

## **Out-migration and Commons Management:**

Social and Ecological Change in a High Biodiversity Region of Oaxaca, Mexico

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### **Abstract**

Commons scholarship has done a poor job of studying drivers of change, their impact on commons institutions, and how these institutions and other social arrangements are responding to such change. This paper looks at the multiple impacts that demographic and cultural change through human out-migration is having on a commons regime in a high biodiversity region of Oaxaca, Mexico. The findings suggest that the region's forest communities face an uncertain future. While change through out-migration can undermine traditional governance systems and erode social and cultural reproduction, innovative institutional adaptations and the existence of strong transnational ties may help reduce community vulnerability. Within this context, the paper discusses the implications for land use and forest biodiversity, and in doing so adds a new layer of complexity to the body of work examining the consequences of rural depopulation on Mexican forest landscapes.

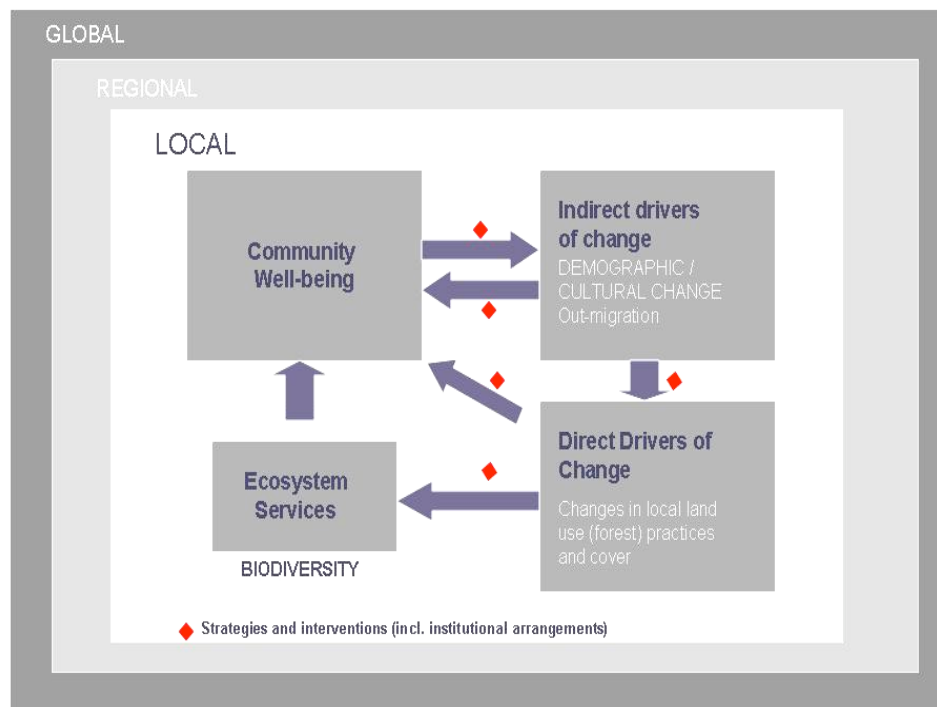
## INTRODUCTION

Despite some notable exceptions (Agrawal 2002, 2005; Baker 2005), commons scholarship has done a poor job of studying drivers of change, their impact on commons institutions, and how these institutions and other social arrangements are responding to such change. Indeed, the study of susceptibility and response to change has been described as one of the most neglected and least understood aspects in resource management science (Gunderson and Holling 2002). While self-governed commons regimes can maintain themselves and flourish for centuries (Netting 1976; Ostrom 1990), other studies have told a story of systems that falter and fail (Baker 2005).

Commons regimes are complex and uncertain (Adger 2006; Anderies et al. 2004; Ostrom 2005) and it is not easy to predict if, how or why a stressed regime will persist unchanged, transform to endure, or collapse. Community vulnerability to external stress concerns the multiple factors that influence their susceptibility to harm and govern their ability to respond. Cutter et al. (2003) suggest that these factors can include a lack of access to resources (including information, knowledge and technology); limited access to political power and representation; social capital, including social networks and connections; and, rules, norms, beliefs and customs.

This paper looks at the effect on a commons regime of demographic and cultural change through human out-migration. While the impacts of migration on receiving communities have been documented (Agrawal 2001; Gibson, Ostrom and McKean

2000), the impacts on sending communities have received far less attention, as shown by literature reviews and revision of the papers presented at the last four biennial conferences of the International Association for the Study of the Commons (IASC). While the main focus of the paper is on how out-migration impacts key institutional arrangements, it also considers how these changes are affecting territorial land use, environmental knowledge and practice, and forest biodiversity (Figure 1.1). In doing so, it adds to the growing body of work examining the consequences of rural depopulation on Mexican landscapes, and forest transition theory more generally (Myerson et al. 2007; Rudel et al. 2005).



**Figure 1.1** A conceptual framework for understanding the relationship between human out-migration, community wellbeing and the environment (adapted from MEA, 2005)

Field data comes from the Chinantec community of Santiago Comaltepec, located in the Sierra Norte (Northern Sierra) region of Oaxaca, Mexico. This region provides the perfect setting and context for such a study, thanks to its rich biological diversity, the extensive forest areas under community control, and the increasingly important role that migration plays in the local and regional economy (Cohen 2004a; Martinez Romero 2005; Merino 2004; Mittermeier et al. 2005).

### **Oaxaca and the Sierra Norte**

Oaxaca is widely considered the most biologically important state in a country ranked fifth globally in terms of terrestrial biodiversity (Conabio-Conanp 2007). This is despite the general absence of state or federal protected areas (Robson 2007). Rather, the vast majority of its forest lands (over 80%) are under the management and control of approximately 1,400 local communities (Merino 2004; Sarukhan and Larson 2001). The majority of these (more than 75%) are indigenous communities, with far fewer *ejidos* of mixed ethnic background (Atlas Agrario del Estado de Oaxaca, 2002). Their presence in the region typically dates back to pre-Hispanic times.

The Sierra Norte (Northern Sierra) of Oaxaca is a rugged, highland region that comprises the southern limits of the Sierra Madre Oriental mountain chain. A unique topography and location in the neo-tropics has blessed this area with a diversity of climatic and physiographic conditions. While the abrupt terrain divides valleys, canyons and water basins, the constant influence of the Gulf of Mexico and the Pacific Ocean on either side provide for varying humid, dry and temperate conditions. This spatial and

vertical distribution of climatic elements has led to a myriad of soil and vegetation types. Home to four of the six principal vegetation types found in Mexico (Rzedowski 1978), the Sierra Norte is nationally and internationally renowned for its concentrations of biological diversity (Conabio-Conanp 2007; Garcia-Mendoza et al. 2004; Mittermeier et al. 2005).

Administratively, the Sierra Norte is divided into 68 municipalities, which are split into three districts: Villa Alta (24 municipalities); Mixe (18 municipalities) and Ixtlan de Juarez (26 municipalities). Ixtlan de Juarez, the geographical focus for this paper, covers 2,921 km<sup>2</sup>, and its forests are regarded as the best conserved in the region. Most of Ixtlan's 26 municipalities are made up of Zapotec, Chinantec or Mixe communities, the majority of whom have made use of dynamic and innovative management practices to create 'multifunctional, cultural landscapes' (Berkes and Davidson-Hunt 2006; Chapela 2005; Robson 2007). Territorial use is based upon long-standing customary ownership and is reflected in a mosaic of land uses that include forest protection, timber extraction, the harvesting of non-timber forest products (NTFPs) and (principally) corn and bean cropping systems (Chapela 2005; Gonzalez 2001).

### **Out-migration and Local Resource Institutions**

Despite widely documented success in marrying resource productivity with conservation goals (Chapela 2005; Robson 2007; Sarukhan and Larson 2001), it is not clear how indigenous communal land tenure systems in Oaxaca, nor the institutional

arrangements that regulate them, are responding and adapting to new realities and challenges. Human out-migration, in particular, is a process with probable implications for land use cover and change. Since the 1960s, increasing numbers of people have been leaving the Sierra Norte in search of work in regional, national and international urban centres. The loss of people has become an issue of increasing concern to many community leaders, and has been identified as an emerging constraint to resource management and self-governance (Martinez Romero 2005).

