

Rural out-migration and resource-dependent communities in Mexico and India

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Abstract Resource regimes are complex social–ecological systems that operate at multiple levels. Using data from two distinct cultural and environmental contexts (Mexico and India), this paper looks at the susceptibility and response of such regimes to rural out-migration. As a driver of demographic and cultural change, out-migration impacts both the practices and institutional arrangements that define territorial resource use and management. The research shows that critical yet poorly recognised shifts in migration dynamics can increase the pressures felt locally and serve to reduce the effectiveness of institutional adaptations at the community level. From an environmental perspective, the research adds to the body of work examining the impacts of rural depopulation on land and seascapes and associated biological diversity. We question the assumption that rural–urban migration necessarily simulates ecosystem recovery and aids conservation. This finding is timely as funding agencies and government programs show belated interest in the consequences of out-migration for environmental management, resource use and rural livelihoods in tropical country settings.

Keywords Out-migration · Demographic and cultural change · Institutions · Oaxaca · Orissa · Resource practice · Biodiversity

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Introduction

While resource management regimes are dynamic and able to build social–ecological resilience, they remain vulnerable to endogenous and exogenous drivers (Folke et al. 2005; MEA 2005). This research brief reports on the susceptibility and response of such regimes to demographic, cultural and environmental changes driven by rural out-migration, a process that is stretching institutions, identities and territories across space and time (Young et al. 2006; Berkes 2009). Data come from two distinct cultural and environmental contexts: temperate and humid montane forests of Oaxaca, southern Mexico, and brackish coastal lagoons of Orissa, eastern India. Discussions focus on three specific issues:

- (i) A rethink as to the notion of ‘community’, as capital, governance and identity become deterritorialised;
- (ii) Changes to existing institutional arrangements and the emergence of new institutions that stretch across geographical scales;
- (iii) A decline in the customary practices and mobility of resource users, which can drive changes in local ecology and biodiversity.

We argue that out-migration can facilitate deep-seated change in traditional ways of life, whereby migrants (and their families) become disconnected from both resource practices and the institutions of the home (or sending) community (after Bebbington and Batterbury 2001; Bryceson et al. 2000). Such shifts in social, political and economic organisation have attracted the attention of theorists studying globalisation-related interconnections and have been referred to as forms of ‘transformation’ rather than mere (localised) change (Vertovec 2004:971). Although there is considerable potential for communities to benefit from the finances and skill-sets of non-resident members (Adger et al. 2002; Cohen 2005; VanWey et al. 2005), as well as reduce local demand on the natural resource base (Klooster 2003; Grau and Aide 2007), our research shows that assumptions of this kind are overly simplistic. They both fail to consider the significance of migration patterns that can and do change over time and err in pointing to a linear and deterministic relationship between migration and the environment, disregarding the negative ecological impacts that decline in customary resource practice may lead to (after Curran 2002).

Study sites and methods

Oaxaca, in southern Mexico, is nationally and internationally renowned for its biological and cultural diversity (Smith and Masson 2000; García-Mendoza et al. 2004). The research took place in the *Sierra Norte* (northern highlands), a region where significant areas are classified as ‘extreme priority sites’ for conservation at the national level (Conanp-Conabio 2007). Zapotec, Chinantec and Mixe indigenous communities, through approximately 60 communal properties, control these forestlands. Long-standing customary systems of governance and institutional arrangements, combined with a multifunctional land use, have helped to maintain forest cover and associated biodiversity (Chapela 2005; Robson 2007). Household

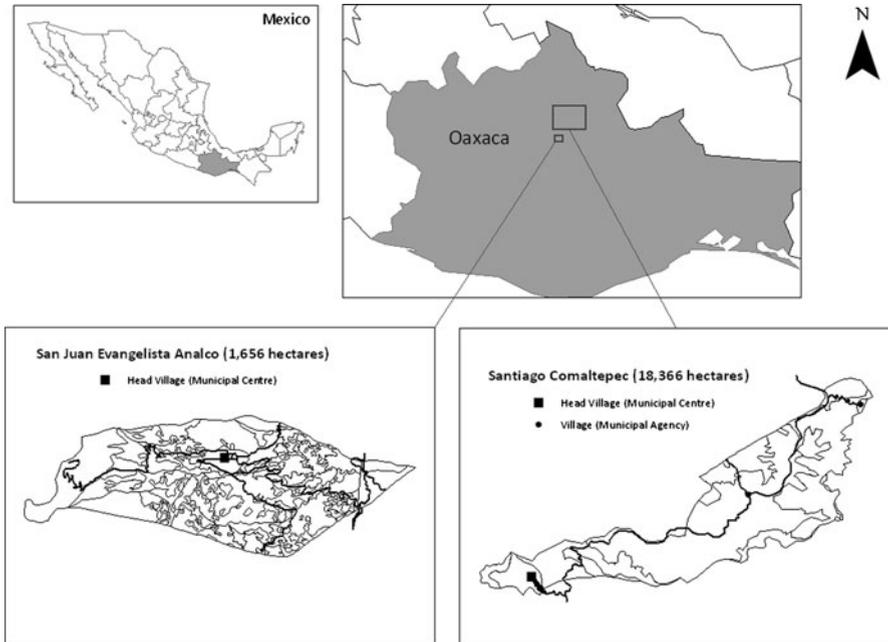


Fig. 1 Location and layout of study communities, Sierra Norte of Oaxaca, Mexico

and village-level data come from the Chinantec community of Santiago Comaltepec (**Comaltepec**) and the Zapotec community of San Juan Evangelista Analco (**Analco**) (Fig. 1). The research was interdisciplinary, which is essential for understanding the complex processes that link migration and the environment in sending communities. Methods included are as follows: (1) formal and informal interviews with village authorities, *comuneros* (common property rights-holder) and returned migrants; (2) household surveys ($N = 80$) focusing on demographic and socio-economic aspects, migration dynamics and land-use change; (3) secondary sources consulted for socio-economic and demographic data, including (i) local community census and (ii) INEGI census and population counts; and (4) territorial walking tours and mapping exercises. Principal fieldwork took place between December 2007 and November 2008, with a trip to Los Angeles in August 2008.

