

The COMMUNITY
FORESTS *of* MEXICO

Managing for Sustainable Landscapes

Edited by DAVID BARTON BRAY,
LETICIA MERINO-PÉREZ, *and* DEBORAH BARRY

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CHAPTER 5

Indigenous Community Forest Management in the Sierra Juárez, Oaxaca

FRANCISCO CHAPELA

In this chapter, the experiences of communities living in the Sierra Juárez, also known as the Sierra Norte of Oaxaca, and in particular communities that organized themselves into the Unión de Comunidades Zapoteco Chinanteca (UZACHI) will be examined. This organization consists of three Zapotec communities and one Chinantec community. Each one of these is autonomous and has its own internal governance mechanisms. Together, they created UZACHI to be a regional body, a union, to support the management of their forests and to face common problems collectively. This is an opportune time to carry out an evaluation of UZACHI, which was established 10 years ago. Such an evaluation can help identify lessons that can be applied to the design of future institutional arrangements that support sustainable natural resource management and rural development policies. The history of UZACHI will be placed in the context of the larger struggle of Oaxacan indigenous peoples to regain control of their land and their resources after the Spanish Conquest. The concepts of natural and social capital will also be employed to help illuminate some contemporary dimensions of UZACHI's success in community forest management.

The Mexican state of Oaxaca is located in a region with great natural endowments favoring the development of community forestry. It is located in southern Mexico, where mountain chains running from the coast of the Gulf of Mexico converge with those from the Pacific Ocean. The confluence of these two mountain systems resulted in an abrupt topography, producing a range of climatic variations and microclimates. The geology in this part of Mexico is very complex, and consequently is home to a very wide range of soil types. One can find within Oaxaca practically all the main ecosystems and vegetation assemblages found in Mexico. In fact, the list of plants and animals in Oaxaca is the most extensive in Mexico, famed for its high level of biodiversity.

Cultural Diversity and History

This great variation in natural environments has impeded the use of a single model to manage natural resources. Instead, through cultural evolution dating back 10,000 years, local Oaxacan communities have developed traditional techniques to adapt to the microenvironments typical of the state. In addition, cultural heritage has developed unique aspects in each of the 15 ethnic groups found in Oaxaca, adding an important dimension to the state's diversity. Thus, the traditional natural resource use patterns of the Huaves, Mazatecos, Zapotecos, and Chinantecos, as well as many others, show important differences even though they sometimes share similar environmental conditions.

The enormous variation in geography and cultures has historically limited large-scale exploitation of the state's natural resources. During Spanish colonization, only those valleys that could be irrigated or sustain livestock were occupied by Spanish haciendas, with the indigenous peoples being pushed up into the mountain slopes, where they further adapted traditional technologies, organizational systems, and resource management institutions. The Spaniards demanded payments from these local communities, but the traditional management systems were maintained. Although the indigenous territories were not officially recognized, the size of their territory was used as the base to determine the tribute to be paid to the crown representative.

When the country began fighting for independence in the first two decades of the nineteenth century, indigenous communities were under the control of the central government, while maintaining autonomy in technical and productive areas. In the second half of the nineteenth century, the liberal party promoted the creation of new property rights in Mexico with the objective of "modernizing" the rural sector. These policies failed to recognize the territorial rights of indigenous communities, meaning that the majority of Mexico's indigenous population began the twentieth century without the legal right to use their own territories. Traditional management systems broke down in many parts of the country. In Oaxaca, however, the resilience of many traditional institutions and organizations, along with the physical difficulties of establishing a state-led system of natural resource exploitation, allowed for the persistence of traditional resource management systems. Throughout the twentieth century, Oaxacan communities fought for the reestablishment of

their traditional territorial rights. The availability of colonial tax documents, known as *títulos primordiales*, was their strongest argument for the devolution of territorial rights. These struggles by Oaxacan communities and the frictions they caused with neighboring communities due to unclear boundaries generated innumerable conflicts throughout the last century across all the 570 municipalities in Oaxaca.

However, the majority of Oaxacan communities have started the twenty-first century with a reconfirmation of their territorial rights, and the history of their appropriation of forest management and timber production is the best example of how they have regained rights over their natural resources, adapting traditional governance structures and institutions to this new task.

Natural Capital and Social Capital

As forests and clean water become scarcer, the concept of natural capital has emerged to recognize the economic value of biological resources. Environmental economists have observed that conventional economic theory and analysis fail to internalize the environmental impacts of economic production. Realities such as the contamination of the environment or the exhaustion of the natural resource base are rarely incorporated into private-sector accounting systems. To have a more realistic picture of the economic situation, we must add to conventional accounting figures data that reflect more comprehensively the flows of wealth, not just cash and physical capital, but also *natural capital* (such as forest stocks, seeds, or soils). With this, one would have a more realistic picture of the economic situation. The unsustainable exploitation of natural capital makes a country poorer, not richer, in the long run (Daly 1993).

