertain.

ACKNOWLEDGEMENTS

The research presented in this paper was undertaken as a part of the 1997–2000 Southern Yucatán Peninsular Region (SYPR) Project, which has core sponsorship from NASA's LCLUC (Land-Cover and Land-Use Change) program (NAG 56406) and the CIS-CMU (NSF-SBR 95-21914). NASA's New Investigator Program (NAG5-8559) also supported the specific research in this paper. The SYPR project is a collaboration between El Colegio de la Frontera Sur (ECOSUR), Mexico, Harvard Forest—Harvard University, the George Perkins Marsh Institute—Clark University, and the Center for Integrated Studies on Global Environmental Change—Carnegie Mellon University (CIS-CMU). For specific elements of the project study, see <http://earth.clarku.edu/lcluc/>. I thank the members of the SYPR project for their valuable insights and collaboration. I gratefully acknowledge the comments by B. L. Turner II, Jacqueline Geoghegan, Colin Vance, and Paul Laris as well as those of three anonymous reviewers.

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DEVELOPMENT POLICIES AND TROPICAL DEFORESTATION

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