Most indigenous communities in the region are underpinned by a traditional governance system called '*usos y costumbres*' (uses and customs), which is legally recognised under the 'Rights of the Indigenous Peoples and Communities of the State of Oaxaca', a law brought into force in 1998 (Velásquez 2000). This system considers the local assemblies (both municipal and communal) as holding the maximum authority within their jurisdiction. Elected posts are accountable to these assemblies rather than state or federal government, and communities are free to devise and approve norms to govern life in these (predominantly small) municipalities, including activities related to the use and conservation of communal forest resources. Central to the workings of this autonomous governance system is local participation in obligatory labour days (*tequios*) and service through non-paid positions of responsibility and authority (*cargos*). These two social institutions are key components of community identity, community organization and community social capital, and can be understood as the set of conditions that enable collective action and for problems to be resolved.

Work by Chapela (2005) and Merino (2004) has shown that this governance system provides for at least five of the eight design principles that Ostrom (1990, 2005) argues characterize robust and successful commons regimes. These are: (i) the participation of appropriators in the formulation of rules that regulate resource use; (ii) the participative monitoring of resource conditions; (iii) transparency in resource management decision-making; (iv) spaces for discussing and resolving problems (conflict resolution); and, (v) strong social capital within the community and past experience and knowledge (social memory). This system also meets many of the criteria considered important for resource conservation: local officials are elected; communities can self-evaluate their actions; communities are able to network with each other; communities have appropriate institutions to manage and regulate natural resource use; and, most importantly, community institutions are recognised and authorised by the municipal, regional and national authorities (Chapela 2005).

*Cargos* and *tequios* not only form the structural base from which the governance system operates, but act as mediating variables between the population and the pattern of resource use and management that takes place locally. Conservation efforts and other forms of land use tend to involve considerable administrative labour at the local level. Much of this work is carried out under the auspices of two village-elected community authorities: the *Comisariado de Bienes Comunales* (Commissioner of Communal Resources) and the *Consejo de Vigilancia* (Surveillance Council). Traditionally, these *cargos* are held for a three-year period, at which point newly elected village members replace the outgoing authorities.

These same community institutions also represent the interface between state and community, with incumbents of high-level *cargos* acting as brokers or intermediaries with state institutions. The *Comisariado de Bienes Comunales*, for example, is the community body that deals with both government and non-governmental environmental agencies and is responsible for applying for project funds and accessing conservation support on behalf of the community.

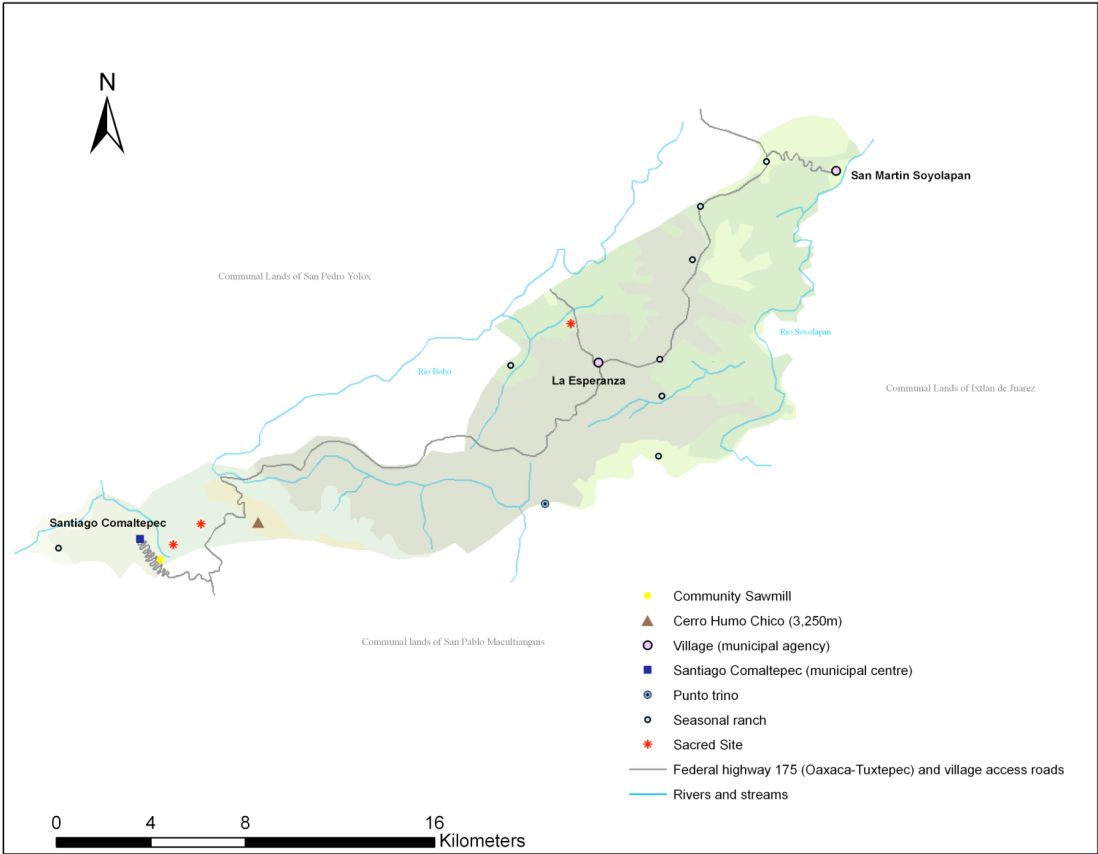
## **THE COMMUNITY OF SANTIAGO COMALTEPEC**

Map 2.1 provides the location of the indigenous Chinantec community of Santiago Comaltepec, and the layout of its communal territory. The main village of Santiago Comaltepec is located in the west, at an altitude of 2,005 metres above sea level. It is approximately 3 hours drive north of the state capital of Oaxaca City. The community was founded in 1603, with the original inhabitants having previously resided in the Rio Soyolapam region. During 1958 and 1959, a federal highway (No.175) was built that helped to facilitate the establishment of two more permanent settlements: La Esperanza and San Martin Soyolapam. While Santiago Comaltepec is the municipal centre, these two villages act as municipal agencies and help to maintain a presence throughout the community's large and diverse territory.

The ancestral lands of the community were formally recognised as common property in Presidential Resolution on June 17, 1953, which gave Comaltepec official title to 18,366 hectares or approximately 200km<sup>2</sup> of forest lands. For local resource users, these