From an environmental economics perspective, a community forest enterprise (CFE) management plan should seek to increase levels of capital through the accumulation of machinery, equipment, and infrastructure, while also increasing the value of the natural resource base. Similady, Ostrom and Ahn (2001) noted that education and technical training are forms of investment in human and social capital, with the objective of improving long-term productive capacity. Ostrom and Ahn also see the cost of time and effort in creating an organization as an investment in social capital. These organizations can then set objectives and establish rules that can improve the economic competitiveness of the CFE or

intercommunity organization, and, therefore, they can be considered social capital.

Within this conceptual frame, the UZACHI struggle can be viewed as a movement that responded to a concern of local indigenous communities to preserve their natural capital and increase their human and social capital, thus increasing their financial capital and cash flows. This does not mean that the people of UZACHI now all have cars and VCRs; rather, as a result of investments in social, human, and natural capital, they are able to provide their families with a decent way of life, demonstrated by life expectancies, literacy rates, and numbers of professionals that are well above the average for Mexico.

The Struggle to Halt the Destruction of Natural Capital:

From Concessions to UZACHI

Halfway through the twentieth century, the majority of Oaxaca's local and indigenous communities had yet to secure the full reinstatement of their territorial property rights. Then in 1956, despite many communities being in the middle of the political and legal process of renegotiating these rights, the government decided to administer the communities' forests as if they were public resources. Responding to the dominant institutional schemes of the time, the government awarded concessions to forestry companies in exchange for a stumpage fee (*derecho de monte*), which was administratively fixed far below the market value. Further, the concessionaire then controlled all activities in the forest, totally alienating the communities from their own forests. Thus, there was no incentive for the communities, government, or the concessionaire to make investments in the forest. In the case of Oaxaca, the region of the Sierra Norte was given as a concession to the paper company Fábricas de Papel Tuxtepec (FAPATUX), while the Sierra Sur was given to the company Bosques de Oaxaca, which had a plywood, board, and veneer factory. The responsibility for the elaboration of forest management plans fell to a forestry engineer who was contracted by the companies under authorization from the government. In this way, over 3.4 million hectares of Oaxacan community forestlands were given out in concessions from 1941 to 1978 (SARH-SFF 1980).

The latest struggle for the rights of indigenous people over their land and the disposition of their forest resources began at the end of the 1960s. This was manifest by the struggle of 15 communities, led by San Pablo Macuilianguis, which refused to sign the logging contracts

and launched a boycott for higher salaries, increases in stumpage fees, investment in roads, and fulfillment of promises like scholarships for children. It is revealing that these communities did not yet envision managing and logging the forests themselves. A *comunero* in Macuilianguis said of this period: "We seem like workers and not owners of the forest. That's why we have always had a rebellious position with respect to the enterprise since it carries away all our wealth and our sweat and doesn't leave us anything . . . we are the most beaten down, while those that work for the enterprise, the workers as well as those that have their confidence, earn triple what we take out" (Alatorre Frenk 2000:59). The Unión de Pueblos Abastecedores continued its strike for six years before FAPATUX finally ceded to some community demands.

These forest struggles can be linked to other movements of the period and to the confluence of rural and urban struggles in Mexico in the 1970s and 1980s. The 1968 university students' movement in Mexico sparked the reappraisal of many issues, such as the role of peasants in modern Mexico and the relationship between urban and rural areas. León Jorge Castaños, a former undersecretary for forests and wildlife and one of the foremost supporters of community forestry in Mexico, believes the 1968 movement to have been an important event for community forestry in Mexico:

The 1968 students' movement made many people aware of their social commitment. It broke down silences and official monologues, and led the 1970-1976 Federal Administration to introduce a number of operational initiatives that provided real support for urban and rural social causes. . . [At the same time] some other movements and independent peasant struggles were developing, typically made up of peasant communities upset with the way they had been treated in the past and adamant that they would reject the presence of any concessionary business that would work against their interests in the future-as happened in Northeast Durango and in the South and North Oaxacan Sierras. (Castaños 1999).

The "democratic opening" under President Luis Echeverría (1970-76) led to a political divide, where the government shifted from a "Soviet" model, with only one effective state party, a welfare state, and very strong political leaders, to a new competitive and more plural political system. One of the manifestations of this was the relative empowerment of rural

forest communities in the early 1970s. The democratic opening gave renewed hope to rural groups that believed that, if community organization was promoted and given enough support, long-term progress could be achieved in Mexico. In contrast to the non participatory form of national development of the 1950s and 1960s, which led to the 1968 crisis, new approaches saw rural communities as the main actors in a process of sustainable national development.