Orissa, in eastern India, is known for its vast natural resources and a large rural population. Research was conducted in Chilika Lagoon near the Bay of Bengal, the largest lagoon in India (Fig. 2). Chilika is a Ramsar wetland site of conservation importance, and a productive area with a fish fauna adapted to the mix of freshwater and seawater that characterises lagoon ecosystems. The shallow and sheltered waters of the lagoon are also suitable for aquaculture, especially for the production of the lucrative tiger prawn (*Penaeus monodon*). More than 300,000 fishers, belonging to specific caste groups, customarily depend upon the lagoon for their livelihoods. Participatory field research collected data over a 28-month period (2007–2009) using a mix of qualitative and quantitative methods (Creswell 2003; Johnson and Onwuegbuzie 2004). Household data come from two villages—**Berhampur** and

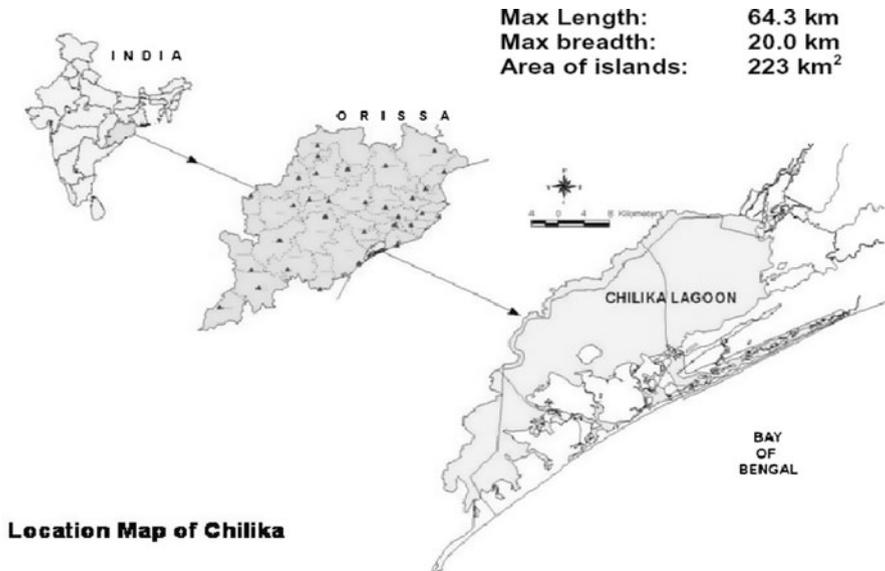


Fig. 2 Location of Chilika Lagoon, Orissa, India. *Source:* Chilika Development Authority, Bhubaneswar, India

Badakul—located in Puri and Khurda districts, respectively. Household ($N = 160$) surveys were combined with semi-structured interviews and focus groups with multiple actors (involving caste groups and women within both fishers and non-fishers categories). Monthly household-level ($N = 30$) livelihood monitoring was conducted in Berhampur and Badakul, while several community consultations and policy workshops were organised. In addition, a wider village-level survey ($N = 140$) was conducted across the Chilika lagoon region.

Results

Out-migration dynamics and demographic changes

Sierra Norte of Oaxaca

Approximately half of all household members are currently residing outside the home village (Table 1). Although there appears to be no significant difference in the

Table 1 Percentage of migrant family members and destination

Community	% of household members living outside village	% of migrants in USA	% of migrants in Mexico
Comaltepec	57	54	46
Analco	43	43	57

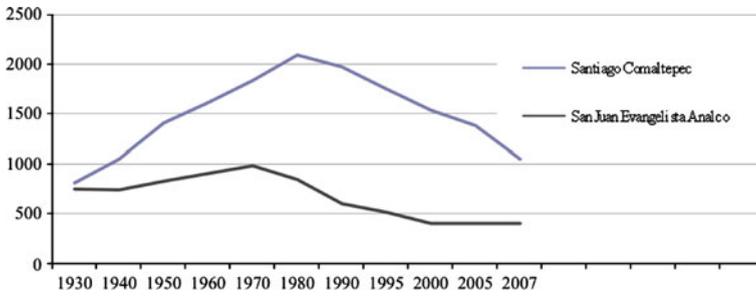


Fig. 3 Population growth and decline in Comaltepec and Analco (1930–2007)

numbers of U.S.-based and Mexico-based migrants, the trend over the past twenty-five years has been towards international migration, particularly for migrants from Comaltepec.

In both communities, local paid work provides barely enough (around US\$10 a day) to cover the costs of schooling, feeding and clothing the average family. A similar amount can be earned in one hour working as a construction worker, gardener or nanny in Los Angeles, making the pull of U.S. currency a strong one. An economic model of migration, however, does not apply to all who leave, especially teenagers who leave soon after finishing school. This supports a more ‘cultural’ explanation of migration (after Durand and Massey 2004), where a few years (or longer) spent living in *el Norte* (the North) become a ‘rite of passage’ for village youth.