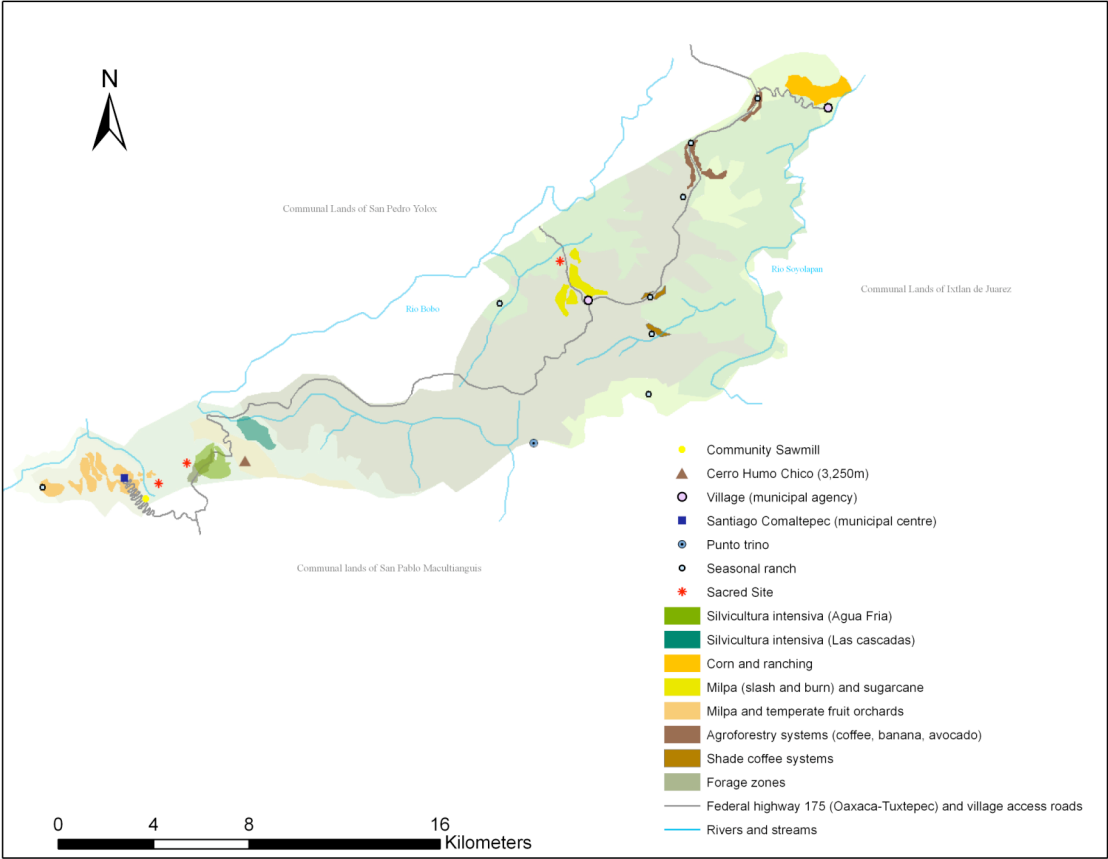


communal lands are split into two main zones: the more extensive wet, humid zone that lies to the east of the main *cerros* (mountain peaks), and which spans both tropical and temperate climates, and a less extensive dry zone to the west.



**Map 2.1** Chinantec community of Santiago Comaltepec, Sierra Norte of Oaxaca, Mexico

The community is home to large areas of the four forest types found in the Sierra Norte: tropical dry forest, mixed pine-oak forest, cloud forest and tropical rainforest. The community's cloud forest covers some 6,000 hectares, is well conserved with little fragmentation, and forms part of one of the largest and best conserved areas of cloud forest in Mexico. The community's forests also provide a range of vital hydrological services; not only to the local populace but also to downstream users living in the cities of Valle Nacional and Tuxtepec. At a regional scale, the community's territory forms part of the River Papaloapan watershed, one of the most important in the south of Mexico.



**Map 2.2** Territorial land use, including agricultural and forestry zones

## **Multifunctional Land Use**

Diversity in soil type, vegetation type, temperature and rainfall has been a driving force behind the diversification of agricultural and resource practices in Santiago Comaltepec. Land uses range from multi-crop production for both subsistence and commercial enduse, pasturelands for grazing, forestlands dedicated to logging (of differing intensities), the protection of ecosystem services, wildlife refuges, and the harvesting of NTFPs. In this way, territorial use (Map 2.2) is based on multiple values and needs that consider forest resources for both their subsistence and economic importance, for their spiritual significance, and as providers of important environmental services.

Since 1993, Santiago Comaltepec has developed a community land use plan to guide management of its territorial resources. In accordance with the current 10-year plan (2003-2013), the community's territory is divided into four main land use categories (Table 2.1). The plan is approved by the whole community, and implemented by the *Comisariado de Bienes Comunales*. Technical support is provided by UZACHI (*Union de Comunidades Zapoteco-Chinanteca*) – a regional organisation of three Zapotec communities and one Chinantec community, which was created to develop and support community forest management strategies and face common problems collectively (Chapela 2005)

Subsistence agriculture and gathering in Santiago Comaltepec persist as central elements of local livelihoods. Corn, beans and squash are universally grown crops in all territorial zones. In temperate zones, pea, butter bean, cilantro and mustard are also

<b>LAND USE ZONE</b>	<b>AREA (HECTARES)</b>
I. FOREST PRODUCTION AREAS	
- Intensive logging	452.57
- Low intensity logging	291.60
- Low impact logging	0.00
- Seed areas (Germoplasm)	4.97
- Domestic use	687.20
Subtotal	1,436.34
II. PROTECTED AREAS	
- Watershed protection	522.82
- Wildlife protection	4,420.85
- Forest reserve	5,067.85
- Recreation	0.00
Subtotal	10,011.52
III. FOREST RESTORATION AREAS	416.03
IV. AGRICULTURE / LIVESTOCK / URBAN USE	6,206.28
<b>TOTAL</b>	<b>18,070.17<sup>1</sup></b>

**Table 2.1** Community Land Use Plan

found, along with orchards of peach, apple, cherry and other temperate fruits. In the tropical zone that surrounds San Martin Soyolapam and Metates, the climate allows for the growing of more exotic crops including papaya, grapefruit, banana and tamarind. Protected home gardens provide important venues for many of these crops. Cash crops

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<sup>1</sup> 295 hectares of Comaltepec's territory was under legal dispute with the neighbouring community of San Pedro Yolo. While this conflict has been resolved, no form of land use is currently permitted in this area.

also exist in each climatic and ecological zone. There are small-scale fruit plantations and cattle ranches in tropical areas, sugar cane is grown close to La Esperanza (and to a lesser degree in Soyolapam), and shade coffee has been grown across extensive areas on the humid side of the mountains.

By promoting such crop selection, the community is home to high levels of agrobiodiversity. Local shade coffee plantations include up to 20 different native and non-native tree species. In some instances, coffee is grown together with bananas (up to 10 different varieties) and other crops (avocado, mamey, vanilla) as part of multi-crop agroforestry systems that also use trees to provide shade, maintain humidity and improve soil fertility. These systems exhibit important levels of beta-diversity (Bandiera *et al.* 2005). In addition, the agriculture-forest mosaic provides for a complex, patchy landscape to which a number of species respond. In particular, many birds (faisan, among others) and a number of forest mammals (white-tailed deer, jabali, tejon, mapache) either reside in, or are frequent visitors to these areas (field observations and interviews with local land users, 2007-2008).

In higher, more temperate areas, the community has extensive pine-dominated forests that include large populations of commercially valuable species such as *Pinus patula*, *P. pseudostrobus* and *P. ayacahuite*. The community's forest management plan and cutting cycles have moved away from the single-species focus favoured by previous logging operations to an ecosystem approach that seeks to protect natural forest processes and functions. This alternative silvicultural system (known in Mexico as the *Metodo de Desarrollo de Silvicultura*) incorporates clearings and regeneration cuts that

imitate the effects of forest fires to help with pine regeneration and reproduce processes of ecological succession (Bray and Merino 2004; Matthews 2003).

Each village has a designated domestic use zone, where villagers extract oak and other local species for use as firewood or as timber for house construction and fence posts.

This kind of strict land use zoning is a recent phenomenon, which has developed since Santiago Comaltepec became a member of UZACHI in the mid-1980s. In La

Esperanza, due to strict regulations aimed at protecting cloud forest species, only dead, dry wood is removed, with care taken when cutting not to damage living individuals.

Community members in this region are only allowed to extract what they can carry. In all three villages, wood remains the preferred fuel for cooking, although many homes now use gas as well.

### **Autonomous Community Conservation Areas**

Comaltepec's territory covers an area of the Sierra Norte identified as an 'extreme priority site' for biodiversity conservation in Mexico (Conabio-Conanp 2007), which recognises not only the biological richness of local forest lands but also their importance for national conservation planning priorities. However, this is a region that has maintained forest cover and rich biological diversity in the absence of state or federal protected areas. Rather, it is indigenous communities that have helped to protect the region's natural resources through a multifunctional land use system that includes the establishment of autonomous community conservation areas (ACCAs) (Robson 2007).

Under the 2003-2013 management plan, over half of Comaltepec's territory (10,011 hectares) is designated for forest and ecosystem protection: with over 500 hectares set aside for watershed protection; almost 4,500 hectares for 'wildlife protection'; and, over 5,000 hectares as a 'forest reserve'. In all such areas, extractive activities are officially restricted, with sets of rules clearly defining (and limiting) who has access to, and use of, forest resources. The communal authorities, and specifically the *Consejo de Vigilancia* (Surveillance Council), are charged with supervising and monitoring this forest area.