Forest communities took full advantage of the historical moment. For the first time, they had the chance to talk directly with the government about their property rights, which had been recognized in principle after the revolution, but which were almost forgotten during the post-World War II economic expansion. Now local communities began demanding full recognition of their property rights and the right to control their own forests. Community empowerment, the crisis within state-owned forestry companies, and the increasingly visible technical constraints of the concessions regime, led communities to switch from asking for better work conditions or wages, as in the late 1960s, to demanding that control over the logging business be handed over so that they could create their own CFEs.

Another important institutional change that contributed to set up the scenario for the development of community forestry was Mexico's decision in 1976 to enter the GATT¹ agreement and pursue a Structural Adjustment Plan (SAP). Under this SAP, state-owned companies were to be sold or closed if possible. Taking advantage of this, Oaxacan communities suggested that --if state-owned companies were being closed down-- the communities themselves could take care of forest management in their territories, thereby regaining control after their natural resource base.

In 1981 the concession period for FAPATUX in the Sierra Norte and Bosques de Oaxaca in the Sierra Sur expired. By 1979 the companies had already begun to lobby the government for another 25-year concession period, but there was a growing awareness in the communities of just how much they were losing from the concession scheme. By 1980, the forest communities of Oaxaca formed a mass social movement, with regional communities ready to protest the renewal of the concession and concerned about the preservation of their cultural and natural heritage. In the Sierra Norte, the Organización para la Defensa de los Recursos Naturales y el Desarrollo Social de la Sierra Juárez (ODRENASIJ) coordinated mass protests involving more than 30 communities. Simultaneously, other communities from the Sierra Sur

mobilized themselves to successfully deny an extension of Bosques de Oaxaca's concession. In the Mixe zone, the Coordinadora para el Desarrollo de la Región Mixe (CODREMI) was formed, involving the participation of some 60 municipalities from the Mixe indigenous group; in the isthmus region the Unión de Comunidades Indígenas del Istmo (UCIRI) was formed, made up of 30 local communities.

It quickly became evident that the communities would need professional support. They recruited professional sons of community members and a lawyer to help take legal action against the forestry concession decree. They also sent delegations to the National Autonomous University of Mexico (Universidad Nacional Autónoma de México; UNAM), the Autonomous Metropolitan University (Universidad Autónoma Metropolitana; UAM), the Autonomous University of Chapingo (Universidad Autónoma de Chapingo; UACH), and the National School of Anthropology. In this way the communities made contact with a group of graduates from the UAM, who, over the following years, developed the technical aspects of a community-based forest management program. From this initial group, Estudios Rurales y Asesoría Campesina, A. C. (ERA), was formed. ERA identified two possible options for dealing with the needs of the communities. One was to directly resolve, as professionals, the technical problems in forest management. The second option was to form a technical corps within the communities that would be given the support necessary to find the technical solutions themselves. ERA opted for the second approach and developed a range of formal training activities to develop a body of qualified and skilled community members. They did not identify their goal as "developing human and social capital," but this is in fact what they were doing.

Disquiet and unrest with state-owned companies grew steadily; concessionaires were no longer seen as the vanguard of progress but as entities that were destroying the community's natural capital. This increased tensions and led to demonstrations against the state companies in Oaxaca. The Mixe carried out militant demonstrations against FAPATUX, demanding its removal from community territory (Castro 1985). The communities that would later compose UZACHI struggled for the right to use the forests in their territories (Bray 1991).

Unsurprisingly, government officials did not support changes in the institutions of the forestry sector. However, such was the scale of social mobilization that it forced institutional changes within the national forest sector. Thus, a new forestry law was passed on 19

December 1985 (Díaz 1985) and published in early 1986 (see also Merino-Pérez and Segura-Warnholtz, this volume). This new law accepted that, under regulation by the forest agency, a private, professional team in the employ of the communities could develop the legally required forest management plans, instead of the Forest Service (Ley Forestal 1986). In spite of its limitations, this law helped to dismantle paternalist structures and opened up opportunities for more participatory forest management approaches, particularly the organization of unions of communities that banded together to provide their own forest technical services and management plans, as in the case of UZACHI.

A second big institutional change came on 6 June 1986, when the Forest Commission was created under the leadership of León Jorge Castaños (*El Herald*o, 6 June 1986:5). The commission was given the goal of coordinating forest initiatives in the public and private sectors, rather than making the decisions by itself, as the Forest Service had done. This new approach contrasted sharply with the ideology of the omnipresent Forest Service, limiting government intervention to the role of referee over non government initiatives. In Castaños's (1999) words, "All this was done to put an end to the damage and problems associated with logging bans, concessions and [state] companies, and to put the focus back on the [natural] resource owner."