Figure 3 shows the population of both communities during the period 1930–2007. Since 2000, the community’s resident population has levelled out at around 400, a fall of around 60% from its peak in the 1970s. The decline in Comaltepec’s resident population came a decade later, in 1980, but has been even more dramatic, falling from 2,096 to 1,050 during this period. The loss of community members of a productive age has had a profound impact on the age–sex structure of those left behind. As well as an overall slimming (population loss), there has been an obvious change in the number of ‘active’ residents aged 20 to 45 (especially men). While the proportion of citizens over 60 years of age has increased, the number of children under the age of 15 has fallen dramatically.

Chilika Lagoon, Orissa

Table 2 shows the number of households in Berhampur and Badakul affected by out-migration. The numbers are not as high as they are for Oaxaca, but out-migration is a much more recent phenomenon. Indeed, Berhampur has no history of

Table 2 Number of households in Berhampur and Badakul with migrant members

Community	Households with at least one migrant family member (%)	Households with no migrant family member (%)
Berhampur	54	46
Badakul	31	69

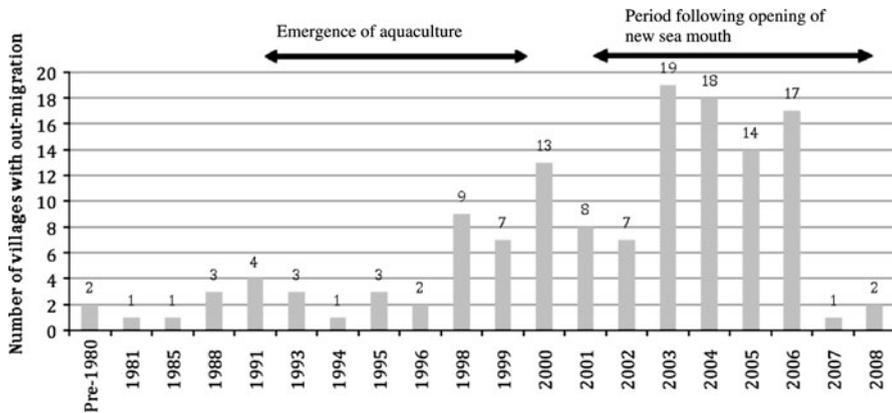


Fig. 4 Out-migration from Chilika fisher villages as linked to ecological drivers—(1) aquaculture and (2) new sea mouth (adapted from Nayak and Berkes 2010)

out-migration prior to 2001, while in Badakul most households did not use migration as a livelihood strategy before the mid-1990s.

Of the migrant households surveyed, 40% in Berhampur and 24% in Badakul stated that degradation of the Lagoon was a determining factor in their decision to migrate, while 52% in Berhampur and 31% in Badakul felt that the loss of productivity and income from the Lagoon also contributed. Poor loan arrangements and the lack of alternative employment opportunities were additional factors for a significant number of migrant households. The decision to migrate has also been influenced by a general lack of skills to engage in other livelihood strategies (available locally).

Figure 4 shows the two peak periods in out-migration for the 140 fishing villages surveyed across the Chilika region. The first occurred from 1991 to 2000 and correlates strongly with the development of aquaculture. The second occurred from 2003 to 2008 and was associated with the opening of a new sea mouth by the state government. Both were identified by survey respondents as drivers of large-scale ecological changes in the lagoon. The opening of a new sea mouth, for example, led to disturbances in the salinity regime, changes in the nature of water inflow and outflow, increasing sand infestation, invasion of sea barnacles and the sudden appearance of what local people call ‘sea creatures’.

Institutional changes

Sierra Norte, Oaxaca

Comaltepec and Analco are self-governed by long-standing customary practices (*usos y costumbres*), whereby multiple aspects of communal and municipal life are administered via the obligatory and unpaid participation of village rights-holders (*comuneros*) in positions and posts of responsibility (*cargos*) and collective workdays (*tequio*). Together, these two key social institutions form the central elements of wider community ideals of participation and reciprocity.

Table 3 Numbers of resident and non-resident *comuneros*

Community	Resident <i>comuneros</i>	Active	%	Retired	%	Non-resident <i>comuneros</i>
Comaltepec	241	158	66	83	34	299
Analco	104	82	79	22	21	240

Table 4 Number of *comuneros* per *cargo* in Comaltepec and Analco

Community	No. of active <i>comuneros</i> (2008)	Comunero: cargo ratio (2008)	No. of active <i>comuneros</i> (late 1970s)	Comunero: cargo ratio (late 1970s)
Comaltepec	158	1.90	380	5.51
Analco	82	1.55	255	4.25

Table 3 shows the result of several decades of out-migration, whereby the number of **non-resident *comuneros*** now outnumber **resident *comuneros*** in both communities, by 54% in the case of Comaltepec and by almost 70% in Analco. Because of an ageing population, a growing proportion of resident *comuneros* is over ‘retirement’ age and no longer obligated to perform *cargos* and *tequios*. As a consequence, the pool of available labour has diminished significantly. There were an estimated 83 *cargos* in Comaltepec and 53 *cargos* in Analco in 2008. If we combine the number of *cargos* in each community with the number of active *comuneros*, it is possible to calculate a **comunero: cargo** ratio and compare this with a best guess ratio for the late 1970s (when resident populations were at their peak). The findings (Table 4) are striking:

With fewer home residents to cover the collective workload, the demands made of active *comuneros* have increased very significantly, with the local governance system impacted in numerous ways. There has been a discontinuation of the traditional *escalafon* (ladder), whereby young *comuneros* start with low-level responsibilities before progressing to medium-level and top-level *cargos* as they gain experience. The age for ‘retirement’ from *cargo* and *tequio* service has been increased in Analco and the smaller villages of Comaltepec. Lastly, some low-level municipal *cargos* have disappeared from both communities, while *tequios* are now rarely used in certain areas of village life or have had to increase in number as “more is done with less”.