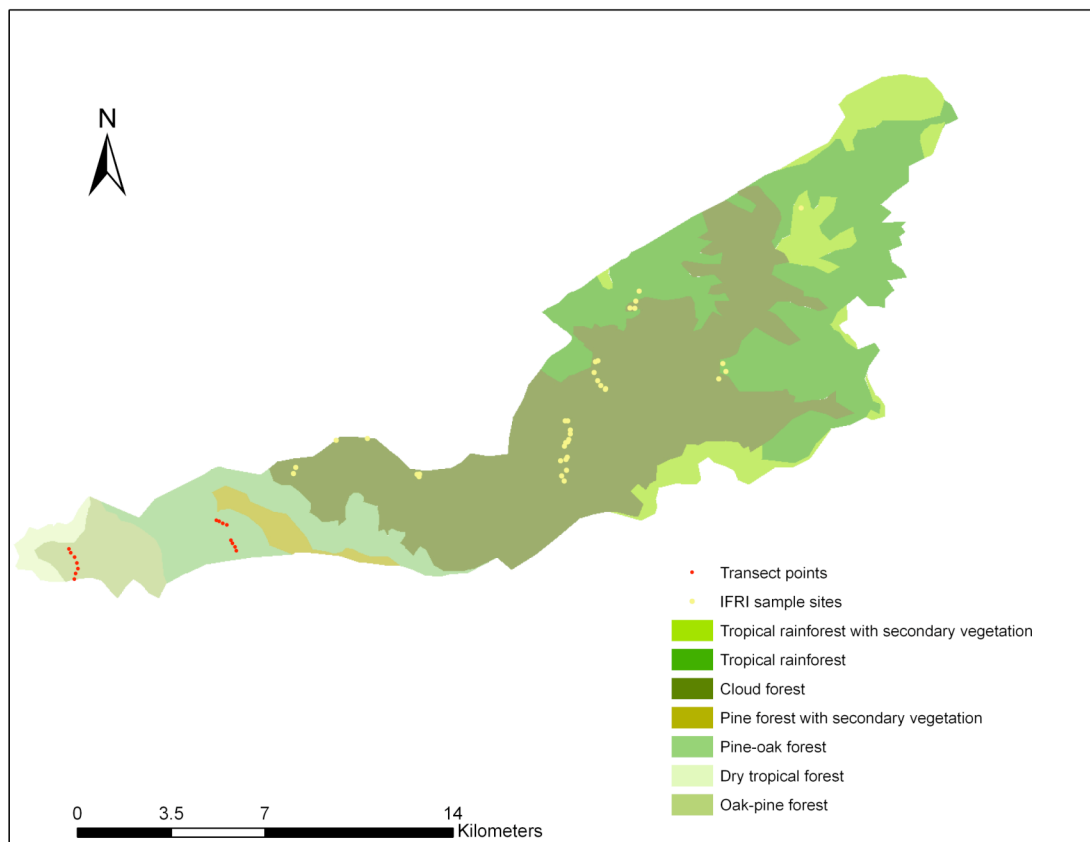
## **OUT-MIGRATION FROM SANTIAGO COMALTEPEC: IMPACT ON COMMONS INSTITUTIONS, LAND USE AND FOREST BIODIVERSITY**

### **Methods**

Santiago Comaltepec was chosen for this study based on the following criteria: out-migration rate (high) (Martinez-Romero 2005); level of forest production and integration (Procymaf Type IV community); and, conservation status ('extreme priority site', Conabio-Conanp 2007). The research conducted was interdisciplinary, which is essential for understanding the complex processes that link migration and the environment in sending communities. The methods employed borrow from cultural anthropology, sociology, demography, ecology and human geography:

1. Participant observation;
2. Formal and informal interviews with communal and municipal authorities;
3. Informal interviews with *comuneros* (rights-holders), women, migrants (residing in Los

- Angeles), returned migrants, and young people;
4. Household surveys focusing on demographic and socio-economic aspects, migration dynamics and land use change;
  5. Forest sampling work in the community's cloud forest (applying IFRI methodology, 35 sites were visited to measure local forest conditions) (Map 3.1);
  6. Forest transects in the pine-oak forest around 'Agua Fria' and the oak-pine domestic use forest, with the assistance of local guides (Map 3.1);
  7. Secondary sources consulted for socio-economic and demographic data, including: (i) local community census, and (ii) INEGI census and population counts; and,
  8. Revision of community statutes and current land use plan (2003-2013)



**Map 3.1** Forest ecosystems with location of IFRI sample sites and transects



Principle fieldwork took place between January and April 2008, with a trip to Los Angeles in August 2008. The author was assisted by an interdisciplinary team of researchers from the National Autonomous University of Mexico (UNAM).

## **Principal Findings**

### *Recent Migration History and Current Dynamics*

Out-migration has been a feature of life in Santiago Comaltepec since the beginnings of the twentieth century. During the Mexican Revolution (1910-1917), a number of families left for Tuxtepec and Valle Nacional (two cities that lie close to the border with Veracruz state). From the 1940s through to the early 1960s, many men from the community took part in the Bracero Program; a guest worker program established to provide a cheap supply of foreign labourers to the US agricultural sector.

In the 1960s and 1970s, out-migration began to increase as individual community members and whole families left in search of off-farm employment in regional and national urban centres (Oaxaca City and Mexico City in particular). At the end of the 1970s, there was an important shift in the migratory pattern as the first *Comaltepecanos* (people from the community of Santiago Comaltepec) left for the USA. Very quickly, the USA overtook Mexico City as the prime destination for migrants. Indeed, many who had earlier left for Mexico City moved onto the USA when they heard that work there was plentiful.

During the 1980s and 1990s, migration to the USA rose sharply as social networks became established between home and migrant communities. The vast majority of *Comaltepecanos* (80% and 90% of USA-bound migrants) headed to Los Angeles, with the majority settling in a handful of neighbourhoods. While many of the first migrants were men, increasing numbers of women have been leaving in recent years.

Over time, the migratory pattern has changed. While most make the trip illegally (or 'sin papeles'), crossing the border during the 1970s, 1980s and early 1990s was easier and the 'coyotes' (smugglers who take people illegally from Mexico to the USA) more affordable. As such, it was common for Comaltepec migrants to move regularly between the USA and their home village. Such temporary, circular migration has become more and more difficult in recent years. Not only is the border crossing more complicated, but the *coyotes* are now extremely expensive (charging US\$3,000 per migrant in 2008 compared to around US\$250 in 1990). In addition, many unmarried migrants who left in the 1980s and 1990s have since started families in the USA, making trips back to Comaltepec a riskier and less attractive venture. Consequently, a form of semi-permanent or permanent migration has emerged, with migrants spending 5, 10, 15 years or longer in the USA before returning. Many do not return at all.

It is quite possible that the current economic crisis in the US will see an increase in migrants returning to Comaltepec. However, this has not happened to date (as of October 2008). The most likely to return are those individuals with minimal family ties in the USA.

### *Push and Pull Factors*

Out-migration is, first and foremost, a response to economic pressures such as: the need to earn money to build a house in Comaltepec, put children through school, or simply provide food and clothing for the family. Nearly all respondents stated that there is little paid work in the village and what work there is often 'no alcanza' (does not provide enough) to cover basic expenses. The daily wage in the community is about \$130 pesos (US\$12). The same amount (often more) can be earned in one hour in Los Angeles as a construction worker, gardener or nanny. For many, the USA provides an opportunity to earn enough for themselves while sending money back to the family in Comaltepec.