The forestry unions that were formed after the 1986 law quickly moved beyond labor demands to demand greater control over forest resources and industries. They developed their own technical staff and their own forest management approaches. In addition to the two objectives of constructing technical capacity and forming a regional forestry management and negotiating body, there was also the question of addressing past mistakes. If UZACHI was to successfully obtain and maintain control over regional forestry production, it would be a mistake to reproduce many of the unsustainable logging practices carried out by the state forestry company. The restoration of communal rights was UZACHI's principal goal; the goal of more sustainable logging practices developed over the next decade, with the explicit aim of increasing natural capital. Thus, UZACHI began to view forestry not from a short-term business perspective but from a communal one, where the well-being of the next generations is seen as being just as important as that of the current one. Community led foresters developed a new approach in UZACHI's 30,000 hectares, most of which was forested, with some interesting features. For example, land use planning addresses community needs in a

comprehensive way. This means that the objectives of crop production for subsistence, availability of pasturelands, and maintenance of wildlife areas are as important as the objective of wood production. The paper mill urgently needed raw materials, so their management objective was to get them at any cost. For communities, timber production is a means to get cash, but is not the only use of the forest. There are areas suitable for timber production, while others are dedicated to water catchments, wildlife refuges, or non-timber products areas. Forest improvement is as important as timber extraction. Because one explicit management objective is to assure that future generations inherit productive forests, extracted volume leads to current well-being, and improvements to remaining stands leads to future well-being. Forest management under community control also eventually led to a transition out of the Método Mexicano de Ordenación de Montes (MMOM; Mexican Method of Forest Management) to a more flexible system called the Método de Desarrollo Silvicultura (MDS; Silvicultural Development Method). Among other things, MMOM did not allow sufficient space for the regeneration of pine, encouraging a transition from pine forests to oak forests, and reducing the commercial value. MDS opens larger spaces, encouraging pine regeneration and preserving the genetic quality of the forest. It is recognized that to manage a forest is to manage a complex ecological system, where no effective control can be achieved by merely controlling for some simple variables such as minimum cutting diameter or maximum allowable volume. An adaptive management approach is used instead, where monitoring and evaluation are important tools to keep the management system directed to the main strategic objectives.

Community Forest Management and Circles of Interdependence

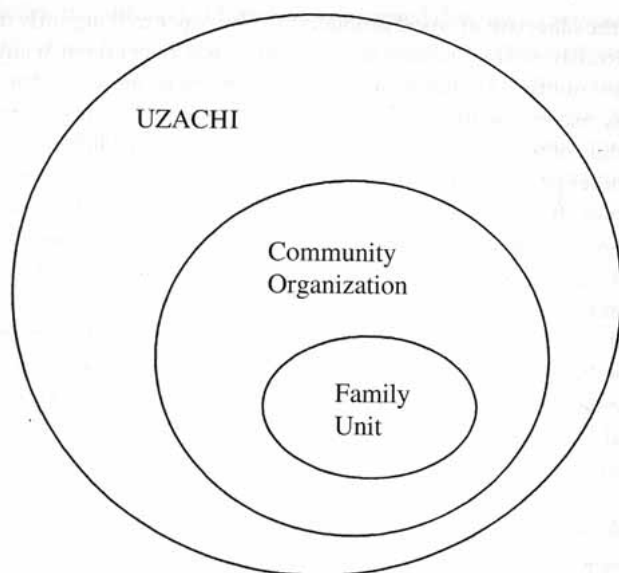


Figure 5.1 Organization levels and interdependence.

Community management of natural resources takes advantage of family, communal, and regional organization, forming a system in which the three levels of organization mutually depend upon each other in what may be thought of as circles of interdependence, as illustrated in Figure 5.1.

The family remains the basic unit of production in the forest communities of the Sierra Norte. It

is at the family level that basic subsistence and income-generating activities such as agricultural production and wooden arts and crafts are carried out. Individual family members may also work as employees in the CFE, and the family member who is a registered *comu-nero* can help make management decisions about the forests and other community properties through the General Assembly. Beyond the family level are the networks of extended families, or *guelaguetza*, whereby various families engage in labor exchanges that may include food or cash for the most demanding agricultural work.