Chilika Lagoon, Orissa

Fishery institutions in Chilika have evolved over a long period of time and, in contrast to the key institutions underpinning resource regimes in Oaxaca, are specifically tied to the status of the resource and the nature of fishing activities that the resource can sustain (Sekhar 2004; Nayak and Berkes 2010). These multiple institutions range from village to regional-level bodies and have customarily been managed by the fishers themselves. This elaborate institutional design has helped fishers negotiate their rights and entitlements with government agencies, as well as deal with commons-related problems of excludability and high subtractability.

Table 5 Status of commons institutions (includes village fishermen cooperatives)

Current status	Number of village institutions
Functional	11
Dormant	122
Dysfunctional	3
Do not exist	4

The loss of fishery-based livelihoods has led to the weakening of these customary arrangements. Institutions at every level have been affected (Samal and Meher 2003). Specifically: (i) many of the PFCs now exist on paper only, used to secure the fishing area lease but no longer performing any of their traditional duties; (ii) the Central Fishermen Cooperative Marketing Society (CFCMS) was dissolved and replaced with a state-level bureaucratic institution called the FISHFED; (iii) once regarded the hub of decision-making, the *Jati Panchayats* (or Caste Assemblies) have been severely weakened; and (iv) once a symbol of unity amongst Chilika fishers, the Fisher Federation is currently in crisis due to internal conflicts and division into five splinter groups. In Berhampur and Badakul villages, the PFCs are dysfunctional and traditional village fishery institutions struggle because of stagnant and ineffectual leadership. The pool of potential leaders has dwindled due to population loss and because many returned migrants are no longer interested in participating in village affairs.

Table 5 shows that just 11 of the 140 surveyed villages had properly functioning fisheries institutions, which highlights how dependent commons institutions are on both the health of the resource and the ‘togetherness’ of the users responsible for crafting them.

Declining resource practices and territorial mobility

Sierra Norte, Oaxaca

While agriculture remains the main productive activity, with member families still dependent on communal lands for many of life’s necessities, this (collective) dependency has lessened in recent decades. Table 6 shows that a sizeable percentage of households now meet most of their basic food needs through the marketplace rather than subsistence farming practices.

In both communities, the area of land under cultivation has fallen to less than a hectare per household, with only a few families producing enough crops to meet domestic needs throughout the year. Out-migration has robbed households of intra-family labour to cover on-farm activities, while *mozos* (local wage labourers) are conspicuous by their absence. A decline in market prices for key cash crops, such as coffee, and unpredictable weather patterns are additional drivers (Robson 2009). As many families abandon their fields, this has multiple impacts on resource use generally. It has led to a reduction in the diversity of crops being grown. It affects the numbers collecting firewood and NTFPs, which are often harvested by farmers

Table 6 Source of food for households in Comaltepec and Analco

Source	Proportion (%) of total (per household) Comaltepec	Proportion (%) of total (per household) Analco
Food grown locally by the family	32	43
Food grown locally but not by the family	2	9
Food bought from a local market (not grown in the community)	65	38
Food acquired through trade	0	6
Food acquired as a gift or form of support	0	3
Other (specify): Government support programs	1	1

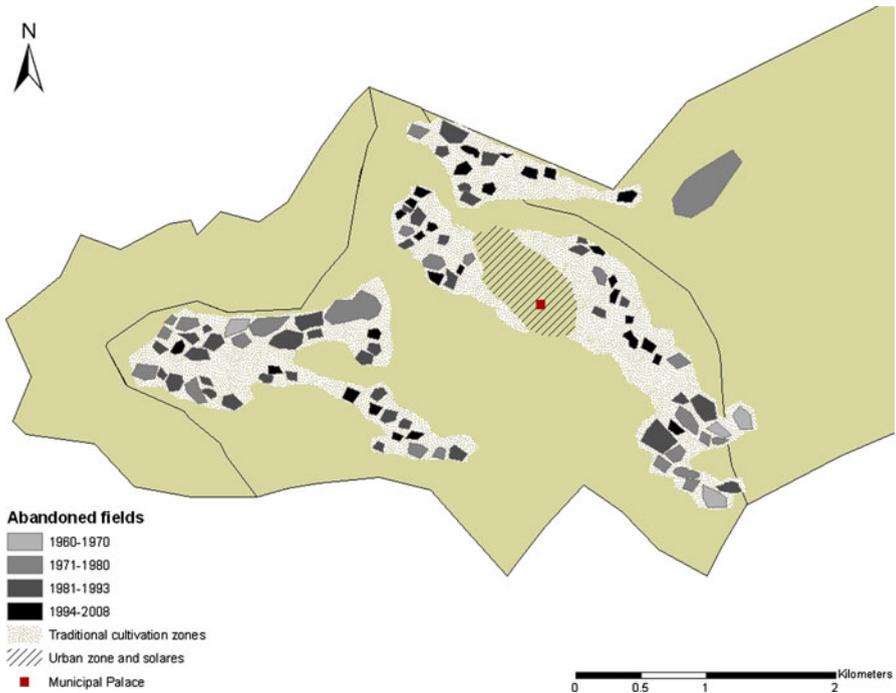


Fig. 5 Agricultural abandonment around head village of Santiago Comaltepec (1960–2008)

from patches of forest adjacent to their fields. As remaining farmers choose to work land closer to the home village, the population has become, in territorial terms, far less mobile. This is most evident in Comaltepec, where *comuneros* and their families used to work at seasonal *rancherías* (ranches) dotted around the community’s extensive lands. Today, few residents divide their time between dry and humid territorial zones.