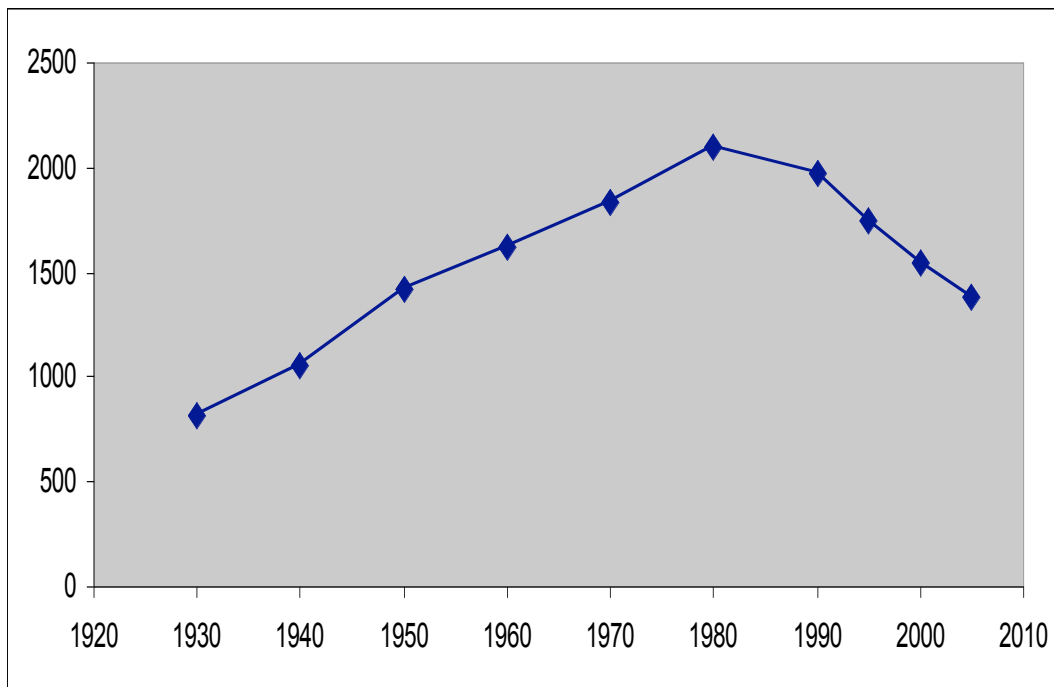
The classic economic model of migration, however, does not apply to all who leave; especially the teenagers who head to the USA soon after finishing school. In only a few cases are they sent by their parents to earn money; in most instances they leave of their own accord (and often against their parents' wishes). Survey respondents stated that many younger migrants head to the USA 'para conocer' (to get to know), in addition to any financial pull. This phenomenon helps support a more 'cultural' explanation or model of migration (after Durand and Massey 2004), where a few years spent living in the US becomes a 'rite of passage' for young *Comaltepecanos*.

Whatever the reasons for leaving, migration to the USA is aided by a strong social network. According to survey results, over 90% of first-time migrants to the USA have

friends or family members already living there, who can provide accommodation, help find work, and lend moral and financial support.

### *Demographic Changes*

The line graph (Graph 3.1) shows Comaltepec's 'active' population during the period 1930-2005. 'Active' populations refer to those individuals currently residing in one of the three permanent localities, and thereby participating regularly in community life. Data is taken from INEGI census and population counts. INEGI (Instituto Nacional de Estadística Geografía e Informática) is the government institution responsible for national censuses (every 10 years) and population counts (every 5 years).



**Graph 3.1** Population Change, Santiago Comaltepec (1930-2005)

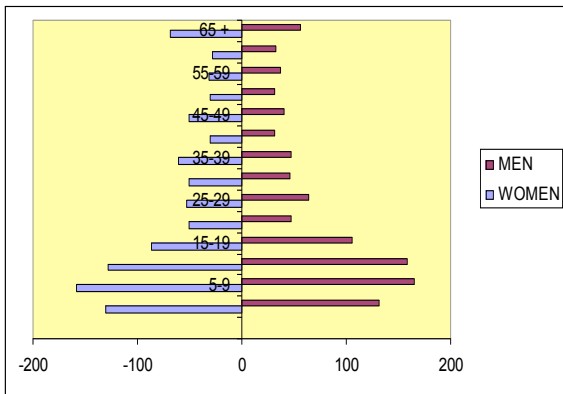
(Source: INEGI census and population counts)

Between 1930 and 1950, the community's population increased steadily. Although growth rates slowed a little between 1950 and 1970, it appears that out-migration to urban centres in Mexico was not enough to offset the high birth-rates at that time. The community's population peaked in 1980, dropped off and then decreased considerably between 1990 and 2005. This can be attributed to the combined effects of high out-migration rates to the USA, as well as the introduction of family planning initiatives in the mid-1970s.

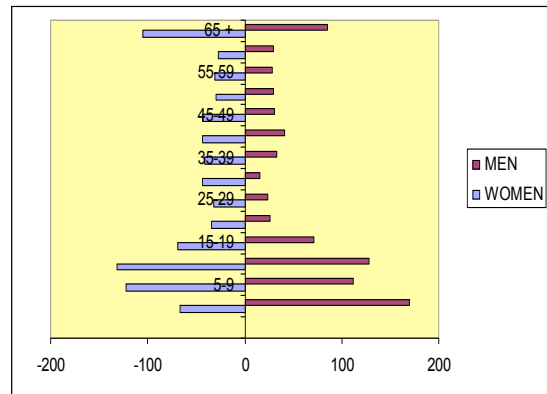
According to figures from the community's 2007 census, the current 'active' population has dropped to 1060, which puts it at 1940 population levels. The main village of Santiago Comaltepec has 823 'active' inhabitants, residing in approximately 200 households, while La Esperanza and San Martin Soyolapam are much smaller with approximately 152 inhabitants (40 households) and 83 inhabitants (20 households) respectively.

The community authorities estimate that between 700 and 900 Comaltepecanos currently reside in the USA. A further 350 or so are living in other parts of Mexico. Migrants to the USA are mostly men and women aged between 17 and 45. The loss of community members of a productive age has had a profound impact on the age-sex structure of those left behind (Figures 3.1, 3.2 and 3.3). These population pyramids show how the community's demographic structure has changed between 1990 and 2007. As well as an overall slimming (population loss), there has been an obvious change in the number of 'active' residents aged between 20 and 45 (especially men). At

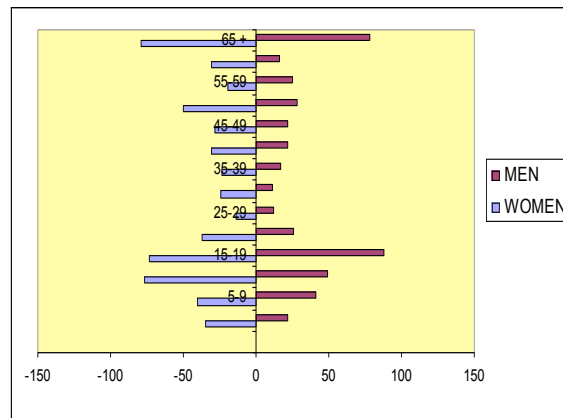
the same time, the proportion of residents over 60 years old has increased, representing a general aging of the population. The number of children under the age of 15 has decreased dramatically, which is likely a result of reductions in both the community's adult population (of reproductive age) and family size (from an average of 8-10 children in the 1960s to an average of 3-4 today).



Age-sex pyramid (1990)



Age-sex pyramid (2000)



Age-sex pyramid (2007)

**Figures 3.1 – 3.3** Age-sex pyramids of 'active' population for 1990, 2000 and 2007  
(Source: INEGI census, local community census)

### *Socio-economic Changes*

In conjunction with state and federal rural development policies, out-migration has also changed the local socio-economic landscape. Prior to the 1960s, *Comaltepecanos* worked the land to cover most if not all of their subsistence needs and generated little or no cash income. In the late 1950s, construction of the federal highway marked the beginning of an era of greater integration into mainstream Mexican society, which has led to many changes in terms of education, healthcare, new employment opportunities, and the provision of basic public services. It also brought village members closer to regional, national and international urban centres.

Since the late 1970s, migrant remittances have been the most important local driver of socio-economic change. One only has to wander through Santiago Comaltepec, La Esperanza or San Martin Soyolapam to see the impact of 30 years of remittances on these villages, and on housing in particular. The traditional adobe houses are now in the minority, with two-storey houses built of cement and other 'modern' materials dominant. For community members, new house construction is the most commonly cited benefit associated with out-migration (followed by an improved diet and better clothing).