The basic forest management decisions are made by each community's General Assembly. Such decisions may include the definition of those areas of the community territory that are devoted to agriculture, commercial forestry, and wildlife, along with rules to regulate the collection of firewood, the grazing of livestock, and other land uses. The General Assembly also determines forest management issues such as reforestation practices and CFE issues such as how much of the annual authorized volume to cut and decisions concerning the sawmill. Figure 5.2 shows the structure of relationships of the CFE within the community and the external relationship with ERA, the NGO that has supported them since the late

1980s.

In the majority of issues related to natural resource management, the local community governance structures have been effective, making decisions efficiently on issues such as the definition of rules governing access to forest resources, the planning and construction of road networks, the production of sawnwood, and the obligation of community members to participate in forest protection. A form of community labor service known as the *tequio* is the vehicle whereby community members contribute to the maintenance of community infrastructure such as libraries, health clinics, and potable water systems. It is now also used to maintain logging roads.

Today, UZACHI is composed of the four communities of La Trinidad, Santiago Xiacuí, Calpulalpam de Méndez, and Santiago Comaltepec. As is shown in Table 5.1, the four communities together have 23,125 hectares of their total surface area of 28,978 hectares in permanent forest estates for the sustainable management of forest production.

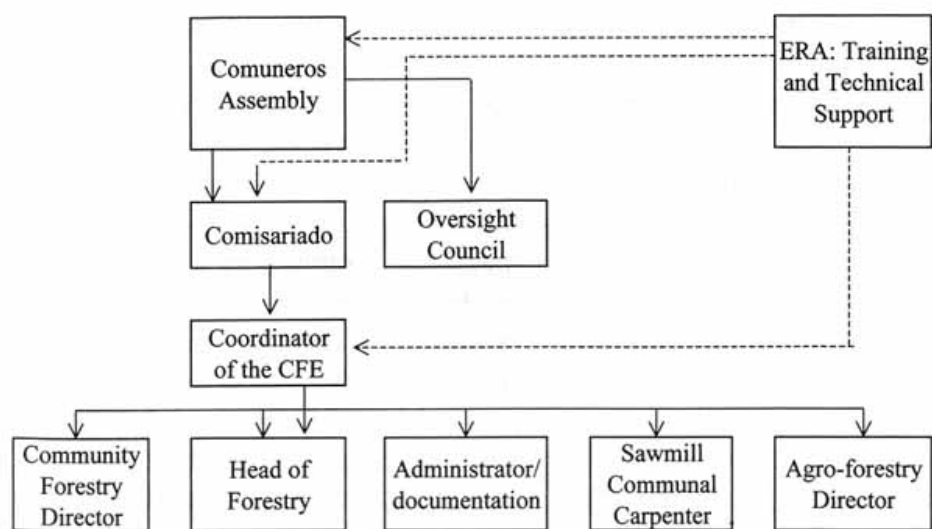


Figure 5.2 Organization of a community member of UZACHI.

It is the responsibility of the technical team of UZACHI, headed by the university-trained forest technical director (a community member since 1990), to develop forest management plans for each community, following the guidelines of each assembly and of Mexican law. UZACHI has also developed a regional training program and has begun another program to support the development of agroforestry systems. In addition, it has started a research program with the participation of various academic institutions, along with a biodiversity and

carbon sequestration development program.

The organizational chart of UZACHI is shown in Figure 5.3. The most important union decisions are made in the Asamblea de Delegados. Each community names four delegates to participate in this Union Assembly. In addition, the president of the Comisariado de Bienes Comunales joins the participants. In both the union and the communities, representatives and delegates are elected every three years, with no consecutive terms. The personnel responsible for technical areas, like the forest technical director and the union's program coordinators, along with the forestry chief or manager of each of the community's sawmills, are kept on or changed depending on the decisions of the newly elected representatives.

Table 5.1. Area of the UZACHI (ha)

	<i>Total</i>	<i>Agriculture/ livestock*</i>	<i>Forest</i>
La Trinidad	913	189	724
Santiago Xiacuí	2,229	462	1,767
Capulalpam de Méndez	7,470	2,083	5,387
Santiago Comaltepec	18,366	3,119	15,247
Total	28,978	5,853	23,125

Source: UZACHI, 1993

**Note:* Area includes zones under temporary agriculture, pastoral zones and secondary forest created through agriculture or the extraction of firewood and building materials

Developing New Resources

The natural and social capital-forming strategy is yielding clear dividends for UZACHI members. On the one hand, an emphasis on profitable logging has kept the CFEs in business in spite of the very harsh economic environment during the last two decades. On the other hand, a lot of effort has been directed to increasing other monetary and non monetary values as well, such as food self-sufficiency and the development of new sources of natural resource income.