Interviews with farmers and other land users, combined with extensive mapping work, suggest that between 50 and 60% of traditional agricultural lands have been abandoned over the past 30–40 years (Robson, [forthcoming](#)) (Figs. 5, 6). This figure

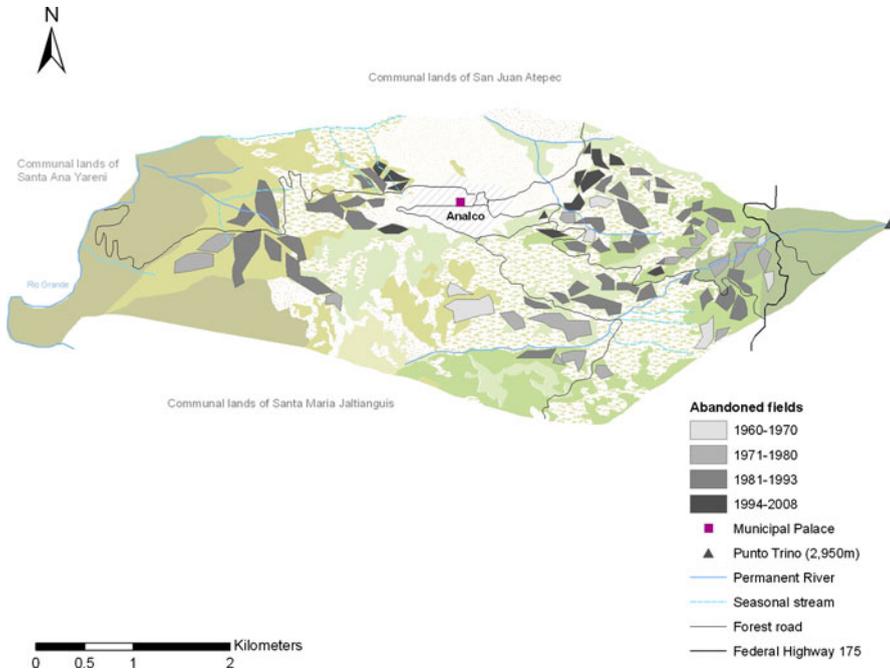


Fig. 6 Pattern of agricultural abandonment across communal territory of Analco (1960–2008)



Fig. 7 New pine growth in plot abandoned five-six years previously, Santiago Comaltepec

may be as high as 70% around the head village of Santiago Comaltepec. As previous work has shown (Robson 2009), the abandonment of agricultural areas has had a major impact on the community's landscape, slowly changing the ratio between forested and open areas and leading to a process of ecological succession in many former corn and bean fields (Figs. 7, 8, 9).



Fig. 8 Secondary forest (pine) on corn terraces abandoned in the early-mid 1980s, Analco



Fig. 9 Former farmland in southern part of Analco's communal territory now covered in stands of secondary mixed oak-pine forest

Chilika Lagoon, Orissa

Households in Berhampur and Badakul have primarily depended on fishing as their main occupation, which, for most families, has formed their principle source of income. In certain cases, fishing is supplemented by farming activities but this concerns just a handful of households in both villages. True to their local culture of 'rice and fish', the fisher households traditionally depend on the lagoon for fish as food and also fish for buying rice and other necessities. However, the economic crisis that was driven by ecological changes in the lagoon has led fishing to lose ground as the preeminent livelihood occupation.

Table 7 Importance of fishing as occupation in Berhampur and Badakul

Villages	Fishing as primary occupation (% household)		Fishing as only occupation (% household)	
	Yes	No	Yes	No
Berhampur	99	1	28	72
Badakul	87	13	24	76

In Berhampur, where the livelihood crisis is most recent, 99% of households still pursue fishing as their primary occupation (Table 7). However, income levels from fishing have dropped significantly; only 28% of households continue to have fishing as their sole occupation, whereas 72% of households have moved into a number of non-fishing occupations. In Badakul, 87% of households have fishing as their primary occupation, 24% of households have fishing as their sole occupation, and 76% of households have diversified into other activities. Some fishing practices have become redundant in areas where lots of fishers are absent. Village residents now prefer to use synthetic nets that are designed for use by individuals or small groups of fishers. Second, a growing number of households have abandoned fishing as more family members choose to migrate (mainly in Berhampur). Such patterns reflect a similar set of drivers that affect farming practices in northern Oaxaca, namely: (i) a reduced pool of intra-family labour; (ii) cultural changes affecting peoples' occupational aspirations; and (iii) limited or poor market access for resource-based products. Third, out-migration has impacted the status of customary fishing areas in Chilika (Table 8), with an 80% decrease in fishing area and a clear decline in the mobility of resource users.

This trend is likely to continue as villages become embroiled in conflict with the more powerful (higher caste) aquaculture owners who have encroached into their territories. Badakul, for example, has abandoned more than half of its customary fishing areas because of these conflicts.