While a small number of households (approximately 10%) live (almost) entirely off remittances, for many more families (60%), money sent from the USA is considered an "important" or "very important" supplement to local sources of income, and "a great help" in covering domestic expenses and school and medical bills. Data from the household survey suggest that fewer than 15% of households receive no migrant remittances at all. It should be noted, however, that remittances appear less important

than they were 5 or 10 years ago. For example, where sons and daughters have migrated, their parents tend to receive less money than before and on a more irregular basis. This is because many first generation migrants have now started families in the USA, and as their own expenses rise they find that they have less money to send home.

Migrant remittances have provided a range of benefits to the local economy. The majority of these, however, remain with those with family in the US. Benefits for the community as a whole are much harder to pinpoint. New housing is an example: while driven by migrant monies and an important source of work locally, it is also a source of 'disequilibrio' (inequality) between migrant and non-migrant families, and a perceived threat to internal harmony.

#### *Out-migration and Village Institutions*

Upon reaching 18 years of age, all men in Comaltepec assume status as 'comuneros' (rights-holders) and are asked to comply with *cargos*, *tequios* and to participate in community decision-making. Only those continuing with their studies are temporarily excused compliance with these obligations.

Thirty years of out-migration have generated multiple stresses and led to a number of changes to this system. One obvious change has been a discontinuation of the traditional, hierarchical nature of the *cargo* system (where comuneros start with low-level *cargos* before moving up to positions of greater responsibility). In San Martin Soyolapam, for example, the municipal agent and secretary are just 24 and 22 years old



respectively, whereas older, more experienced individuals would normally fill these positions. In addition, while the top cargos (Municipal President, Mayor, and President of the *Comisariado de Bienes Comunales*) require a certain level of education and leadership ability, the pool of well-qualified 'comuneros' has diminished over time. Comuneros talk about how difficult it can be to name the three candidates required for community elections.

Traditionally, after completing 6 years of *cargos* a comunero can 'retire' from further commitments, while upon reaching 50 years of age he is no longer obligated to participate in *tequios* (collective work days). While this is still respected in the main village of Santiago Comaltepec, it may not continue if out-migration rates remain high. For many years now, this internal agreement has been rescinded in La Esperanza or San Martin Soyolapam, where there is no longer a limit on years of service. It is quite common to find men aged 65 or older still participating regularly in *tequios* and holding down less-demanding *cargos*.

Another big change has seen individual *cargos* reduced from a three-year to a one and a half year posting. It was felt that by reducing the length of the *cargos* more people were likely to stay in the community and it would be easier to encourage migrants to return to fulfil *cargos* if asked to do so. The disadvantage, of course, is that with shorter postings there is now a quicker turnover of *cargo*-holders and less 'rest' for comuneros. Whereas one could previously expect to have a 3 or 4-year break between postings, it is not uncommon for *comuneros* to move straight from one *cargo* to another.

The cumulative effect of these changes has been to make the traditional governance system more demanding than ever before and a burden in the eyes of many community members. For the system to remain viable in the long term, some argue that further changes or modifications are required that go beyond the 'reactive' and short-term strategies adopted thus far.

Perhaps the most telling response at the community level has been the inclusion of a new article in the communal statute; setting out in writing what migrant *comuneros* are expected to do if they wish to maintain full communal rights and status. In practice, this means that *comuneros* in the USA are asked to provide monies in lieu of carrying out *tequios* and *cargos* in person. For *tequios*, this means contributing a certain amount of money each month, with a record of contributions maintained by the municipal and communal authorities. If named for a *cargo*, the migrant has the choice of returning home or paying for somebody else to carry out the role.

The authorities estimate that fewer than 50% of migrant *comuneros* in the USA cooperate with *tequios* and *cargos*. Those who do cooperate tend to be those with families living in Santiago Comaltepec, and who plan to return at some stage. For these *comuneros*, it is important to comply with obligations and maintain comunero rights. However, in the words of one respected comunero, many others who leave "se les olvida de sus obligaciones" (forget about their obligations to the community), or believe that "no me pueden obligar porque no uso los servicios en el pueblo" (they can't make me comply when I don't use the services in the village). Many who do return from the

USA end up settling in urban centres such as Oaxaca City or Tuxtepec. An additional problem is that many younger migrants leave after finishing school at 16 or 17 years of age. This is before they have officially become *comuneros* and are only 'morally' obligated to contribute monies for tequios or comply with cargos, and not obligated under communal laws.

### *Land Use Change*

Until recently, agriculture was the principal activity and livelihood strategy for most families and a focal point for life in the community. Most of the accessible land around Santiago Comaltepec, La Esperanza and San Martin Soyolapam was farmed, while people from all three localities would work seasonally at the many *rancherías* (ranches) dotted around the community's territory. For the past 30 years, however, there has been a steady reduction in the numbers working 'en campo' (in the countryside), and far fewer families dividing their time between dry and humid territorial zones. In addition, those who do plant corn, beans and other crops tend to be working fewer hectares than in the past; largely due to the reduction, or total absence, of available labour. Other factors leading to a reduction in farming include: depressed market prices for key cash crops such as coffee; and, less stable weather patterns that make planting crops a higher risk venture.

Interviews with farmers and other community members suggest that approximately 60% of agricultural lands have been abandoned over the past 30 to 40 years. In the 1940s, 1950s and 1960s, around 90% of agricultural lands were being worked, and there were

very few abandoned plots. Most families at this time worked two or three areas (in both dry and humid zones) where they would both temperate and tropical crops. When the forestry concessions began in the late 1950s, many farmers went to work for FAPATUX (one of the largest processors of lumber and paper in the state of Oaxaca, which held rights to extract timber from the forests of the Sierra Norte from 1956 to 1981) and began to cultivate less. When out-migration rates increased, this trend continued. By 1990, no more than 50% of agricultural lands were being worked. Since then, more and more 'parcelas' (plots) have been abandoned. Around the main village of Santiago Comaltepec, it is estimated that only 20-30% of original agricultural zones are currently in use.

The abandonment of agricultural areas has had a major impact on the community's landscape, slowly changing the ratio of forested to agricultural areas, and leading to a process of ecological succession in many former corn and bean fields. Generally speaking, plots still being worked are those located close to permanently settled areas, while plots furthest away from villages and access roads are the first to be abandoned. In temperate zones, old terraces, abandoned 15 to 30 years ago, are now covered with young pine- or oak-dominated forests. In La Esperanza, areas no longer used for long fallow rotational agriculture (popularly known as 'slash and burn') are at different successional stages towards a return to cloud forest. Around all three villages, forest cover has increased considerably. There are also instances where population loss through out-migration has saved existing forest from being cleared. In Soyolapam, local

residents noted that the forested hillside behind the village would have been cleared for pastureland if most of the population had not left for the USA.

Many older comuneros are saddened that young people are no longer content working in the countryside and providing for their families by means of a subsistence-based livelihood. As many admit, younger community members "ya quieren otras cosas" (now want other things) and an increasing number of families (especially in the main village of Comaltepec) are no longer growing corn or other staples but rather living off migrant remittances and buying subsidised corn from 'CONASUPO' (the name refers to the state-owned food distribution network and grocery stores that provided basic foodstuffs to the rural and urban poor in Mexico). This change has not just come about through out-migration; it is recognized by many as forming part of a larger process where television, radio, Internet, roads and other aspects of 'development' have served to connect the village with the outside world, and further integration with mainstream Mexican and North American society.

Forestry has been impacted in several ways. For one, the community has found it increasingly difficult to find local people skilled and/or willing to work in the community sawmill or its logging operations. At the moment only 15 local men are employed in these two activities. There are just two teams involved in felling trees, whereas in the 1980s and 1990s there used to be 3 or 4 teams working simultaneously. This is due to a lack of skilled chainsaw operators, which contrasts markedly with earlier years when the community had a large group of workers to choose from, the majority of whom had

received their training during the FAPATUX forest concession period. The lack of available workers is also tied to local wage inflation being driven by migrant remittances. Men can get paid more working in and around the village (building new houses or looking after migrants' agricultural plots) than they can working in the forest for the CBC. Migrants earning dollars in the USA are willing to pay local workers \$10 or \$20 pesos more per day than the daily wage (\$130 pesos) offered by the communal authorities.