Mushrooms provide an especially interesting case. As a result of traditional restrictions, only a few people in each community had knowledge of mushroom ecology and uses, and this knowledge was vanishing. UZACHI, with technical assistance from ERA, started a project to restore mushroom knowledge (Chapela and Massieu 2001). Mushroom samples and information about uses were stored in UZACHI facilities. Mushroom collections are accessible to UZACHI members and the information collected was compiled in a handbook that was distributed as a draft. The handbook has not been published for lack of funds, but the project greatly increased mushroom knowledge in the communities. As a result, many mushroom production and collection initiatives have appeared in UZACHI communities and elsewhere in Oaxaca, and wild mushrooms are more frequently found in local marketplaces. Forest areas not used for logging because they were not appropriate have now gained new value as wild mushroom production areas.

The search for new resources led UZACHI to a very innovative project in which community members used wildlife refuge areas to participate in a study that quantitatively analyzed the relationship between microbiological diversity and several management environments in an attempt to gain understanding of what drives chemical innovation in nature. This was a joint project between the Swiss-based pharmaceutical company Sandoz (which later merged with Ciba to form Novartis) and UZACHI, and it involved the challenge of undertaking high-quality technical work in the field. In structuring the collaboration, UZACHI put as conditions that the agreement would not guarantee Sandoz researchers access to communallands, that all fieldwork would be done by UZACHI members under the direction of the UZACHI technical director and executive council; that under no circumstances would the agreement involve the selling of indigenous traditional knowledge,

that the terms of the agreement should be in alignment with Mexican legislation, current or future; that the agreement should increase equipment and capacity on UZACHI's premises; that the agreement should leave trained people in UZACHI; and that UZACHI communities should receive sufficient payment to keep their wild areas management programs running during the agreement and some years later (Chapela and Massieu 2001).

Sandoz, convinced of UZACHI's technical capacity and reliability, accepted these conditions, making it unnecessary to hire professional biologists since community members were trained to conduct field research activities on their own. The project opened a window for rural organizations to engage in bioprospecting, keeping control of the process, and taking a reasonable share of the benefits (Kissling et al. 2002). This agreement ended in 1999 because Novartis and UZACHI felt that the legal framework was still too weak to engage in further collaboration. However, the laboratory which had been dedicated to producing microbial samples turned to producing mushroom mycelia, and is now the largest producer of mushroom mycelia in Oaxaca.

UZACHI has also been exploring the potential to use their forest areas to develop carbon sequestration activities. This initiative has led to the formation of a statewide organization called Servicios Ambientales de Oaxaca (SAO; Oaxaca Environmental Services), which organizes the main forestry and coffee production groups in Oaxaca to offer carbon sequestration services to polluters in Mexico using domestic schemes and to polluters elsewhere using the Clean Development Mechanism (CDM), set up by the UN Framework Convention on Climate Change.

Table 5.2. Carbon capture area and sequestration costs

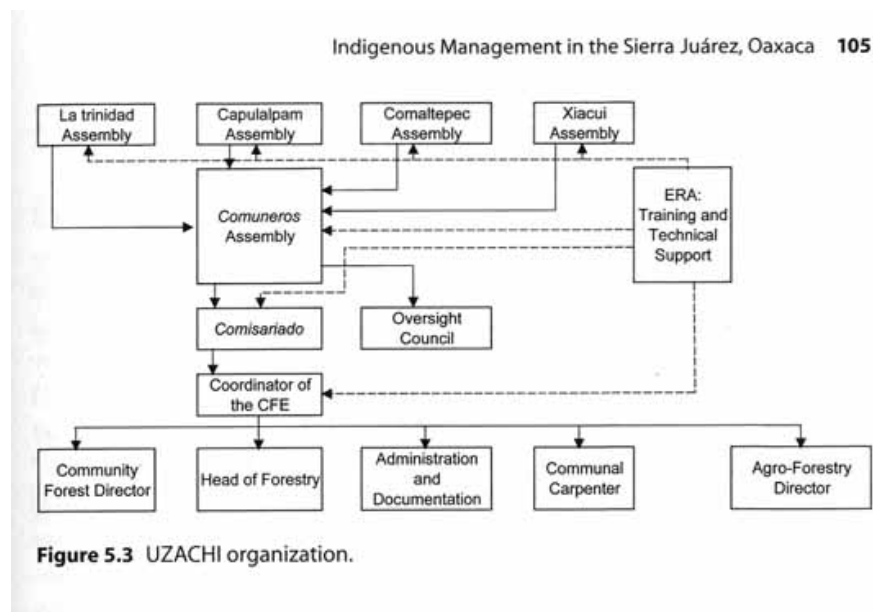
Community	Area devoted to sequestration activities (ha)				Total by community	
	Communal protected areas	Timber production	Shade coffee	Agroforestry systems	Area	Sequestration cost
Santiago Teotlaxco	80	300	37	180	597	24,362
San Juan Metaltepec	110	250	338	500	1,198	48,908
Santiago Comaltepec	10,004	4,210		120	14,334	585,424
San Miguel del Puerto	120	700	45	230	1,095	44,722
San Miguel Aloapam	980	490		160	1,630	66,572
Capulalpam de Méndez	873	1,500		80	2,453	100,185
Santiago Xiacuí	382	1,500		80	1,962	80,131
La Trinidad	84	1,500		120	1,704	69,594
San Juan Yagila	40	1,000	61	150	1,251	51,093
Totontepec, Villa de Morelos	80	900	65	120	1,165	47,581
Nvo. Zoquiapam	88	1,500		100	1,688	68,941
San Bartolomé Loxicha		1,000	110	290	1,400	57,178
La Merced el Potrero		1,000	130	310	1,440	58,812
Santa María Huatulco		1,200	200	240	1,640	66,980
Santa María Xadani	60	900	120	250	1,330	54,319
San José el Paraíso	20	500	90	218	828	33,817
Cuajinicuil	10	450	80	150	690	28,181
Total	12,931	18,900	1,275	3,298	36,404	1,486,800