Discussion

With elevated out-migration extending into a fourth decade in the Sierra Norte and a second decade in Chilika, demographic impacts have intensified, while the cultural gap between rural and urban societies has narrowed. Out-migration is speeding up many of the changes associated more widely with 'development', 'modernity' and 'globalisation', where a new generation of community members share values,

Table 8 Status of customary fishing area under impacts of out-migration

	Number of fisher villages		
	Decrease in actual fishing (lease) area	Encroachment of fishing area	Sub-lease of fishing area
Based on the actual number of responses from fisher villages who have leasable fishing areas	Yes 80	79	81
	No 7	7	3

desires and beliefs different to those of their parents or grandparents (after Bates et al. 2009). Despite clear differences in the way that out-migration has impacted the two study regions, in both Oaxaca and Chilika, we can see (i) the *detritorialisation* of traditional community spaces and identities; (ii) the continuity and emergence of institutional arrangements; and (iii) the environmental impacts of declining resource practice and use.

Deterritorialisation of community spaces and identities

In Oaxaca, the emergence of *de facto* deterritorialised communities has some profound implications for communal resource regimes whose systems of governance were designed for operation at the local level. Two contrary trends are evolving. On the one hand, new residence patterns are straining municipal and communal governance, to the point where a major concern locally is the future well-being of municipalities and their agencies as viable self-governing entities. On the other hand, while communities are weakened by migratory dispersion, they are now able to “tap and accumulate greater financial resources... from citizens living and working temporarily or permanently in the north [or urban Mexico]” (Fox and River-Salgado 2004:456). Attracting investments from migrants is one way by which communities could persist and even flourish despite the depopulation of rural areas.

The process of deterritorialisation among Chilika communities is different to the Oaxacan experience. For one, it is more cultural in nature, given that short-term, circular migration to regional destinations is still the norm. As such, rather than being driven by long-term absence, new community configurations are resulting from a general breakdown in customary arrangements. With members leaving fishing and many heading to regional urban centres, a process of cultural change is weakening the traditional notion of a ‘fisher community’, as defined by caste and occupational identity. Some migrant fishers now find it hard to express ‘who they are’ and ‘which caste or community they belong to’. Consequently, the pride felt by individuals who belonged to the fisher community has been replaced by a deep sense of alienation, where occupationally displaced fishers do not feel they belong to either world—neither Chilika nor the city where they work as wage labourers.

The findings from both Sierra Norte and Chilika support the view that communities are not static but change over time (Agrawal and Gibson 1999; Baker 2005), and that from a resource management perspective, researchers must strive for a thorough understanding of the multiple actors and their diverse interests in using shared resources, the processes by which these actors interact with one another, and the institutional arrangements that structure such interactions. Amid the shift from a traditional to trans-local arena, community making must necessarily involve distributions of social power and privilege that move beyond a bounded territorial area to incorporate migrant Diasporas, which likely involves a dialectic emerging between resident and non-resident community members. This reconfiguration further affects the excludable and subtractable nature of a communal resource base, with the meaning of ‘who is granted rights and who is not’ and ‘who is *still* eligible to derive benefits and based on what criteria’ requiring new thinking as community membership and decision-making moves across geographical scales and straddles cultural divides.

The continuity and emergence of institutional arrangements

It has been argued that community-based institutions, rather than communities themselves, create the conditions for sustainable commons management (Agrawal 2002; Nayak and Haque 2005; Nayak and Berkes 2008; Ostrom 2005). A particular focus of our research concerned the ability of institutions to renew and reorganise, learn and adapt, and deal with uncertainty and change (Holling 2001; Berkes et al. 2003).

In Oaxaca, household-level and community-level data made clear the multiple impacts that out-migration is having on the *cargo* and *tequio* systems—the institutional arrangements that are central to village life, including the administration of communal territorial resources. The *cargo* system in particular has been weakened by moderate to severe deficiencies in the offices of municipal and communal government. The decision to migrate invariably factors in community obligations, and so the growing demands of the local governance system have affected attitudes among significant numbers of community membership. These demands are themselves directly influencing migration flows to and from the community, and as the labour pool dwindles further, a vicious cycle emerges. To date, the main institutional responses have been reactive and directed towards mitigation rather than a strict attempt to manage the flow and timing of migration. As affected villages struggle to cope, their greatest hope arguably lies in the establishment and strengthening of trans-local ties, which can assist the continuity of existing customs and norms, and the emergence of new institutional arrangements. In particular, the ‘*monetisation*’ of the *cargo* and *tequio* systems—obliging migrants to provide compensation for non-participation—is an opportunity for non-resident members to provide finance for, and enhance the welfare of, the home (sending) community. However, while out-migration was once temporary or circular in nature—thereby helping to maintain a balance between subsistence production and market engagement—a form of semi-permanent or permanent migration has come to dominate over the past decade, coinciding with an increase in US-bound migration. Consequently, while trans-local institutions have emerged to strengthen cultural and productive links between migrant and home communities, Table 9 shows that as many as half of current migrant *comuneros* participate either intermittently or not at all in these arrangements.

Compared to high expectations associated with a more ‘romanticised’ view of trans-local communities (Cohen 2005; Klooster 2005; VanWey et al. 2005), the levels of actual participation are more modest, consistent with findings for other Oaxacan communities (Fox 2007). Such findings support the contention that stress

Table 9 Make-up of non-resident *comuneros*

Community	Non-resident <i>comuneros</i>	Semi-active	%	Non-active	%
Comaltepec	299	140	47	159	53
Analco	240	122	51	118	49

arises when members' "opportunity costs for participating in the commons management regime begins to diversify" (Baker 2005:34). As migration becomes more entrenched, the distribution of dependence on and interest in the collective benefits that the regime provides begins to alter, and the willingness of migrants to contribute to the material welfare of the community is diminished. Interviews with migrants showed that village fiestas receive support each and every year. Migrants are less willing (or able), however, to finance infrastructure improvements in the villages, such as drainage or school equipment, while neither community has yet been successful in requesting money from a Hometown Association for specific forest management or conservation-related activities.