*Tequios* in the forest have also been affected by the reduction in available labour. Currently, there are only 180 'active' *comuneros* in the community. There used to be close to 400. In La Esperanza and San Martin Soyolapam, respectively, there are only 40 and 19 *comuneros* available to carry out work in forest areas. Some older *comuneros* mention that not enough *tequios* are being carried out in the forest, and those that are organized are just single-day activities. In past years, it was common for truckloads of *comuneros* to head into the forest, make camp, and spend several days working on forest road-building projects, reforestation or maintaining territorial boundaries.

#### *Erosion of Traditional Ecological Knowledge*

Associated with a changing land use and fewer forest workers is a weakening of ties between community members and their territory. Despite the richness of local ethnobotanical and environmental knowledge systems in Comaltepec (Bray 1991; Martin 1993), which have formed the basis for important conservation and resource practices and institutions, a process of demographic and cultural change is leading to a

breakdown in the inter-generational transmission of this knowledge. As it does so, the number of knowledge-holders is decreasing. While there are still innovative farmers in Comaltepec – who hold extensive traditional ecological knowledge, grow a wide array of crops, and experiment with new productive resource activities (cloud forest honey, ixtle palm) – most of these individuals are over 50 years old. Their sons and daughters are invariably in the USA or studying in a Mexican city, and many are unlikely to return. Their children "ya no anden en campo ni en el monte... no lo concocen" (they don't go into the countryside or the forest... they don't know it).

## **DISCUSSION**

The community of Santiago Comaltepec is being impacted in multiple ways as people leave their homes to work and settle in other parts of Mexico and North America.

Comuneros of all ages talk of a crisis in the *cargo* system, or of a crisis that will hit home in the coming years. Currently, there are fewer than half the 'active' comuneros there were in the late 1970s.

While groups can adjust to slow changes, where enough feedback is provided about the consequences of these changes, Ostrom (2005) has noted that as variables change more quickly, institutional adaptation is made more demanding. In Santiago Comaltepec, the responses of key social institutions to demographic and cultural change have been largely reactive, and done little to encourage people to stay in their home villages. The issue of what should be done over the long term is a contentious

one, with opinion somewhat divided along generational lines. While younger *comuneros* complain of the burden and, for some, archaic nature of the *cargo* system, older *comuneros* now retired from active service still expect their sons to contribute to the community as they once did.

A particular bone of contention is the recent 'monetarization' of the *cargo* system, whereby migrant *comuneros* in the US can pay for a substitute in place of returning to the village themselves. While this is one way of dealing with the low numbers of 'active' *comuneros*, some older *comuneros* argue that paying for a *cargo* is not the same as performing it oneself. For many, it goes against the very ethos of community life, identity and participation, which is based on providing an unpaid service in exchange for community membership and benefits such as land and access to territorial resources.

### **Diversification as Adaptation**

One of the major problems faced by the community is that despite being home to an incredible natural capital, their territorial resources have not generated the commercial or economic benefits to reflect this potential. A combination of limited local employment opportunities and low wages is the principal reason why the community has suffered so heavily from out-migration. If more options were available locally, this could encourage more community members and their families to stay. Does forestry offer an opportunity to keep people at home? While an option, it is doubtful whether the community currently has the skill-base to increase logging activities dramatically. In addition, Martinez



Romero (2005) has already shown that, in the Sierra Norte, there is no clear relationship between level of community forest production and out-migration rates.

There has been limited formal discussion at a community level about out-migration, its impacts, and the appropriate long-term responses or coping strategies. One idea being debated by the current municipal and communal authorities is to encourage *comuneros* to organize themselves into work groups to develop more productive and commercially oriented agricultural activities. This, in turn, could provide investment options for migrants and a move away from a reliance on subsistence-based livelihoods. Such initiatives could generate more employment options locally, and increase farmer incomes, but they also represent a shift from individual to group level work, and a possible departure from community-level initiatives and decision-making. It is not clear where this shift to a more market-based economy would leave a customary governance system based on ideals of non-paid community service and participation.

This is a key question that gets to the heart of how communities like Santiago Comaltepec can negotiate the meaning of migration, and resolve the collective and individual tensions that such processes generate. Another area that comes into play is gender, given that *cargos* and *tequios* have traditionally been the sole domain of men. Despite the low number of 'active' *comuneros*, the community has largely restricted the use of women's labour to a few treasury and secretarial positions. This contrasts with some other communities in the Sierra Norte, where women have been given higher-level *cargos* within communal and municipal authorities. For example, in the nearby

Zapotec community of San Juan Evangelista Analco, women have held village *cargos* since the early 1990s; with six women currently working in medium-level *cargos* in the municipality and CBC.

### **Out-migration as Opportunity**

While it is suggested that the depopulation of rural areas, along with a demographic shift toward an increased average age of remaining residents, represents serious threats to natural systems and resources locally (Agder et al. 2002; Meyerson et al. 2007), out-migration may also provide important opportunities. A number of studies, for example, point to the reinforcement rather than the weakening of local institutions, and recognise that the erosion of community is not universal (Basch et al. 1994; Kearney 1995; Waterbury 1999).

The maintenance of strong socio-cultural and economic links that connect home villages with migrant communities in Oaxaca City, Mexico City and further afield may provide an important opportunity to safeguard customs and local governance structures, and finance new village projects. They may also help migrants and their children remain part of traditional community processes, so much so that new senses of belonging and ethnic and village identity are forged (after Basch et al. 1994; Kearney 1995). In Mexico, two studies have highlighted instances where demographic and cultural changes have actually strengthened community through positive changes to local systems of governance that regulate community life and management of its territory (Orlove 1999; Waterbury 1999).

In Santiago Comaltepec, the existence of strong links between migrants and their home villages provide an important opportunity to invest in adaptation. It is estimated that up to 70% of migrants from the community reside in the Greater Los Angeles Metropolitan Area. Migrant networks have helped forge strong economic and cultural ties between the two localities. Since the late 1990s, *Comaltepecanos* in Los Angeles have set up 'mesas directivas' (hometown associations) to coordinate both cultural events in Los Angeles and maintain formal links with the home community. Each of the three villages has its own mesa directiva, structured in much the same way as the traditional village authorities, with a President, Secretary and Treasurer as the main (unpaid) positions that change hands on an annual basis. Through these associations, *Comaltepecanos* in Los Angeles have been able to maintain many of the customs practised back home in Oaxaca, including the February carnival and the community fiesta that takes place each year in July.

As well as sending remittances to their families in Comaltepec, many migrants in Los Angeles send other monies to the community. This is to pay in lieu of carrying out *tequios* and *cargos* in the home village or to part-finance specific village projects at the behest of the municipal and communal authorities. This may include the improvement of basic urban services in the village (such as drainage and sanitation), the construction or refurbishment of the village temple, the purchase of computers for village schools, or equipment for the 'casa de salud' (health centre).

Adger et al. (2002) suggest that the use of migrant remittances in this way can improve social resilience by promoting diversification and risk-spreading, enhance social capital and extend opportunities for improved wellbeing. Recent policy developments in Mexico such as the *Tres Por Uno* program (whereby the Mexican government provides matching funds for community-level projects that are part-funded by hometown migrant associations in the USA) also acknowledge the importance of such contributions. In Comaltepec, the existence of strong ties between home and migrant communities provides an opportunity to encourage more migrant investment in community-level projects. For example, there has been talk of turning some *cargos* into full- or part-time paid positions. This has already happened in some communities in the Sierra Norte. Part of the money to finance this would have to come from migrants in the USA. Indeed, migrants are the most likely source of financing given the chance of limited assistance from state or federal government.

Nevertheless, while the community may believe that more money can be leveraged from migrant contributions, the migrants themselves may see things differently. For example, in neither of the three villages have migrants been asked to contribute financially to forest or conservation-related work, and there is no guarantee that they would be willing to do so. As some community members have already commented, it is by no means certain that migrants will be willing, or even able, to provide monies to finance community projects beyond the village fiestas or upkeep of the local church.