Source: SAO 2003.

As can be seen in Table 5.2, SAO has already developed a *sink* on 36,404 hectares managed by communal organizations, with an expected yearly income of 1,486,800 pesos (about US\$148,680), proceeding from the capture and sequestration of 123,900 carbon tons per year by enhanced community forestry activities (SAO 2003). In the carbon project, the availability of a staff of community technicians able to manage sophisticated concepts such as carbon sequestration and trained to do baseline and follow-up studies is crucial. Once again, the accumulation of investment in social capital in the previous years, coupled with an effective stewardship of communities' natural capital, seems to have begun yielding dividends for UZACHI and other communities in Oaxaca.

The union has served as an effective regional organization that is able deal with natural resource management issues that the communities cannot attend to individually because of the scale, cost, or complexity involved. The current structure of UZACHI is shown in Figure 5.3. Technical Forest Services, which is a professional team with occasional external consultancies, is one of the few instances of a new organizational structure that has been

grafted onto traditional governance mechanisms. Other examples have been specialized committees that have dealt with biodiversity management and the sale of services related to it, as happened in the carbon sequestration and bioprospecting projects described above.



The Restoration of Natural Capital and Impacts on Social and Human Capital

In this section, I will evaluate the impacts of logging on natural capital during the concession and community forestry period; I will also comment on the contributions to social and human capital that have arisen from community forest management. To discuss the impacts on natural capital, I will draw principally on a 1974 forest inventory carried out by FAPATUX (Escárpita et al. 1994) in what would become the UZACHI communities, and compare it to the first UZACHI forest inventory carried out 18 years later, in 1992 (Chapela and Lara 1993).

During the FAPATUX period, with its 25-year concession, there was little incentive to make long-term investments in the forest to increase natural capital. After a period of reflection and experimentation, the communities have taken steps to safeguard their natural capital. Their analysis of the situation revealed that after some two decades of management under MMOM, stocks of pine had fallen by 7%, but oak and other noncommercial species had increased by 68%. As explained earlier, this is the typical response of tropical pines to MMOM. When the 1974 and the 1992 forest inventories were compared, effects on the productivity levels of pine were also observed. The annual average increase of the commer-

cial forest stands fell by 16.26%, from 30,104 cubic meters per year in 1974 to 25,210 in 1992. In 1974, the UZACHI forests were valued at 30 million pesos (1994 equivalent rate). After the concession scheme, the communities received forests valued at 25 million pesos. The concession scheme led to a loss in timber stocks of 16%. That is to say that the UZACHI communities lost almost 5 million pesos (1994 equivalent rate) during the 1974-1993 period, which means a loss of 258,000 pesos (US\$772,737 at 1994 rate) every year (Chapela and Lara 1993).

The underlying logic of concessionaires versus that of the communities is simple. The concessionaire's access rights expire after a period of time; therefore it makes no economic sense to invest in anything that will only pay beyond the 25-year concession period. In contrast, for the CFE, the ownership of the forest is for the long term, and it clearly makes sense to make capital investments, such as forest improvements or long lasting infrastructure, that will pay dividends 20, 30, or 40 years from now, making sustainable forestry the most rational choice for them. Communities believe they will be compensated for the higher investments required by sustainable forestry through the maintenance of forest value and the increased productivity of both the forest and the CFE itself.