Chilika, in contrast, throws up examples of institutional arrangements that have begun to fail completely, undermined by the diversification of property rights in the lagoon. Some areas within the lagoon—although managed as a *de facto* commons regime by traditional fishers—have been 'privatized' through encroachment by non-fishers for shrimp aquaculture. At the same time, the government retains its ownership over all fishing areas, thus making them *de jure* state property. Each property type implies specific forms of institutional arrangement, which complicates the administration of the lagoon commons given that the more powerful state and private institutions dominate those arrangements crafted at the community level. Out-migration from Chilika has also impacted regime leadership. Elders are particularly concerned that the declining involvement of young fishers is severely weakening the strong and reciprocal relationships that existed among the different village institutions. The breakdown in institutional arrangements has prompted the state government to place more of the lagoon under its control, through the establishment of protected areas, which further reduces customary fishing areas, replacing fishery cooperatives with higher-order bureaucratic institutions, and other types of restrictions. Concurrently, private interests (from aquaculture owners to tourist operators) are taking advantage of the situation to increase their sphere of influence. With more fishers becoming migrants, there are far fewer voices at a community level to counter these competing claims. As in Oaxaca, a vicious cycle emerges. To date, there has been little or no evidence of institutional adaptation in Chilika, largely because the region's fishery institutions are intimately tied to resource condition, such that ongoing declines in fishery productivity have led many to lose purpose and function, and thus make appropriate institutional adaptations difficult to design.

The environmental impacts of changing resource practice and use

Conventional models tend to draw a linear and deterministic relationship between the environment and migration: migration to places where there is available land and out-migration in response to limited environmental resources in sending areas. As Curran (2002) explains, such models are limited because they do not consider how varying forms of migration or social variables associated with migration can lead to different impacts on the environment through modifications to territorial land

use and resource practice. In both study regions, the ability of local communities to effectively manage their forest or lagoon resources has been weakened as:

1. Migration draws labour away from, and increases the opportunity cost of, customary resource activities.
2. The management of communal resources and claims for use-rights are affected by a diminished territorial presence, substantial off-farm and off-lagoon mobility and (in the case of Oaxaca) the long-term absenteeism of village rights-holders.
3. The rules and norms in place to regulate the appropriation of territorial resources become less and less relevant as fewer local people work in the countryside.

In the Sierra Norte, lower overall demands on the resource base, agricultural abandonment and forest resurgence are driving a myriad of environmental changes at the local level. It would be quite wrong, however, to assume that such changes constitute a classic win–win scenario for biodiversity conservation. Although these findings fit the general theory of ‘forest transition’¹⁵, as previously reported within the context of Latin America and Mexico (Klooster 2003; Rudel et al. 2005), there is still uncertainty about the type and particular characteristics of transitions that will occur under differing socio-cultural and environmental conditions. The region’s impressive biodiversity is found in a mosaic of forest and cropland, with high environmental variability along steep altitudinal gradients. While anthropogenic disturbance can be described as chronic, widespread and increasing in intensity in many parts of Mexico (Challenger 1998), in the Sierra Norte, a combination of low-intensity logging, rotational (*milpa*) agriculture and other small-scale resource practices has produced pronounced spatial heterogeneity in forest structure and composition (Rey-Benayas et al. 2007; Robson 2009). The ratios between these different vegetation categories are now in a state of flux, with out-migration initiating a process of ecological succession on a scale unheard of previously. Del Castillo and Blanco-Macías (2007) found that the relationship between agricultural disturbance and species diversity in southern Mexico to be non-linear, with diversity displaying maximum values at intermediate intensities of disturbance. The same authors concluded (2007:174) “a maximum diversity is likely to be achieved in situations in which agriculture is neither very frequent nor very uncommon in both time and space”. In this way, large-scale agricultural abandonment may lead to a scenario of lower rather than higher environmental variation, which would imply negative as well as positive implications for biodiversity at the landscape scale (Newton 2007).

At first reading, the relationship between out-migration and the environment in Chilika matches more conventional models, with ecological degradation a major factor in the decision of local people to leave their village and a fishery-based livelihood. Yet the removal of fishers and the weakening of sustainable fishery practices are themselves leading to important consequences for the lagoon ecosystem. In this region, customary fishing practices are caste-based, season-based, species-based and location-specific. Each caste of fishers has traditionally used different fishing gear and methods to fish in different locations, which was determined by customary norms. There was clear agreement on what to catch,

where to catch it, during which season and the particular fishing technique to be used. Thus, fishing methods valued the importance of maintaining a healthy lagoon system for resource sustainability by focusing on the seasonality of the lagoon and its species. A number of these methods require the collective action of a large group of villagers and rules by which villagers are able to fish together and also apportion the catch equitably. The changes brought about by out-migration have meant that most of these fishing practices have since changed considerably, with a diversity of customary practices and techniques slowly being replaced by more modern methods and technologies using synthetic gillnets and trammel nets. Moreover, fishing has become an individual activity, in contrast to earlier times when a large group or sometimes the whole village was required to fish—a form of collective action more conducive to commons management than the individual behaviour increasingly evident today.