## **Implications for Forest Biodiversity**

In Santiago Comaltepec, the most obvious environmental change has been driven by a reduced reliance on agriculture, and lower overall demands on the resource base. This has led to a general abandonment of agricultural areas and a subsequent process of natural forest regeneration in old corn and bean fields. These findings fit the general theory of 'Forest Transition', previously reported upon within the context of Latin America and Mexico (Klooster 2003; Rudel et al. 2005).

Forest transition theory suggests that economic development eventually leads to forest recovery and so, in this respect, migration can be seen as playing a positive role in forest encroachment (Velazquez et al. 2003). However, and as Klooster (2003) points out, there is still uncertainty about the type and particular characteristics of forest transitions that will occur under differing socioeconomic and environmental conditions. For example, it is not clear what these changes mean for forest biodiversity beyond an obvious increase in forest cover.

In both the dry and humid zones of Santiago Comaltepec, and the Sierra Norte more generally, high biodiversity is found within working landscapes that integrate logging, agricultural and conservation areas. Berkes and Davidson-Hunt (2006) have argued that the practices taking place within such landscapes help conserve biodiversity through four main mechanisms: the maintenance of successional stages; the creation of patches and gaps; the creation of edges; and, the conservation and enhancement of

vertical diversity. Recent empirical work on resource systems managed to increase food production and farmer incomes, conserve biodiversity, and protect ecosystem services supports this view (Leakey 1999; Schroth et al. 2004; Bhagwat et al. 2005)

Interviews with local land users have highlighted how, within cultivation zones, the combination of forested and open areas provides important refuge, habitat and food to a range of fauna. In both dry and humid zones of the community's territory, many forest birds, mammals and rodents reside close to, or frequent, open areas where grains and wild and domesticated fruits are grown. The anecdotal evidence collected so far suggests that fewer birds and mammals are being seen in agricultural areas as the ratio of non-forested to forested areas changes.

While a great many elements of forest biodiversity will no doubt benefit from agricultural abandonment and new forest growth, other elements may be negatively affected. These findings support the argument that multiple components of managed landscapes should be conserved, and the 'patchy' dynamic maintained (Robson 2007). In Santiago Comaltepec, this would require the continued promotion of multi-cropping systems – combining the cultivation of staples such as corn and beans, with fruit orchards, grains and other crops – to complement sustainable forestry operations and autonomous community conservation areas (ACCAs). Of course, encouraging people to return to farming when there is little or no money in such activities would prove extremely challenging. Moreover, there is no guarantee that such a move would have any significant effect on lowering out-migration rates.

Managing for diverse conservation and resource values is an even greater challenge in areas where out-migration is reducing the number of land users and territorial ties are being weakened. While out-migration is not avertly affecting people's perceptions of the forest, there is little doubt that it is affecting the evolution and transmission of traditional ecological knowledge (TEK). Comaltepec's multi-functional land use system is based on the application of different environmental and resource practices according to ecological niche, and ethno-botanical knowledge of soils, climates, and both wild and domesticated plants (Chapela 2005, Martin 1993). This knowledge, however, is now held by a diminishing number of aging comuneros. Out-migration is both robbing the community of potential foresters and resource users, and leading to a breakdown in the traditional inter-generational transmission of TEK.

Another key management issue is that some of the labour deficits caused by out-migration are closely tied to the problem of administering biodiversity – something that other authors have alluded to in the case of sustainable forestry (Klooster 2003; Mutersbaugh 2002) and certified organic agriculture (Mutersbaugh 2004). In Santiago Comaltepec, all forests, grazing lands and water courses are common property resources and are administered by the *Comisariado de Bienes Comunales*, under the mandate of the General Assembly of Comuneros. The strict regulation of different resource uses and the existence of specific institutional arrangements have helped to control the level and type of extractive activities taking place within each of the community's forests, and have played an important role in conserving forest cover and diversity.

This system is now under multiple stresses. First, out-migration is reducing the number of 'active' *comuneros* who can take part in forest *tequios*, which are traditionally used to carry out a wide range of forest work. Second, the pool of well-qualified *comuneros* to fill high-level *cargos* in the CBC and the Consejo de Vigilancia is getting smaller. Third, out-migration impacts the community's ability (or inability) to carry out appropriate forest surveillance, monitoring and maintain a general presence throughout its large and diverse territory. One of the principal characteristics of common-pool resources is their high-excludability which, in the case of Comaltepec, concerns the physical nature of local forests that makes exclusion both difficult and costly. This is complicated by the presence of a federal highway that passes through the middle of the community's territory. While there is no apparent problem with illegal logging, there are concerns over clandestine harvesting of orchids and other highly valued plant species. La Esperanza and San Martin Soyolapam were established partly to increase the community's presence throughout its lands, improve surveillance of territorial resources and better defend communal rights. If current migration trends continue, the long-term viability of these two villages could be in doubt.

A final pressure derived from a poorly studied consequence of out-migration, concerning the reduction in duration of medium-level and high-level *cargos* from a three-year to a one and a half year term. While many *comuneros* were happy to see shorter *cargos*, there is now a much quicker turnover of communal and municipal authorities and this is affecting the quality of the work that each authority is able to achieve. This is due to several reasons. For one, there is little time for the incoming



authority to 'learn the job' and fully assume its responsibilities before having to make way for the next set of incumbents. Next, the short eighteen-month term discourages authorities from pursuing longer-term projects (that last more than 1 or 2 years) or when long-term projects are in place, there can be a problem of 'seguimiento' (follow-up) from the incoming authorities. In the context of communal forest resources, this is particularly relevant for the streams of money that are raised through participation in national and international conservation schemes; which tend to imply two to five-year commitments.

## **CONCLUSION**

It is not clear what the future holds for commons regimes in the Sierra Norte region of Oaxaca. For a long time, local communities here were held up as examples of highly successful resource management systems and considered a model for other forest regions, both in Mexico and internationally (Bray 2006; Bray et al. 2003; Merino 2004; Chapela 2005). However, these are communities that face multiple challenges as they become open to the uncertainties of globalization, transnationalism and environmental change. While some (Cohen 2004b) argue that communities in Oaxaca have been able to maintain a sense of independence and uniqueness that belies their involvement in global markets and transnational processes, this paper suggests that the ability of rural communities to balance and reinvent local traditions may be beyond cultural, social and environmental resources.

Time will tell whether traditional community governance structures can survive a process that is robbing them of their single most important asset – people. The outcome will depend largely on how community members perceive and assess the consequences of migration and engage in a process to elaborate and enforce a set of norms, rules and meanings of benefit to them and their communal resources. In this way, the study of community vulnerability to the changes brought about by out-migration must consider not only what is happening now, but perhaps more importantly, what may happen in the future.

An important component of the author's ongoing research is to try to understand communities' vulnerability to out-migration over the next 5, 10 and 15 years, and examine what communities are planning to do in the long term as a response to both current and predicted demographic and cultural changes. This work involves an appreciation that while out-migration acts as a driver of change in rural Oaxaca, it itself is responding to larger forces impacting upon Mexico, and Latin America more generally (Loker 1999; Otero 2004). External drivers such as economic growth and integration, structural change and globalization all play a key role in shaping processes at the local level. Consequently, social relations and institutions are becoming stretched across space as a community's sphere of influence crosses borders and moves beyond a single geographical locality (after Basch et al 1994; Kearney 1995, 2004). In this way, attention limited to local processes, identities, and units of analysis will likely yield an incomplete understanding of what is happening.

The implications of these changes for local conservation remain unclear. While forest cover is increasing, the effects of agricultural abandonment on those elements of forest biodiversity that reside in, or around, farmed zones are less obvious. More research is needed on the specific characteristics of forest transition theory as it relates to complex areas such as the Sierra Norte. Such work would need to consider many different aspects, including: the environmental and biological implications of a changing landscape mosaic; the reduction in local land users and foresters; and, the erosion of important ecological and ethno-botanical knowledge. Together, these changes will determine the role that local land use systems and autonomous community conservation areas (ACCAs) can play in future efforts in the region, in addition to framing the responses of external agencies and government policy.

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