Table 5.3. State of marginalization: Rankings of UZACHI communities

<i>Key</i>	<i>Municipality</i>	<i>Population</i>	<i>Degree of marginalization^b</i>
20458	Santiago Comaltepec	1,972	405
20496	Santiago Xiacuí ^a	2,333	535
20247	Capulalpam de Méndez	1,427	555
	Total	5,732	

Source: Consejo Nacional de Población 1990.

^a La Trinidad community is part of Xiacuí municipality.

^b Oaxaca has 570 municipalities. Therefore, the most marginalized has a marginalization degree of 1. The least marginalized (or wealthiest) has a degree of 570.

In addition to the increases in natural capital which community forestry has yielded, there has also been a notable formation of social and human capital and a consequent impact on levels of poverty and marginalization. UZACHI itself is a form of social capital, which has brought significant economic benefits to the member communities. Policies of job rotation have spread forest management skills throughout the community, and investments have been

made in agricultural training and infrastructure as well. It is also apparent that the UZACHI communities are relatively prosperous in the context of Oaxaca, and while in some cases this may be due to other factors, clearly community forest management has made a significant contribution to this relative prosperity. The National Population Council has ranked all 570 municipalities of Oaxaca as to their degree of economic and social marginalization (i.e., a ranking of relative poverty, with 1 being the most marginalized and 570 being the least marginalized, or most prosperous). Table 5.3 shows that some UZACHI communities rank among the least marginalized in Oaxaca.

Discussion

The UZACHI model of family, community, and regional organizational interdependence has allowed for the integrated management of 28,978 hectares of community territory. This scale of management is sufficiently large to talk about the management of forest ecosystems at a regional scale. The communities control significant watersheds and areas that sustain large areas of habitat for viable populations of trees, other plants, and fauna. Without a system of communal management, forest areas might well be fragmented among the 1,000 families that make up the four UZACHI communities. If the land area of UZACHI were to be evenly divided among the families, this would lead to 28-hectare properties, each one with its own plots of agricultural land and pasture. In such a situation, the chance of protecting habitats from fragmentation would be very low. However, under the common property system, there are forest areas that extend for more than 12 kilometers without interruption.

The experience of UZACHI shows that even small forest communities like Santiago Xiacuí, with an annual timber production of 2,000 cubic meters and sales on the order of US\$120,000 a year, are able to rent road building machinery and to purchase cranes, chainsaws, and trucks. If there were no organized forest management, each family would have to face the problem of paying for the cost of managing its 28-hectare property. Without community organization, it is quite easy to imagine properties being dedicated to the rearing and grazing of livestock, to orchards or agriculture, but forestry activities and the maintenance of wildlife conservation areas would be practically impossible.

The high level of community organization has meant that community land use planning

activities have been relatively easy to carry out, and it has clearly established the objectives of forest management, with well defined priorities (UZACHI 1993). UZACHI's principal strategic planning objectives include (1) ensuring the availability of firewood and wood for other domestic uses for community members; (2) ensuring the permanence of forest habitat in which processes of species diversification are maintained and ensuring a supply of genetic material for the maintenance of forest biodiversity; (3) maintaining indefinitely the production of forest timber from the forest production area and generating local employment; (4) maintaining indefinitely the production of processed wood in Oaxaca and generating regional employment; (5) advancing our knowledge of current commercial tree species and of non-timber forest product species that are of potential commercial importance; (6) preserving watersheds, in particular, the Río Valle Nacional and Río Grande watersheds; (7) maintaining the scenic value of the most important recreational areas; and (8) increasing the level of forest production through the restoration of areas that previously were dedicated to non forest use.

These objectives reflect the need to give top priority to the economic needs of families and communities as well as to forest and ecosystem service conservation. This is in line with UZACHI's principal mission, which is to make the forest a permanent source of benefit for its member communities. The objectives linked to sustainable production have also been given a high priority, which corresponds to the idea that the forests should serve as a strategic base within the regional economy. Finally, consideration is also given to the provision of regional and global environmental services, and their contribution to the economy and development of the state of Oaxaca.

The communities of the Sierra Norte have received significant support over the years from the state and federal governments, although there have also been periods of conflict and opposition. But UZACHI is unique in that it has had consistent long-term support from student advisors who later organized themselves into ERA and who are able to help arrange for external subsidies from foundations and other sources of support. If society has decided that it needs to maintain its forests, and if community forestry can preserve these forests, how can Mexican or global society finance the formation of the capital that is needed to do this, not only in the four communities of UZACHI, but in most of the 570 municipalities of Oaxaca and nationally? The promise and the challenge of UZACHI is that appropriate investments in human, social, and natural capital produce a stream of economic and

environmental benefits for local communities and for the planet.

Note

1. GATT was the General Agreement on Tariffs and Trade, which became the World Trade Organization (WTO).

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