Although a number of studies have highlighted changes in the ecological character of Chilika lagoon (Ayyappan and Jena 2000; Sutaria 2009; Dujovny 2009), it is difficult to make an exact quantitative assessment of fish stock and catch to substantiate the level of lagoon degradation. However, a qualitative assessment of the nature of changes in the environmental, economic and political status of the lagoon and its fishers, before and after out-migration began, has been carried out by Nayak and Berkes (2010) and concluded that the yields of important fish species and fishers' incomes have both declined, and this decline has been serious enough to make fishing livelihoods no longer viable in some villages. In Chilika, therefore, linkages between environmental degradation and out-migration may be understood as a two-way process. With a third of adult fishers displaced from fishing, the political voice of fisher collectives weakened and marginalised in the face of increased pressure from powerful aquaculture groups, and customary fishing areas losing ground to shrimp aquaculture, there has been a severe impact on the lagoon's diversity of native fish species and overall health (Fig. 10).



Fig. 10 Aquaculture development is, along with a new sea mouth, a major driver of ecological change in Chilika, with severe impacts on the socio-cultural and economic life of fishers

Driving transformations in customary ways of life

In the context of our research, we consider the ‘transformation’ of customary ways of life as disconnection between people and traditional resource-based activities, as well as community, through non-participation in locally devised institutions (rules-in-use). In this way, for transformation to take place, there needs to be disconnection between migrants and *both* of these key aspects of traditional commons regimes.

In the Sierra Norte, the evidence suggests that out-migration is now self-sustaining and likely to remain a key livelihood option for local people for the foreseeable future. As recent theoretical and empirical work has shown (Durand and Massey 2004; Portes and DeWind 2007), when social networks are established, migration can develop a momentum of its own that is particularly hard to slow. In many villages, young men and women now *expect* to migrate, and many do not return. Close to half of current migrants no longer participate in (trans-local) institutional arrangements or comply fully with community-set obligations, which means that a sizeable number of migrant families have forfeited their communal rights, and thus, see their long-term future outside the home village. These findings thus point to the significance of the shift from temporary to permanent migration and show that rural–urban migration is not simply a diversified livelihood strategy to obtain cash income, to be achieved without suppressing local productive practices or dissolving traditional customs. The Chilika case is perhaps less informative because of its much shorter history of out-migration. However, similar patterns are emerging, with out-migration facilitating the physical separation of fishers from their resource base, as many abandon fishing as a culture-based livelihood and breach customary linkages with commons institutions. There are ever-increasing numbers of absent fishers, which will have lasting consequences for resource-based livelihoods and the institutional arrangements that govern them. In this way, current trends do point to customary ways of life undergoing transformations from an initial position of diversification. While male members migrate, the women and children left behind do not fish and so the family’s involvement in the community’s institutional processes comes to an end.

While transformations of this kind are most evident among long-term absentees (and their families), similar processes are beginning to emerge among non-migrant resident families that are adopting attitudes and lifestyle choices that take them away from traditional occupations and potentially lessen overall interest in community ideals. In particular, only a handful of the young people interviewed in either study region are contemplating a life working the fields or fishing the lagoon as their parents and grandparents did. In all study communities, older residents are concerned that there will be nobody willing to assume future management responsibilities and ensure the continuance of long-standing resource activities.

Conclusions

This study has shown that demographic, cultural and environmental change through out-migration can alter the configuration of institutions, capital and values that

characterise traditional resource-dependent communities and does so while moving away from a 'bounded' community to one that functions across multiple levels.

In northern Oaxaca, common property regimes are organised around rotating, unpaid service commitments, which are a requirement for community membership. High rates of out-migration make it difficult to fill civic and communal posts, placing these institutions under great stress and posing a serious question mark against the future viability of the customary governance system. While the increased capabilities of migrants can help stimulate community economy and better defend local autonomy, such an argument is highly contingent and dependent upon histories, cultures and geographies, in addition to variation in migration processes and flows. As international migration continues and becomes less temporary or cyclical in nature, the demographic centre of gravity is shifting away from bounded communities and into the populations of trans-local communities, where long-term absence affects migrants' willingness to participate in community institutions and invest in community economy.

In Chilika, fishers are leaving their villages as a result of economic factors driven primarily by ecological changes in the lagoon. This constrains their ability to reconnect to customary resource-based practices, and a limited skill base leaves residents with fewer options to secure alternate livelihoods locally. In addition to driving further ecological degradation and change, out-migration has contributed to the confusing blend of property rights now attached to the resource—muddying the waters to such an extent that managing the lagoon as a commons has become less viable. The village committees—among the few institutions not explicitly tied to the resource base—have the potential to respond to some of these challenges. However, even if that was possible, the external drivers (international shrimp market, government conservation policy, state and regional-level political dynamics) to which out-migration is responding, remain beyond the capacity of local people to influence.

Our findings point to transformative changes in the attributes that characterise the management regimes of traditionally resource-dependent communities and that this can happen irrespective of differences in geographical, cultural and environmental contexts. In both Oaxaca and Chilika, communities of practice (after Lave and Wenger 1991) are shifting from farming or fishing-based activities to off-farm and off-lagoon activities that are more often than not located outside the bounded community territory. The ecological implications are profound and, in some cases, unexpected. In Oaxaca, while changes in land use are leading to significant increases in forest area, the biodiversity impacts will likely involve a decline in both the spatial heterogeneity of forest vegetation and species diversity along environmental gradients. In Chilika, meanwhile, it is a switch from traditional to modern fishing methods, the relatively unopposed encroachment of shrimp aquaculture across customary fishing areas, and the mix of property right arrangements that have all contributed to social and environmental degradation in the Lagoon system. Such observations contrast with the assumption (Grau and Aide 2007) that rural–urban migration stimulates ecosystem recovery and enhances biodiversity locally. This is critical from a policy perspective given how little research had been conducted to

date on the consequences of out-migration for environmental management, resource use and rural livelihoods in tropical country contexts.

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